G-6449

Continuing Studies in Music Aptitudes

Edwin E. Gordon

GIA Publications, Inc.
7404 S. Mason Ave., Chicago, IL 60638 • www.giamusic.com

G-6449
$11.95

Continuing Studies in Music Aptitudes

Edwin E. Gordon

Research Professor
University of South Carolina

GIA Publications, Inc.
7404 S. Mason Ave., Chicago, IL 60638 • www.giamusic.com

G-6449

GIA Publications, Inc.
7404 S. Mason Ave., Chicago, IL 60638
1.800.442.1358 • www.giamusic.com

ISBN: 1-57999-350-8

Table of Contents

Middle-School Students and the Advanced Measures of Music Audiation

Introduction

The *Advanced Measures of Music Audiation* (AMMA) was published in 1989. It was designed at the request of members of the National Association of Schools of Music to be used with college and university students. Although it was expected the test would demonstrate objective validity, it had to be short, no longer than 20 minutes to administer, and it had to yield separate tonal and rhythm scores in addition to a total score. Further, the professors suggested that a manual accompany the published test, and that it include technical data, details of a national standardization program, and established percentile-rank norms for young adults. Those conditions were satisfied, and the test was recorded with directions and practice exercises. The primary purpose of the test was to diagnose the potential of matriculating college and university freshman music majors so they could be placed in music theory classes appropriate to their individual musical differences in terms of anticipated achievement. There was no intent to use the test results to deny applicants admission to music programs in institution of higher learning.

During its developmental period and throughout the standardization program, various ancillary investigations were undertaken. AMMA was administered to college and university non-music majors who were taking required elective courses in schools of music. Comparisons of data from the various groups contributed to the

determination of the reliability and validity of the tests when used with music majors. The test functioned so well with adults who had no formal instruction in music that norms were developed for college and university undergraduate and graduate non-music majors as well as for undergraduate and graduate music majors. Soon after AMMA was published, research results suggested that a third set of norms for high school musicians might be included in the manual. However, there was no thought at that time, about fifteen years ago, to investigate the feasibility of using the test with middle-school students. That has been a recent development. The purpose of this paper is to relate that eventuality, and concurrently report technical information pertinent to the proper use of AMMA with middle-school students, both musicians and non-musicians.

Before moving to the essence of the paper, some preliminary issues that will assist in the interpretation of AMMA results might prove helpful. If desired, however, a leap may be made to *Design of the Study* which pertains specifically to the use of AMMA with middle-school students. A short account of the history of the nature and measurement of music aptitude and of significant related topics follow.

Aptitude and Achievement

There is a difference between music aptitude and music achievement. Aptitude is the potential to achieve, and musicians manifest the capacity when they intuitively understand what others consider inextricable connections in music that defy notation, and they are able to vocalize them or sing them through their instruments. When words such as *ability, gifted, musical,* and *talented* are used, the differences between aptitude and achievement are obscured, and the meaning of the two tend to become synonymous. That is a serious problem, particularly for music educators, because teaching to

individual musical differences among students is best facilitated by basing instruction primarily on music aptitude rather than on music achievement. How many persons do you know who cannot sing or play a music instrument? Typically, they are summarily dismissed as not being "talented" or "musical." Research has disclosed that approximately 50% of students in elementary through high school who possess relatively high music aptitude (those in the upper 20%) never have received music instruction beyond required classroom participation, perhaps no more than participation (or lack thereof) in group singing for 30 to 45 minutes a week. Usually no attempt is made to identify those students, because it is assumed by professionals and laypersons alike they are unmusical by virtue of their lack of performance skill, which is actually music achievement. Human potential is wasted and enjoyment forsaken as a result of the misuse of words that leads to erroneous and misguided conclusions. In fact, when middle-school students with substantially high music aptitude scores are encouraged and given the opportunity to begin to study music systematically, their music achievement is extraordinary, sometimes excelling that of their peers who have taken music lessons for a number of years.

Audiation

Music aptitude is described best by the word *audiation*, which is to music what thought is to language. Audiation is fundamental to both music aptitude and music achievement, but audiation functions differently in each, and that is an important contributing factor to the dissimilarity between the two. All students do not share the same innate capacities. Audiation potential cannot be taught. It is a matter of music aptitude which comes naturally. By providing persons of all ages with appropriate knowledge and experiences, however, they can be taught how to audiate, that is, how to use their inherent

audiation as determined by their music aptitude, to maximize their acquired music achievement as determined by the quality of their educational environment.

Sound itself is not music. Sound becomes music only through audiation, when, as with language, you translate the sounds in your mind and give them meaning. The meaning you give to these sounds will be different on different occasions as well as different from that given them by any other person. Audiation is the process of assimilating and comprehending (not simply rehearing) in our minds music that we have just heard performed or have heard performed sometime in the past. We also audiate when we assimilate and comprehend in our minds music that we may or may not have heard but are reading in notation or are composing or improvising. In contrast, aural perception takes place when we are actually hearing sound the moment it is being produced. We audiate actual sound only after we have aurally perceived it. In aural perception we are dealing with immediate sound events. In audiation we are dealing with delayed musical events.

You may audiate when listening to, recalling, performing, interpreting, creating, improvising, reading, or writing music. Though it may seem contradictory that you can listen to music and at the same audiate that music, certainly you would agree that you automatically think about what has been said while at the same time you are listening to or participating in conversation. Listening to music with comprehension and listening to speech with comprehension involve similar operations. Consider language, speech, and thought. Language is the result of the need to communicate. Speech is the way we communicate. Thought is what we have communicated. Music, performance, and audiation have parallel meanings. Music is the result of the need to communicate. Performance is how this communication takes place. Audiation is what is communicated. Although music is not a language, the process

is the same for audiating and giving meaning to music as for thinking and giving meaning to speech. When you are listening to speech, you are giving meaning to what was just said by recalling and making connections with what you have heard on earlier occasions. At the same time, you are anticipating or predicting what you will be hearing next, based on your experience and understanding. Similarly, when you are listening to music, you are giving meaning to what you just heard by recalling what you have heard on earlier occasions. At the same time, you are anticipating or predicting what you will be hearing next, based on your music achievement. In other words, when you are audiating as you are listening to music, you are summarizing and generalizing from the specific music patterns you have just heard as a way to anticipate or predict what will follow.

Through the process of audiation, we sing and move in our minds, without ever having to sing and move physically. We learn from the outside in, from the general to the specific. Though we are capable of memorizing specific material without comprehending what we have memorized, we quickly forget it. That is the case with many younger musicians, and many older musicians as well, who give recitals. They are encouraged to memorize notes but they do not know how to audiate what they have memorized and are trying to perform. As a result, they may never experience the joy that comes with the realization that audiation is excitingly circular in musical space, back and forth motion, and not at all like imitation and memorization, which are boringly linear in musical time. In fact, when a student learns how to audiate, imitation and memorization become unnecessary.

Measurement and Evaluation

The words *objective* and *subjective* are used to emphasize the difference between measurement and evaluation. A student's test score represents measurement, which is an objective standard, but a teacher's interpretation of that test score represents evaluation, which is subjective. The word *assessment*, when it is used to analyze test scores or levels of achievement, means simply "to estimate." Unfortunately, when it is used as a substitute for either measurement or evaluation, or both, it satisfies neither and thus distorts one's understanding of and attitude toward testing. Because either assessment or evaluation alone can be only subjective, they should be based on objective measurement. For example, a test score of 80 may be interpreted by a teacher on the basis of some predetermined standard to be worthy of a B or as an indication of satisfactory achievement. But suppose that 80 were the highest score achieved in the class. Should a score of 80 then be considered worthy of an A? And if the lowest score in the class were 80, might that suggest a different interpretation of a score of 80 than if the lowest score were 20? To answer these questions with confidence is impossible without the development and use of objective measurement techniques that support and lead to credible subjective assessment and evaluation procedures.

Purposes of a Music Aptitude Test

The primary educational purpose of a music aptitude test is to improve instruction and not to assist in awarding grades. In the case of music aptitude tests, scores should be used essentially to diagnose students' individual musical differences so that instruction can be adapted to their individual musical needs both normatively (comparing a student's score to the scores of all others in the group)

and idiographically (comparing the same student's scores on a tonal and rhythm aptitude test, for example, to each other), thus avoiding boredom and frustration at high and low extremes. Secondarily, test scores may be used to identify students with exceptional music aptitude and encourage them to participate in special music activities without discouraging those with less potential from taking part in music guidance and instruction. A daunting fact exemplifies the need for systematic music aptitude testing: Whereas students' academic intelligence and academic achievement scores have more than 80% in common, students music aptitude and music achievement scores have a mere 25% in common. There are almost as many students in elementary through high school who possess high music aptitude who have never participated in music activities of any type as there are students with high music aptitude who are members of music performance groups. Such a waste of human potential could be ameliorated if teachers were knowledgeable about all students, not just those who demonstrate music skills.

Characteristics of Music Aptitude

Music aptitude is innate but it is not inherited. We are born with a given potential to achieve musically, but what we are born with is not determined by ancestry. Why certain persons have higher or lower potential cannot be explained other than saying it is a matter of neurological make-up at birth. Contradictory as it may seem, although music aptitude is innate, it is dependent upon a rich music environment to come to fruition. Thus, music aptitude becomes a product of innate potential and early environmental musical influences. Unless the environment is appropriate, the potential a child is born with languishes and all but atrophies. The period from birth to approximately age nine is considered the developmental music aptitude stage, it is when the environment has a pronounced

effect on music aptitude. One's potential may go up or down, and the sooner a child is exposed to a proper music environment, the better. That is because the effect of the environment diminishes with age, and at about age nine, it no longer has much, if any effect. Music aptitude stabilizes at that time, and it remains in the stabilized music aptitude stage throughout adulthood. There is reason to believe that regardless of the nature of the environment after that age, it cannot raise a child's music aptitude. Ideally, environmental influences will raise potential that may have been lost in the very early years back to its birth level. Specific information about the characteristics of music aptitude may be found in other sources.

Four additional conditions of music aptitude are worthwhile noting. 1) Scores on both developmental music aptitude tests and stabilized music aptitude tests are normally distributed. Approximately two-thirds of the population have average music aptitude, one-sixth have above average and high music aptitude, and one-sixth have below average and low music aptitude. There is no one without at least some musical capacity. 2) Music aptitude is not a unitary trait. It is multidimensional. To name a few examples, there is a tonal aptitude, and it has subdivisions such as melody and harmony; a rhythm aptitude that subdivides into tempo and meter; an expressive aptitude that includes phrasing, balance, and style; and music improvisatory and creative aptitudes. For teachers to adapt instruction to students idiographic differences, a profile of each student's music aptitude scores is of significant assistance. A professionally designed music aptitude test yields a minimum of a tonal and a rhythm aptitude score in addition to a total score. 3) Music aptitude test results demonstrate no appreciable correlation with race, religion, nationality, or sex. Further, regardless of the instrument students play or whether they are members of a choral or instrumental ensemble, music aptitude score distributions remain similar. 4) Music aptitude is unique. It has very little or no relation

to any other human trait. Systematic objective research does not support contrary wishful thinking by those with special interests or sensational claims offered in the popular media. Adeptness in audiation is distinctive by virtue of its singular refinement.

Differences Between Developmental and Stabilized Music Aptitude Tests

There are three tests of developmental music aptitudes: *Audie*, *Primary Measures of Music Audiation*, and *Intermediate Measures of Music Audiation*, and there are two tests of stabilized music aptitudes: *Musical Aptitude Profile* and *Advanced Measures of Music Audiation*. For descriptions and use of these tests, the following references are recommended. The are many differences between the two types of tests, and the variance relates to both the validity of their musical content and their design. The content of stabilized tests includes actual music that is specially composed. The reason is familiarity with renown works of art would undoubtedly allow the music achievement of individual students to influence their test scores. In developmental tests, tonal patterns and rhythm patterns, not melodic patterns which combine tonal and rhythm aspects or non-musical acoustical sounds, serve as music content. In less rigorous stabilized tests, students simultaneously hear tonal and rhythm elements, but they are directed to attend to only one dimension to answer the questions. In advanced stabilized tests, however, students are asked to absorb both tonal and rhythm dimensions of the music and to decide for themselves which one or whether both should capture their attention to arrive at a correct answer. Students in the developmental music aptitude stage find it difficult to audiate more than one dimension of music at the same time, and for that reason, valid tests are designed to separate the two. Research during construction periods made it clear that when original short melodic patterns were used as content,

the validity of a developmental test sharply decreased. There is an anomaly with *Audie*, which is used with three-year-old and four-year-old children. For whatever the reason or reasons, to obtain valid results, very short melodic patterns must be made a component of developmental tests. It is interesting that if these very young children are asked to compare only tonal pattern or only rhythm patterns, their attention is directed away from the music and toward the sound source itself, and thus, they straightaway decide both patterns in a pair always sound the same. In this connection, music excerpts in stabilized tests are performed with unaltered or altered sounds of actual music instruments, whereas in developmental tests, patterns are always performed on electronic instruments.

Students in the developmental music aptitude stage are more interested in how music is constructed rather than in its expressive components, yet it is interesting that they become unsettled when asked to generalize a melodic variation. That notwithstanding, preference tests, in which students indicate whether they prefer the phrasing, ending, or tempo of one short passage over another, are absent from developmental tests. They have proven to be unreliable, and if a test is unreliable, it cannot be valid. Conversely, preference measures represent perhaps the most important components of stabilized tests because of their high predictive validity. Moreover, developmental tests comprise only tonal and rhythm measures. Initially, it seemed plausible that developmental tests would be enhanced if measures of timbre and dynamics were included. That idea was quickly dismissed when it became apparent that only extreme differences were obligatory if students were to notice whether or not two tonal patterns or rhythm patterns shared the same dynamic level or the same tone quality, and that, of course, significantly reduced test reliability due to an abundance of correct responses.

With regard to the process of taking the tests, again, there are differences. In stabilized tests, students may be asked to indicate their

response by using the following options: same/different, like/different, or yes/no. Although older students are able to interpret the option-responses high/low, up/down, short/long, they cannot be used. Because their meanings are so closely tied to notation, such option-responses easily transform a music aptitude test into a music achievement test. With the exception of *Audie*, in which yes/no is used, either same/different or same/not same is typically used in developmental tests. Without further research, it can be a matter only of conjecture why same/not same is superior to same/different in terms of developmental test reliability, particularly with younger children.

As with option-responses, directions for taking a test and the design of corresponding answer sheets are also aspects of process validity. Whereas directions for taking a stabilized test are recorded, those for taking a developmental test are read aloud by an adult who is sensitive to any contingencies that might be associated with the testing procedure. To derive highest reliability and validity, answer sheets for developmental tests should not divert students from audiating music because they are experiencing language difficulties associated with reading and counting. Unlike answer sheets for stabilized tests, numerals are not used to identify each question on answer sheets for developmental tests. Instead, simple pictures of familiar objects are used for that purpose. And, an oval or circle need not be filled to indicate an answer. If two patterns sound the same, a box with two faces that look the same is circled under the picture, and if two patterns sound different, a box with two faces that do not look the same is circled under the picture. In this regard it is of interest to note that students who can identify difference typically have higher music aptitudes than those who cannot. Because the majority of students are able to recognize sameness, it has little relationship to music aptitude.

So long as a test requires twenty minutes or less to administer, its length is not an issue in differentiating between its effectiveness for

students in the developmental and stabilized music aptitude stages. Nor is there a difference in silent time between the first and second excerpts or patterns to be compared in the two tests. During that three-seconds, it is anticipated that a student is summarizing and generalizing the overall musical context (tonality or meter) of the first excerpt or pattern in audiation to assist in arriving at a musically intelligent decision about the comparative musical content (individual pitches or durations) constituting the two. If silent time is extended, students attempt to memorize what they have heard, and that interdicts audiation. And although the tonal aptitude of students as a group is universally higher than their rhythm aptitude, increasing silent time actually exacerbates the phenomenon for students in both the developmental and stabilized stages of music aptitude. The possibility of memorization must be avoided, because it is indeed a characteristic of music achievement, and it is audiation that must be emphasized if music aptitude is the focus of concern. Without doubt, context is subjectively audiated, whereas the only option for content is objective memorization in the absence of audiation. Ideally, pattern content is audiated contextually.

Interpretation of Test Results

Historically, test means (average scores) have been found to increase with chronological age for developmental and stabilized music aptitude tests as well as for music achievement tests. That might seem to be in contradiction to the concept that music aptitude stabilizes at approximately nine years of age. The explanation is that although there are slight raw-score mean increments for the *Musical Aptitude Profile* from year to year, students, with slight variations, maintain their relative positions from one test administration to another. The magnitude of the percentile rank differences rarely correspond to more than one standard error, and the majority of

differences are minimal. And, as students increase in chronological age, normative means become more and more similar. That is the case with the *Advanced Measures of Music Audiation*. In fact, the differences are so small and unsystematic that there is no need for separate norms for high school students of different ages nor for adults of different ages. As explained earlier, only three sets of norms, each based on musical age rather than chronological age, are published in the test manual: one for adult musicians, one for adult non-musicians, and one for high school students. In the current investigation the same phenomenon, which may suggest that there is a generic music aptitude, has been uncovered in research with the *Harmonic Improvisation Readiness Record* and the *Rhythm Improvisation Readiness Record*.

It is true that students with a music background on average score higher than those without that background, but some non-music students score very high and some music students score low on AMMA. Thus, only one set of combined norms for music participants and non-participants is necessary for middle-school students. It may be that middle-school represents the period of a pronounced borderline between the developmental and stabilized music aptitude stages, and MAP is more appropriate for students just entering the stabilized stage and AMMA is more appropriate for students who have gone beyond the middle ground and already settled into that stage. The fact that music students as a group score higher than non-music students, however, does not invalidate AMMA as an aptitude test, nor does it indicate that AMMA is an achievement test. Common sense explains that more students with above average music aptitude than those with below music aptitude volunteer to be members of music ensembles. Further, the results of validity studies discount attributes of achievement. For example, when students receive practice in taking AMMA and/or formal music instruction over a semester or more, there are no significant differences observed

in their AMMA scores upon being re-tested. In this regard it is interesting to note that considering there is a possible total score of 40 points for the *Tonal* test and 40 points for the *Rhythm* test, 80 points for the two tests combined, the mean differences between high-school students and middle-school students is less than 2 points for the *Tonal* test, less than about 3 points for the *Rhythm* test, and less than only 5 points for the *Total* test.

A final philosophical question should be addressed. There are a few pundits who contend that developmental music aptitude tests are actually music achievement tests. They base their opinion on the fact that scores on a developmental music aptitude test fluctuate up and down, and such fluctuation is a result of music achievement. Critics fail to recognize or understand the following actualities: 1) The uniqueness of the expected responses by students to test questions is not taught or even addressed in formal or informal music instruction. Students do not practice nor are they taught to compare the sameness and difference of isolated pairs of patterns in rapid succession. Also, although music theory as it pertains to the reading of music notation is a mainstay of music instruction, that knowledge is not measured in developmental or stabilized tests. 2) In typical music activities, students are not expected to identify by themselves the tonality or meter of isolated patterns they may hear. The potential to audiate subjectively musical context is the bedrock of music aptitude. 3) The correlations among students' scores on the same test from one semester or year to another is alarmingly low, even though they are receiving quality classroom music instruction. That fact is objectively illustrated in the companion study in this monograph and in another cross-validation parallel study. It seems that students' immediate impressions and intuitive responses to environmental influences have more of an impact on developmental music aptitude than does systematic instruction in music. 4) The correlation of students' developmental music aptitude test scores with scores and/or ratings

of their music achievement at any one time is virtually zero. 5) It is not unusual for kindergarten children with no prior music informal or formal music instruction to obtain perfect scores on a valid developmental music aptitude test.

Design of the Study

Before the recent publication of the *Music Audiation Games* (MAGS), all necessary pre-publication technical data were collected except information that pertains to the validity of a test. Because the population for whom the test was designed is not intact, music instruction and provisions for documenting the progress of individuals over time could not practically be undertaken. Thus, establishing the congruent validity of MAGS was the only realistic option. In congruent validity investigations, students are administered a newly-developed test along with a test with parallel content and proven longitudinal validity. If it can be demonstrated that the correlation between sets of scores on the two tests is high, it may be assumed that the new test is also valid by virtue of the observed relationship.

Twenty teachers who were enrolled in a summer music seminar volunteered to administer the *Youth* and/or *Adult* version of MAGS on the one hand and a comparable valid test on the other to their students the following Fall who would be attending schools across the United States. The choice of the other test was decided independently by each teacher, depending upon which test or tests teachers believed would be most appropriate for their students. They could choose between PMMA, IMMA, AMMA, and MAP. The publisher provided all test materials free of charge, and in return, the completed answer sheets were returned and hand-scored by the author. After the results were documented and sent to the teachers, the data were analyzed. It was discovered in the process that some teachers out of curiosity choose not to follow recommendations in the test manu-

als. For example, some elementary-school students were given the *Adult* version of MAGS, and some middle-school students were given AMMA. The results, which became part of the report of the original investigation, were most interesting. They contributed uniquely to the understanding of the qualities of the tests. More important in regard to the current investigation, however, the number of middle-school students to whom AMMA was administered was sizeable enough to provide for separate analyses. AMMA test results were combined with those obtained for other middle-school students over the last decade, and when combined, there were 2,077 answer sheets available for examination.

Results of the Study

The first step in the analyses was the computation of means and standard deviations for each of the three tests—*Tonal, Rhythm,* and *Total.* Next, the split-halves reliabilities, Spearman-Brown corrected for length, were calculated for each test. Then, the intercorrelation, standard errors of measurement, and the standard error of a difference for the *Tonal* and *Rhythm* tests were determined. Finally, the three score distributions were plotted and smoothed graphically, and percentile ranks in the respective groups were read and recorded. The percentile ranks for the *Total* test are based on the averages of the raw scores, not the raw scores of the averages.

Means and standard deviations are presented in table 1. Considering that the highest obtained score for the *Tonal* test was 36 and the lowest 8, the mean of 22.4 and standard deviation of 4.53 indicate substantial variability. Specifically, three standard deviations above and below the mean equals 35.9 and 8.85, respectively. Corresponding data for the *Rhythm* test are 36.5 and 10.83, and for the *Total* test, 70.1 and 22.07. The normal distributions of the three sets of scores suggest the composition of the more than 2,000 students

to whom AMMA was administered was sufficient for confidently deriving realistic middle-school norms.

Table 1

Middle-School Means and Standard Deviations for the Advanced Measures of Music Audiation

	Mean	Standard Deviation
Tonal	22.4	4.53
Rhythm	23.7	4.29
Total	46.1	8.01

Reliability coefficients and standard errors of measurement are reported in table 2. A comparison of these impressive middle-school correlations with those for high school, obtained from the results of students who participated in the AMMA standardization program, indicates strong similarities. In regard to the standard errors, they represent the ultimate effect of all factors that lead to inconsistency in an individual student's score on a given test. Thus, the best estimate of a student's "true" score is by adding and subtracting the standard error from the student's obtained score. In about two cases of every three, a student's actual score is included within that interval estimate. For example, if a student received a score of 30 on the *Tonal* test, it may be hypothesized that if the test were administered 100 times, 66 times his or her true score would fall between 28 and 32, and 95 times it would fall between 26 and 34.

Table 2

Middle-School Split-Halves Reliabilities and Standard Errors of Measurement for the Advanced Measures of Music Audiation

	Reliability	Standard Error of Measurement
Tonal	.82	1.9
Rhythm	.80	1.9
Total	.86	3.0

The standard error of a difference is helpful in determining if the observed difference between a raw student's scores on the *Tonal* test and the *Rhythm* test represents a "real" difference. For example, if a student received a score of 30 on one test, a score of 33 or higher or 27 or lower on the other test would represent a real difference (when the standard error of the difference of 2.6 is rounded to 3.0). The intercorrelation coefficient of .65 allows the generalization that for the students as a group, there is slightly more than 40% overall in common between their *Tonal* test and *Rhythm* test scores.

Table 3

Middle-School Standard Error of a Difference and Intercorrelation Between the Tonal and Rhythm Subtests of the Advanced Measures of Music Audiation

Standard Error of a Difference	Intercorrelation
2.6	.65

Test norms are outlined in table 4 in terms of raw-score-to-percentile-rank conversions. Percentile ranks are very simple to interpret, because as standard scores, they have standard meaning. For example, if a student receives a percentile rank of 24, that means the student scored as higher or higher than 24% of the students who are being compared and 76% scored higher. It should be remembered that the percentile ranks reported in table 4 are not absolute. They are intended to serve as a guide in the absence of local norms. That is, for most accuracy in the interpretation of test results, it is recommended that AMMA middle-school norms for a specific school, school district, or city be developed. Computation procedures may be consulted in chapter 14 of *Learning Sequences in Music*.

Table 4

Middle-School Percentile Rank Norms for the Advanced Measures of Music Audiation

TONAL		RHYTHM		TOTAL	
Raw Score	Percentile Rank	Raw Score	Percentile Rank	Raw Score	Percentile Rank
36	99	36	99	70	99
35	98	35	98	69	98
34	97	34	96	68	97
33	96	33	93	67	96
32	94	32	89	66	95
31	91	31	85	65	94
30	88	30	80	64	93
29	84	29	75	63	92
28	80	28	70	62	91
27	75	27	65	61	90
26	70	26	60	60	88
25	65	25	55	59	86
24	60	24	50	58	84
23	55	23	45	57	82
22	50	22	40	56	80
21	45	21	35	55	77
20	40	20	30	54	74
19	35	19	26	53	71
18	30	18	22	52	68
17	25	17	18	51	65
16	20	16	14	50	62
15	16	15	10	49	59
14	13	14	6	48	56
13	10	13	3	47	53
12	8	12	1	46	50
11	6			45	47
10	4			44	44
9	2			43	41
8	1			42	38
				41	35
				40	32

(Table 4, continued)

TOTAL	
Raw Score	Percentile Rank
39	29
38	26
37	23
36	20
35	18
34	16
33	14
32	12
31	10
30	8
29	7
28	6
27	5
26	4
25	3
24	2
23	1

Bibliography

Gordon, Edwin E. *A Music Learning Theory for Newborn and Young Children*. Chicago: GIA, 2003.

Gordon, Edwin E. *An Investigation of the Objective Validity of the Music Audiation Games*. Chicago: GIA, 2004.

Gordon, Edwin E. "Fifth and Final Results of a Five-Year Longitudinal Study of the Musical Achievement of Culturally Disadvantaged Students," *Experimental Research in the Psychology of Music: Studies in the Psychology of Music* X (1975): 24-52.

Gordon, Edwin E. *Introduction to Research and the Psychology of Music*. Chicago: GIA, 1998.

Gordon, Edwin E. *Learning Sequences in Music*. Sixth Edition. Chicago: GIA, 2003.

Gordon, Edwin E. Manual for the *Advanced Measures of Music Audiation*. Chicago: GIA, 1989.

Gordon, Edwin E. Manual for the *Harmonic Improvisation Readiness Record* and the *Rhythm Improvisation Readiness Record*. Chicago: GIA, 1998.

Gordon, Edwin E. Manual for the *Musical Aptitude Profile*. Chicago: GIA, 1995.

Gordon, Edwin E. Manual for the *Primary Measures of Music Audiation* and the *Intermediate Measures of Music Audiation*. Chicago: GIA, 1986.

Gordon, Edwin E. *Music Aptitude and Related Tests*. Chicago: GIA, 2000.

Gordon, Edwin E. *Music Audiation Games*. Chicago: GIA, 2003.

Gordon, Edwin E. "The Longitudinal Interaction of Developmental Music Aptitude and Chronological Age," *GIA Monograph Series*, G-5720. 2001, 63-74.

A Longitudinal Study of Kindergarten, First Grade, Second Grade, and Third Grade Children's Performance on the Primary Measures of Music Audiation

Introduction and Purpose of the Study

One need not look beyond current attitudes and listening habits of the public to grasp the obvious lack of musical sophistication and understanding of much of the public-at-large. To blame that totally on music educators would be mistaken. Media producers not only give the public what they think the average person desires to hear and see, they actually influence what those desires are to be. As a ready example, classical music and jazz on midday and evening radio have all but disappeared being replaced by simplistic-repetitious-amplified-electronic-tranquilizing sounds, sounds that require little attention or thought, and thus a listener is not aware of and/or embarrassed by ignorance. Further, without exaggerated choreography and dazzling arcs of punctuated light in the concert arena, even that music is found to be boring. And to exacerbate the matter, penurious book publishers take advantage of the uniformed inclinations of poorly-educated teachers for which institutions of higher learning are largely responsible. Publishers readily provide them with inane materials for instructional use.

I use the word "ignorance" purposefully; I do not mean stupidity or dumbness. There is ample evidence gleaned from the standardization and post-publication research of the *Music Audiation Games* that the great majority of persons in our country might demand and would be capable of giving intrinsic meaning to challenging music if the environment were modified to support befitting teaching and, also, if ample school time were made available by administrators to accomplish the mission. To make all of this happen will take more than philosophers of music education ineffectually exchanging glorious views with one another about the value of the arts, music in particular, or in setting impressive but nonetheless unrealistic standards for students and music teachers alike to achieve. Glorious, but inutile, words and platinum platitudes have proved to be apologetically oblique, so much so that professional organizations in desperation have attempted to justify music in the schools by claiming that it indirectly sharpens academic acuity. Of primary concern should be that the music education establishment recognize the difference between teaching and learning on the one hand and between entertainment and education on the other. Given this, perhaps more parents, as well as overseeing school administrators and business and community leaders, might become cognizant of the advantages a mature awareness of music can offer not only in adolescence, but also, in adult life.

The purpose of this paper was twofold: 1) to study objective evidence that pertains to an aspect of the quality of music education in elementary school by determining the extent to which individual children maintain their relative standings in developmental music aptitude from year-to-year and 2) to offer suggestions that might contribute to and inspire the amelioration of educational impasses.

Design of the Study

More than one thousand children enrolled in Bennett and Cascades Elementary Schools in Jackson, Michigan, were repeatedly administered the *Primary Measures of Music Audiation* (PMMA) in the 2000 through 2002 when they were enrolled in kindergarten, grade one, grade two, and grade three.* The children received music instruction once a week for forty minutes, and it was based on a Music Learning Theory curriculum. During the first ten minutes of each period, the children would develop their audiation skills by performing tonal patterns and rhythm patterns in solo and ensemble. During the first two years, the music teacher followed the sequence of instruction of discrimination and inference learning outlined in the *Tonal Register Book I* and the *Rhythm Register Book I* published by GIA. The teacher's purpose for administering PMMA was to track children's musical progress so that instruction, as time permitted, would be appropriate to their current individual music needs as determined by their developmental music aptitude test results.

For purposes of research analyses, I was offered the answer sheets after the children were tested. Thus, the design of the investigation was not *a priori*. However, the situation presented a unique and important opportunity to follow the individual children's progress on a continuous basis from one grade to another when taught by a highly qualified teacher using systematic methodology. That is, each individual child's test results could be studied from year to year. Only once before did such an occasion serendipitously present itself, and it is compelling that the results of the present investigation corroborate the findings of the earlier one. Obviously, no control group was

* I am indebted to Mandi Garlock, music specialist in the schools, who administered PMMA to the children, and provided me with the test results.

necessary, because the efficacy of different methods was not being compared. The primary interest was to ascertain whether the majority of children, as should be expected, would maintain or improve their individual *Tonal* and *Rhythm* scores on PMMA during their important formative years, as average scores for the groups become incrementally higher with increasing chronological age.

The children's PMMA scores were, as described below, divided into three groups and analyzed according to the unique school-grade sequence in which PMMA was administered.

Group 1 – Spring (2002) of kindergarten and fall (2002) of grade 1.
Group 2 – Spring (2001) of kindergarten, fall (2001) of grade 1, and fall (2002) of grade 2.
Group 3 – Spring (2000) of kindergarten, fall (2000) of grade 1, fall (2001) of grade 2, and fall (2002) of grade 3.

It will be noticed that the number of children in each group is not uniform, and that is because the testing program was not begun at the same time for each group but ended at the time regardless of how many years each group had been tested. For example, the kindergarten children in Group 1 were initially given the test the same year children in Group 3 were being administered the test the fourth time. Moreover, there was attrition, because the test results of only those children who were sequentially administered PMMA each year were included in the investigation, and that varied from group to group.

Results and Interpretation

Group 1

The PMMA means and standard deviations for children in Group 1 are presented in table 1. The means and standard deviations derived from the PMMA standardization program are in parenthesis. As with Groups 2 and 3, no formal music instruction took place during the summer months.

The kindergarten *Tonal* and *Rhythm* means are considerably above the standardization statistics. This may be due to PMMA being administered in the spring, whereas in the standardization program, PMMA was administered in the fall. Or, it could be that these kindergarten children were exceptional. The *Tonal* and *Rhythm* standard deviations for the children are typical, and the mean increases over the summer months of no more than half a point is normal.

Table 1

Spring and Fall Primary Measures of Music Audiation Means and Standard Deviations for 193 Kindergarten and First Grade Children

	Tonal	
	Means	**Standard Deviations**
Kindergarten – Spring	28.2 (24.7)	4.88 (5.28)
Grade 1 – Fall	28.7 (29.8)	5.28 (5.03)
	Rhythm	
	Means	**Standard Deviations**
Kindergarten – Spring	26.2 (22.3)	4.95 (3.74)
Grade 1 – Fall	26.5 (25.8)	4.08 (4.34)

The correlations between the children's kindergarten and grade 1 PMMA scores are presented in table 2. The intercorrelations between the *Tonal* and *Rhythm* scores for kindergarten and grade 1 children, spring and fall, are reported in table 3. Again, coefficients in parenthesis are standardization results.

Table 2

Correlations Between 193 Kindergarten and First Grade Children's Spring and Fall Tonal and Rhythm Primary Measures of Music Audiation Scores

Tonal	.44
Rhythm	.48

Table 3

Intercorrelations Among 193 Kindergarten and First Grade Children's Spring and Fall Tonal and Rhythm Primary Measures of Music Audiation Scores

Spring	.49 (.45)
Fall	.44 (.49)

An apt glance at table 2 reveals that there is only an approximate relation of 20% among the children's PMMA scores in kindergarten and grade 1. A few children who scored low in kindergarten scored higher in grade 1, and conversely, but unfortunately, only a few children who scored high in kindergarten distinguished themselves again in grade 1. Because the children received no formal music instruction during their vacation and the reliability of PMMA is high, it would be realistic to anticipate their relative standing on

the tests would remain relatively stable. There is no objective explanation of why this is not the case. Given the quality of music instruction known to take place in the schools, it would seem the results are most probably attributable to 1) the limited amount of curricular time devoted to music instruction during the school year which is not sufficient to sustain whatever gains children make during the year or 2) children's exposure to music in the media and related activities during vacation time are patently influential

The intercorrelation coefficients for the *Tonal* and *Rhythm* subtests in table 3 are almost identical to those derived in the standardization program. What is alarming is that the test intercorrelation coefficients are nearly identical to the grade-to-grade correlation coefficients presented in table 2. The numbers indicate that the relation between children's performance as a group on the two different tests administered concurrently in the same school grade is not materially different from their performance as a group on the same test administered in adjacent school grades. From an educational point of view, that reality is difficult to embrace. Common sense and extant cross-sectional research suggest that, the phenomenon of regression notwithstanding, one's musical age from one adjacent grade to another, regardless of one's chronological age, should demonstrate a greater relation than the relation of one's tonal potential to one's rhythm potential.

It is realistic to expect the relation between two sets of scores on the same test administered on different occasions to be rather high. That relation, however, is closely tied to the reliability of the tests under consideration. Psychometricians believe that the coefficient describing the relation between the two sets of scores can go no higher than the square root of the product of the reliability coefficients of the tests. The split-halves reliabilities for the *Tonal* test range from .85 to .89, and for the *Rhythm* test, from .72 to .86 in kindergarten through grade 3. Thus, the correlations between

sets of *Tonal* or *Rhythm* PMMA scores could roughly be found to be as high as .80 for typical groups of children. When the theoretical and observed correlation coefficients are squared to determine the comparative amount of variance each paired set of scores account for in this study, the difference of 20% versus 65% is clearly substantial.

I would be remiss not to mention another possibility—though remote in this study considering the remarkable similarity of the standardization and observed statistics in tables 1 and 3—for the strikingly low correlations noted in table 2. In a longitudinal study that covers more than one school grade, the initial testing of many participants is a necessity, because it is anticipated some children leave the school and that might unduly skew score distributions. Given the large number of participants in this study, the scores of children who missed one or more test administrations were omitted from the analyses and variability remained intact. Thus, no attempt was made, which is often undertaken, to substitute statistically derived fictitious scores for the missing scores. For Groups 1, 2, and 3 combined, about 25% of scores for all test administrations were incomplete.

In research of this type, questions about the validity of the criterion measure becomes of pivotal interest. Considering the more than 25 years since the development and publication of PMMA, there have been many objective investigations of its experimental validity. Most criterion-related validity investigations pertain to doctoral and masters theses and dissertations. I designed and completed several longitudinal predictive validity studies. In all but a one or two concurrent validity studies and in all of the longitudinal studies, the overall validity of PMMA has been well established. That certainly offers readers and researchers confidence in the test serving as a criterion measure, but actually, there is a practical subjective concept that is of far greater concern, particularly with regard to the present study. It is the content validity and the construct validity of PMMA. The child listens to a recording and is asked to mark on

an answer sheet whether two tonal patterns in the *Tonal* test or two rhythm patterns in the *Rhythm* test sound the same or different. Such a natural and straightforward task precludes the possibility of it being daunting. Certainly the simplicity of the directions should ascertain with assurance and without bias the current level of a child's audiation development, regardless of whether the child has or has not received formal music instruction. It is with these thoughts in mind that the interpretations and conclusions that have already been and will be presented herein are offered with certainty and conviction.

Group 2

In addition to the fact that Group 2 includes many more children than Group 1, the second group includes PMMA longitudinal results for the same children from kindergarten through grade 2. It can be seen in table 4 that although the kindergarten means are somewhat lower in table 4 than in table 1, the grade 1 *Tonal* and *Rhythm* means derived in the fall for Group 2 are only one point lower. Nonetheless, with regard to table 4, as would be expected, all means increase systematically from kindergarten through grade 2. The numbers in parenthesis (in this and all other tables) are reproduced from the test manual for the standardization population. Obviously, there is a high correspondence between the performance of children in this group and those who participated in the development of the PMMA norms.

The upper two sets of data in table 5 include correlations among children's scores obtained twice in grade 1 and twice in grade 2. The lower two sets include correlations among children's scores also obtained twice in grade 1 and twice in grade 2, and only once in grade1 and only once in grade 2. Kindergarten children's scores are not included in the analysis because PMMA was administered to them only in spring. All coefficients favor the *Tonal* test over the *Rhythm* test, though the differences are not substantial. Of compelling interest, of course, is that all of the coefficients are low

enough to suggest that there is at best only a moderate carryover of music potential from grade to grade, and that is not materially different from the corresponding coefficients for Group 1. Moreover, as with Group 1, the correlations of scores from year to year on the same test is similar in magnitude to the intercorrelations reported in table 6 between the *Tonal* and *Rhythm* tests for each of the three years. In terms of cross-validation, the coefficients for both groups do not bode well pertaining to what the musical potential and capabilities of children might become in adolescence and adulthood.

Table 4

Fall and Spring Primary Measures of Music Audiation Means and Standard Deviations for 488 Kindergarten, First Grade, and Second Grade Children

	Tonal	
	Means	Standard Deviations
Kindergarten – Spring	26.4	5.42
Grade 1 – Fall	27.7	4.98
Grade 1 – Spring	30.6	4.80
Grade 2 – Fall	31.3 (32.0)	5.06 (4.75)
Grade 2 – Spring	32.8	4.23
	Rhythm	
	Means	Standard Deviations
Kindergarten – Spring	24.6	4.42
Grade 1 – Fall	25.5	4.36
Grade 1 – Spring	27.7	4.18
Grade 2 – Fall	28.5 (27.7)	4.37 (4.55)

Grade 2 – Spring	31.4	3.56

Table 5

Correlations Among 488 First Grade and Second Grade Children's Fall and Spring Primary Measures of Music Audiation Scores

Tonal	Grade 1 – Fall/Spring	.45
	Grade 2 – Fall/Spring	.52
Rhythm	Grade 1 – Fall/Spring	.31
	Grade 2 – Fall/Spring	.39
Tonal	Grades 1 and 2 – Fall/Fall	.51
	Grades 1 and 2 – Spring/Spring	.52
	Grades 1 and 2 – Spring and Fall	.51
Rhythm	Grades 1 and 2 – Fall/Fall	.36
	Grades 1 and 2 – Spring/Spring	.39
	Grades 1 and 2 – Spring/Fall	.39

Group 3

Perhaps the most important section of the study resides with the data collected from the test results for Group 3. It traces PMMA results for the same children longitudinally from kindergarten through grade 3. Little need be said about the means and standard deviations for Group 3 in table 7. They mirror what was discovered for Groups 1 and 2, the measures of central tendency, again, systematically and normally increasing through all school years. The essence of the findings is revealed in the correlations and intercorrelations in tables 8 and 9 that cover longitudinally all years of the study.

None of the coefficients in tables 8 and 9 are imposing. They span from .27 to .51, and when these coefficients are squared,

it may be determined that there is approximately only 8% to 25% commonality among any two sets of corresponding scores. If children with high and low potential were maintaining or increasing at similar or exponential rates their relative positions from year to year, the correlations would approximate .85. Stated in less technical terms, although the collective average scores (means) on PMMA grew normally with increased chronological age between groups, the correlation coefficients make it unambiguously obvious that the musical potential individual children possess at an early age is not an accurate prediction of what the great majority of them will demonstrate at a later age. The *ex post facto* design of the study does not provide for determining an objective reason for such random vacillation. However, with less than one hour a week allotted to even superior music instruction in school, logic suggests that the comparatively many hours of out-of-school environmental influences, both musical and extra-musical, loom large as contributing factors. Albeit, the fluctuation in capabilities becomes more startling, if not alarming, when it is realized that what has been observed pertains to only the early school years of children's lives. The observed trends seem to suggest that the disparity becomes even more extreme as the age of children increases. It defies common sense to accept the belief that the contrariety between sets of scores on the same test administered during different seasons in the same school year or during the same season in adjacent and disjoined school years, on the one hand, compared to sets of scores on different tests administered during the same season in the same school year, on the other, is insignificant.

One can only wonder how so much time and money can be spent by so many persons and so little of manifest importance gained. Is it possible that the time and money already being spent is actually not sufficient, or are there more crucial impediments that might be next to impossible to overcome? I have given the matter earnest thought, and I relate my inferences in the next section. There is the

fervent hope that some of the ideas might seriously galvanize office-holders, professors, school administrators, parents, and teachers into long overdue conscientious action. Children, being culture's most important asset, deserve at least that much from their elders.

Table 6

Intercorrelations Among 488 Kindergarten, First Grade, and Second Grade Children's Fall and Spring Primary Measures of Music Audiation Scores

Tonal and Rhythm	
Kindergarten – Spring	.54
Grade 1 – Fall	.43
Grade 1 – Spring	.45
Grade 2 – Fall	.47 (.51)
Grade 2 – Spring	.40

Table 7

Fall and Spring Primary Measures of Music Audiation Means and Standard Deviations for 366 Kindergarten, First Grade, Second Grade, and Third Grade Children

	Tonal	
	Means	**Standard Deviations**
Kindergarten – Spring	26.7	4.94
Grade 1 –Fall	26.5	5.21
Grade 1 – Spring	29.3	5.00
Grade 2 – Fall	30.2	4.80
Grade 2 – Spring	32.0	4.63
Grade 3 – Fall	33.2 (34.6)	3.43 (3.35)
Grade 3 – Spring	33.9	3.60
	Rhythm	
	Means	**Standard Deviations**
Kindergarten – Spring	25.3	4.09
Grade 1 – Fall	25.9	4.11
Grade 1 – Spring	27.5	4.72
Grade 2 – Fall	28.3	4.53
Grade 2 – Spring	29.0	4.45
Grade 3 – Fall	29.7 (29.4)	3.75 (3.99)
Grade 3 – Spring	30.9	4.51

Table 8

Correlations Among 366 Kindergarten, First Grade, Second Grade, and Third Grade Children's Fall and Spring Primary Measures of Music Audiation Scores

Tonal		Rhythm	
Kindergarten & Grade 1 – Fall	.50	Kindergarten & Grade 1 – Fall	.41
Kindergarten & Grade 1 – Spring	.51	Kindergarten & Grade 1 – Spring	.32
Kindergarten & Grade 2 – Fall	.51	Kindergarten & Grade 2 – Fall	.35
Kindergarten & Grade 2 – Spring	.47	Kindergarten & Grade 2 – Spring	.39
Kindergarten & Grade 3 – Fall	.29	Kindergarten & Grade 3 – Fall	.37
Kindergarten & Grade 3 – Spring	.26	Kindergarten & Grade 3 – Spring	.35

Tonal		Rhythm	
Grade 1 – Fall/Spring	.49	Grade 1 – Fall/Spring	.42
Grade 2 – Fall/Spring	.30	Grade 2 – Fall/Spring	.35
Grade 3 – Fall/Spring	.42	Grade 3 – Fall/Spring	.44

Tonal		Rhythm	
Grades 1 and 2 – Fall/Fall	.41	Grades 1 and 2 – Fall/Fall	.32
Grades 1 and 2 – Spring/Spring	.27	Grades 1 and 2 – Spring/Spring	.46
Grades 1 and 3 – Fall/Fall	.34	Grades 1 and 3 – Fall/Fall	.40
Grades 1 and 3 – Spring/Spring	.42	Grades 1 and 3 – Spring/Spring	.37
Grades 2 and 3 – Fall/Fall	.37	Grades 2 and 3 – Fall/Fall	.37
Grades 2 and 3 – Spring/Spring	.44	Grades 2 and 3 – Spring/Spring	.48
Grades 1 and 2 – Spring/Fall	.49	Grades 1 and 2 – Spring/Fall	.37
Grades 1 and 3 – Spring/Fall	.36	Grades 1 and 3 – Spring/Fall	.38
Grades 2 and 3 – Spring/Fall	.45	Grades 2 and 3 – Spring/Fall	.49

Table 9

Intercorrelations Among 366 Kindergarten, First Grade, Second Grade, and Third Grade Children's Fall and Spring Primary Measures of Music Audiation Scores

	Tonal and Rhythm
Kindergarten – Spring	.28
Grade 1 – Fall	.28
Grade 1 – Spring	.27
Grade 2 – Fall	.41
Grade 2 – Spring	.44
Grade 3 – Fall	.36 (.49)
Grade 3 – Spring	.39

Conclusions

The data presented thus far are objective. The interpretation and conclusions drawn can be only subjective. That having been said, I offer the following to music educators in the schools and institutions of higher learning. When they, who are directly responsible to the profession, become more mindful of and attend to problems that should and can realistically be rectified, other persons indirectly associated with the issues, such as general administrators, parents, and officeholders, may be encouraged to act accordingly by attending to peripheral concerns.

The primary conclusion bears on the scheduling of classroom music in elementary school. It would seem that music instruction once a week is not sufficient for children's appropriate educational advancement. At least two instruction periods each week should be standard. That may be most easily accomplished by having two

shorter periods in place of one longer period during the week. The importance of consistent relevant music guidance for young children cannot be overstated, because when it is absent, human potential at worst is wasted and at best it temporarily goes astray. Ancillary judgments follow:

1. Experienced and thoughtful teachers know that almost all kindergarten and first grade children do not have the musical readiness to learn what a music teacher intends to teach them. To amend the problem, it is imperative that all children be given the opportunity to attend public-supported early childhood music guidance classes in which the agenda is based on the most up-to-date research findings. Simply listening to an amateur musician strumming a guitar or participating in ensemble songfests will not do. A capable music educator must be given the responsibility of guiding the preparation of children for formal music instruction. It is axiomatic that just as a child should be able to think before being exposed to formal instruction in reading, writing, and arithmetic, so should a child be able to audiate before being exposed to formal instruction in classroom music, and particularly in public school and private beginning and advanced instrumental music.
2. Expose children as soon as possible to the art of musical improvisation. The ability to read and audiate music notation is important, but no more important than that of expressing oneself at his or her own level of musical accomplishment. All endeavors in music are based on one sort or another of improvisation ability. Unless a teacher understands the power and importance of improvisation, music achievement will inadvertently be suppressed.
3. Rather than delegating the responsibility to post graduate-summer seminars and "workshops," colleges and universities

should institute with haste undergraduate courses for prospective music educators in 1) the development of a sequential music curriculum following through from early childhood music guidance, 2) the design and development of valid music tests for measuring knowledge, and 3) the design and development of rating scales for measuring instrumental and vocal performance.

4. Schools and institutions of higher learning must become flexible in providing opportunities for conducting research. Currently, committees that oversee political correctness and administrator's fear of litigation preclude the possibility of acquiring necessary information to insure educational progress.

A final word of interest to psychometricians, and to school psychologists and guidance counselors. Rarely are test norms developed longitudinally. That is, test norms for a given school grade or chronological age are derived from the test results of different students enrolled in adjacent grades. In the current study, it has been shown that norms derived longitudinally with the same children for all intents and purposes duplicate norms derived cross-sectionally. Thus, there is no reason to question established methods for gathering normative data.

Bibliography

Gordon, Edwin E. "All About Audiation and Music Aptitudes," *Music Educators Journal* 86, 2 (September, 1999) 41-44.

Gordon, Edwin E. *An Investigation of the Objective Validity of the Music Audiation Games*. Chicago: GIA, 2004.

Gordon, Edwin E. "Audiation, Imitation, and Notation: Musical Thought and Thought About Music," *American Music Teacher* 38, 3 (April/May 1989) 15-17, 59.

Gordon, Edwin E. "Developmental Music Aptitude as Measured by the Primary Measures of Music Audiation," *Psychology of Music* 7 (1979): 42-49.

Gordon, Edwin E. "Developmental Music Aptitudes Among Inner-City Primary Grade Children," *Council for Research in Music Education* 63 (1980): 25-30.

Gordon, Edwin E. *Improvisation in the Music Classroom*. Chicago: GIA, 2003.

Gordon, Edwin E. *Learning Sequences in Music*. Sixth Edition. Chicago: GIA, 2003.

Gordon, Edwin E. Manual for *Primary Measures of Music Audiation* and *Intermediate Measures of Music Audiation*. Chicago: GIA, 1986, 114-118.

Gordon, Edwin E. *Music Audiation Games*. Chicago: GIA, 2003.

Gordon, Edwin E. *Predictive Validity Studies of IMMA and ITPT*. *GIA Monograph Series*, G-3304. 1986.

Gordon, Edwin E. *Primary Measures of Music Audiation*. Chicago: GIA, 1979.

Gordon, Edwin E. "The Assessment of Music Aptitudes of Very Young Children," *The Gifted Child Quarterly* 24 (1980): 107-111.

Gordon, Edwin E. "The Longitudinal Interaction of Developmental Music Aptitude and Chronological Age," *GIA Monograph Series*,

G-5720. 2001, 63-74.

Gordon, Edwin E. *The Manifestation of Developmental Music in the Audiation of "Same" and "Different" as Sound in Music*. Chicago: GIA, 1981.

Gordon, Edwin E. "The Role of Music Aptitude in Early Childhood Music," *Early Childhood Connections* 1 & 2 (Winter, 1995) 14-21.

Gordon, Edwin E. *Tonal and Rhythm Register Books: Reference Handbook for Using Learning Sequence Activities*. Third Revision. Chicago: GIA, 2001.

G-6449 • ISBN: 1-57999-350-8