The Nature of Musical Aptitudes:

a review Dr. Edwin Gordon's research

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Introduction

An inquiry into the nature of music aptitude is an inquiry into the role and purpose of music and music education. It allows one to consider large scale questions relating to the purpose and form of the discipline, questions such as for whom are we doing our work, who stands to gain, and who is excluded (Allsup, 2010)? Through this research, I seek to not only understand Dr. Edwin Gordon's work, but also to explore these questions in relation to the nature of musical aptitude itself.

My broad research interest is in the cultural implications of contemporary understandings and perceptions of musical aptitude and "talent." In some ways, it is not essential for this specific model of music aptitude to be completely accurate for this research to still have value. The definition of talent within cultural conscience has far reaching effects on the lives of all people.

Thus I have chosen to research Gordon's work on music aptitude and its measures. His work is the most recent and deep on the musical aptitude construct itself and his measures are used as a foundation of a multiplicity of studies. The primary works I use are two of Gordon's books: *The nature, description, measurement and evaluation of music aptitudes* (1987) and *A music learning theory for newborn and young children* (both the 1997 and 2013 revisions), along with related evidence from a number of additional researchers.

The Nature of Musical Aptitude

Origins of Musical Aptitude

The first researcher to investigate musical aptitude was Dr. Carl E. Seashore in the early 20th century at The University of Iowa. His seminal research lead to the creation of the first standardized music aptitude measure, the *Seashore Measures of*

Musical Talent (1919a). He named a distinction between the terms "capacity" and "ability," defining the former as "the inborn or native power" and the latter as "acquired skill in the use of a capacity" (Seashore, 1919b pp.14-15). He was working from the assumption of the existence of a fixed and stable lifetime music aptitude. Eventually, his measure was found to have low discriminant validity. Further research involving his measure and skill acquisition found it was actually correlated to and measuring learned skills, not innate aptitude (Gordon, 1987).

How Gordon described musical aptitude

Gordon drew a distinct line between "aptitude" and "achievement" in music, defining the former as "a child's potential to learn music" and the latter as "what a child has learned relative to his music aptitude" (Gordon, 1997, p. 9). He also phrased the difference as "inner possibilities" as opposed to "outer actuality" (Gordon, 1997, p.9). Aptitude should be measured "objectively" with a "valid test", while achievement should be measured "subjectively" through observation (Gordon, 1997, p.9).

"Every child is born with some music aptitude," affirms Gordon (1997, p. 9). Musical aptitude, like other forms of intelligence, is normally distributed among children at birth (Gordon, 1997). As with other normal distributions, this equates to about 68 percent of people being born with average musical aptitude, about 16 percent with low aptitude, and about 16 percent with high aptitude.

Gordon, like most other researchers of aptitude and talent, agreed there is no amount of aptitude alone that will generate success without systematic learning and practice (Mcpherson, 2012). From the start of his research, he acknowledged that

musical aptitude consisted of the combination of environmental experiences and innate abilities in "unknown proportions" (Gordon, 1987, p. 8; Gordon, 1999). Although genetics are implicated in musical aptitude, it does not mean it's inherited, and there has never been any research supporting this (Gordon, 2013).

Musical aptitude is not singular, but rather multi-faceted. Through research with his measures, Gordon (1987, p. 12) identified "at least seven" distinct musical aptitudes: melody, harmony, tempo, meter, phrasing (expression), balance (creativity), and style (interpretation and improvisation). He later identified over two dozen stabilized music aptitudes, but maintained the original seven as the most important (Gordon, 2013). A person could have a wide range of ability across the subtypes. Within an individual, some could be high while others are low, or they could be more consistent.

Gordon (1987) developed a two stage theory to integrate musical aptitude and human development. From birth through age eight, a person is in the developmental music aptitude stage. From age nine onwards, they enter the stabilized music aptitude stage. Gordon (1967) first found the stabilization at age nine in a three year longitudinal investigation into the validity of his first measure of musical aptitude, the Musical Aptitude Profile (MAP), involving students in grades four through six. Gordon never discovered why stabilization happens so consistently at nine, but there are numerous possible explanations. For example, there is neurological research which suggests myelination of the great cerebral commissures along with complex frontal lobe activation is related to stabilization of music aptitude (Gordon, 2013). This claim has face validity, as faster communication across brain hemispheres and more activity in the brain region most responsible for planning and organizing would seem to be conducive to better

audiation, and therefore higher musical aptitude. In any case, the distinction is made to distinguish the time when musical aptitude is greatly affected by the environment (before age nine) and when the environment has absolutely no effect on capacity to learn.

In the developmental phase, a child's musical aptitude is volatile, and highly affected by the environment (Gordon, 2013). Exposure to a musically stimulating environment as early as possible is of paramount importance. Everyone is born with a different level of musical aptitude, but environmental factors cause it to fluctuate from then on. A child is at the peak of musical aptitude at the moment of birth, and declines from then until encountering a musically stimulating environment. Thus the fluctuations in developmental musical aptitude can be conceived of as movements up toward birth levels and down away from birth levels. The less time a child has to fall from birth levels the closer they will come to realizing their birth aptitude level by the time they stabilize at age nine (Gordon, 2013). Also, the higher the aptitude one is born with, the more varied musical experiences one requires to maintain that level of aptitude (Gordon, 1999). The cause of this observed phenomenon is still unclear. Differential neural pruning may contribute to the fluctuations in developmental music aptitude (Gordon, 2013). As neural networks go unused they atrophy, with synapses being directed elsewhere to more frequently used processes. Thus is the importance of a musically stimulating environment as early in life as possible.

There are numerous cognitive and behavioral consequences of being in the developmental stage. According to Gordon (1987), the child can concentrate on only one element of music at once, understanding the detail but failing to see the gestalt.

This is evidenced in their observed strengths and weaknesses in detecting differences in musical stimuli as well as their inability to sufficiently focus on the elements of music with the visual stimulus of the instrument present. This is a primary reason why (in addition to reliability concerns) all Gordon's group-administered developmental music aptitude tests use recordings instead of live performance. Further, only two types of developmental music aptitude have been found, tonal and rhythmic. When asked to make same and different judgments using any of the other musical aptitudes, performance was never above chance levels unless differences were greatly exaggerated (Gordon, 1987). Children also cannot organize and audiate a rhythmic pattern without first being supplied with the tempo (Gordon, 1987). An extensive study by Gordon in 1981 found children in the developmental stage take cues and make decisions using same and different qualities more reliably than by using any other elements of music.

After age nine, regardless of experience, a person's musical aptitude will not change (Gordon, 2013). There has yet to be a reason discovered why all the other musical aptitudes become apparent upon entering the stabilized stage. Earlier in the history of music aptitude research, all aptitude was considered to be stabilized from birth (Gordon, 1987). Gordon was the first to identify the difference between stabilized and developmental music aptitude and define the salient features of each.

In the early part of the developmental aptitude phase, children are also in a music babble stage. There are two types of music babble, tonal and rhythm (Gordon, 2013). In the tonal babble stage, the child has no conceptual distinction between speaking and singing voice. The sing-song "motherese" voices they hear around them

encourage them to keep the speaking and singing voices fused for longer. In the rhythm babble stage, they make short repetitive sounds and movements, not in a consistent tempo.

If children are not frequently exposed to singing and music, or have low musical aptitude, they may take a long time to leave the tonal and rhythm babble stages (Gordon, 2013). Newborns are exposed to speech much more than music. Many do not receive adequate exposure to a variety of sounds in order to build a tonal and rhythmic listening vocabulary. This can impair their ability to develop their musical "speaking" vocabulary as well as their linguistic spoken vocabulary. If they do not receive adequate exposure before eighteen months of age, they can become "preoccupied with language acquisition," ensuring music holds little to no importance for them in the future (Gordon, 2013, p, 6).

The foundational skill of Gordon's musical aptitude construct was audiation (Gordon, 2013). Audiation is what occurs when one hears and comprehends music silently without any outside stimulus. This is in contrast to aural perception, which occurs in the presence of outside sound. Audiation is essential to musical aptitude because it is necessary for distinguishing between same and different musical patterns. Similar to how it is assumed that the more words a child uses to think and express ideas the higher the intellectual aptitude, the more tonal and rhythmic patterns children can audiate, the higher their music aptitude.

Gordon identified eight non-sequential types of audiation and six sequential stages. The non-sequential types are:

1) listening to familiar or unfamiliar music, 2) reading silently or performing vocally or instrumentally notation of familiar or unfamiliar music, 3) notating familiar or unfamiliar music from dictation, 4) recalling familiar music silently or performing vocally or instrumentally, 5) notating familiar music from recall, 6) creating or improvising unfamiliar music silently or performing vocally or instrumentally, 7) reading while creating unfamiliar music, and 8) notating created and improvised unfamiliar music (Gordon, 2013).

The six stages are cyclic as well as sequential, as one moves up through the stages some doubling-back occurs as well.

When listening to music, 1) sound is heard and retained, 2) organized in audiation into series of tonal patterns and rhythm patterns as tonal centers and macrobeats are established, 3) music syntax, tonality and meter which form foundations for those tonal patterns and rhythm patterns, are audiated, 4) tonal patterns and rhythm patterns already organized are held in audiation, 5) tonal patterns and rhythm patterns audiated in other music, similar to or different from those held in audiation are recalled and comparisons and relationships are made, and 6) tonal patterns and rhythm patterns anticipated in familiar music and predictions in unfamiliar music are audiated (Gordon, 2013).

It is upon these types and stages of audiation Gordon's aptitude measures are based.

How Musical Aptitude is Measured

Gordon created his measures to help support the construct validity of musical aptitude (Gordon, 1987). Additionally, the teacher uses he proposed for his measures

centered around differentiated instruction. With an objective measure of musical aptitude, teachers could allocate limited resources in the most effective way possible. Teachers could also use the data to design lessons that more effectively keep students balanced between challenge and success, possibly bringing them closer to their Zone of Proximal Development and Flow State.

Gordon's research first lead him to publish his measure of stabilized musical aptitude, the Musical Aptitude Profile, in 1965. It can be administered to students in grades four to twelve, has an overall reliability coefficient of .94, and an overall predictive validity coefficient of .75. Participants are evaluated on the seven major stabilized music aptitudes: melody and harmony (tonal imagery), tempo and meter (rhythm imagery), and phrasing, balance and style (musical sensitivity). The measure generates sub scores for each aptitude, a sub score for each of the three encapsulating categories, and one overall composite score. This was followed by further research and the creation of his measures of developmental music aptitude: the Primary Measures of Music Audiation (for kindergarten to grade 3) and the Intermediate Measures of Music Audiation (grades one to four). Later came the Advanced Measures of Music Audiation, another measure of stabilized music aptitude for grades seven through college (for both music majors and non-music majors). His final measure was Audie, a developmental music aptitude test for pre-schoolers. All the batteries are administered to groups of participants with the exception of Audie, which is conducted one-on-one (Gordon 2013).

Criticism of Validity

Gordon created his measures because he sought to establish construct validity for musical aptitude. He cited discriminant validity in researching showing MAP performance only weakly correlated with measures of IQ and academic skills (Gordon, 1987). In other words, if the test was reliably measuring something, and it was not other known sources of achievement or aptitude, the construct's existence is further validated. However, its independence as a construct has been criticized indirectly.

Music training can improve students' performance on spatial tasks. Rausher, Shaw, Levine, Wright, Dennis, and Newcomb (1997) found that piano keyboard training significantly improved children's performance on spacial-temporal and spatial reasoning tasks over controls. Because measures of general intelligence and creativity are often rooted in spatial tasks, one may expect to see existing measures of music aptitude correlate with existing measures of general intelligence and creativity. This precise relationship was found in the research of Doxy and Wright (1990) in their exploratory study of 4 to 6 year old school children. The interactions between spatial intelligence, music aptitude, and academic skills are more complex than Gordon first assumed.

Gordon also argued the validity of the MAP based on its relative lack of bias compared to other academic intelligence tests. This is because while other academic intelligence tests require prerequisite achievement, command of a particular language being the most foundational, the MAP does not. Although it is true it doesn't require prerequisite knowledge, it does require prerequisite perceptual skills. For example, one must have good hearing ability and aural perception to complete the MAP. To date,

there has not been any music aptitude test designed with accommodations for deaf musicians.

Guidance and Instruction

Gordon (2013) distinguishes between guidance and instruction in music, naming both as essential to children's musical development. Guidance is informal and can be structured or unstructured, while instruction is formal. Unstructured guidance is free musical exploration while structured guidance involves planned lessons. It is as much a parent's responsibility to guide their child musically as it is to guide them linguistically and mathematically. However, he specifies a questionable set of "basic requirements" parents need to guide their children musically, including to "sing with relatively good intonation and move their body with spatial flowing, continuous free movement" (Gordon, 2013, p. 4). These requirements are questionable because parent-child singing serves a multiplicity of vital functions in the home and family (Custodero, 2006) and therefore parents should not let their personal evaluations of their singing and movement quality bar them from engaging with their children musically.

Gordon's research led to the creation of Music Learning Theory and The Gordon Institute for Music Learning, which can be found online at giml.org. Music Learning Theory is a pedagogical method for teaching musical skills which includes specific sequencing of content and teaching strategies based on Gordon's research. Therefore, content is presented as isolated musical elements, and teacher activity is divided into three distinct "modes" ("About Music Learning Theory, 2012). This divided structure is

congruent with Gordon's research, as he did not believe children had the capacity to understand the gestalt of music, only atomistic elements (Gordon, 1987).

Summary

Edwin Gordon contributed a great body of research to the description and measurement of musical aptitudes. He defined the differences between aptitude and achievement, so that the former could be investigated objectively without the confounds of the latter. He studied the nature of musical aptitude, including how every person is born with some level of it, and its multifaceted properties. He identified two stages of musical aptitude, developmental from birth followed by stabilized from age nine. Developmental aptitude has the ability to fluctuate based on experience, while stabilized music aptitude does not. Gordon observed the salient features of being in the developmental music aptitude phase, and his research led to the creation of Music Learning Theory. In the developmental music aptitude phase, only two music aptitudes are present (tonal and rhythm) and seven are present once aptitude stabilizes (melody and harmony (tonal imagery), tempo and meter (rhythm imagery), and phrasing, balance and style (musical sensitivity). At the foundation of musical aptitude is audiation, the hearing and comprehension of music silently without any outside stimulus.

Gordon designed five measures of musical aptitude: The Musical Aptitude Profile and Advanced Measures of Music Audiation for stabilized musical aptitude, and the Primary Measures of Music Audiation, the Intermediate Measures of Music Audiation, and Audie for developmental musical aptitude. He designed these measures to

establish construct validity for musical aptitude as well as to provide a tool for music educators to aid in creating differentiated instruction. The measures have been shown to be very reliable and fairly valid; as with other aptitude measures, validity is more challenging to establish.

Discussion and Implications

The research literature on human development gives us several ways to evaluate theories as they relate to music education. For example, the following four points quoted from Hargreaves and Zimmerman (1992):

- Any theories and associated evidence should comprehensively reflect the nature of musical behavior.
- Theories and underlying assumptions should be valid across a range of musical activities or 'modalities': composing (including improvisation), performing and audience-listening.
- Evidence should be systematically and reliably produced to support or challenge theoretical assertions.
- Developmental theories should take into account both the natural developmental inclinations of individuals and the cultural environment in which their development is realized.

The first and third points are fairly evident in the musical aptitude literature, the second and fourth could use further investigation. When examined through the lens of the second point, many questions are raised. How does musical aptitude, both developmental and stabilized, relate to listening behavior, listening habits, and neurological responses to listening? Do the many types of measured stabilized musical aptitudes of composers correlate to salient features of the music they construct? What about child (developmental stage) composers? If children cannot see the gestalt of music, how is it that they are able to compose at all? Could the construct validity of music aptitude be influenced by such investigations?

When examined with the fourth point as a lens, this research begs one important question: Do these measures remain valid when investigated in different parts of the world? Similarly, do they hold true for students learning in multicultural curricula? It is the recommendation of this researcher that there should be further longitudinal predictive validity studies, ones which compare groups of people which are diverse culturally and geographically. Would they still be as predictive of success? Would individual aptitudes correlate and covary as expected? Would aptitude scores remain normally distributed across populations? Such research could possibly illuminate the level of universality held by these measures and this construct of musical aptitude.

The cognitive behavioral transition Gordon identified that happens at the age of nine is a research gap requiring significant further examination. It is not known what happens at that point in human development to elicit such a change, nor why it is so consistent in timing. Other stage theories of development have blurred borders around

their projected age ranges (Piaget's theory of development being a notable example), but Gordon has settled decisively on age nine. Perhaps Gordon's sampling introduced a confounding variable increasing error variance, not as obvious but not too dissimilar from Piaget, who developed his theories by studying his own children. If it is not an experimental error, then what are the neural substrates of the change? Perhaps it is some surprisingly large scale and consistent neural pruning, or some similarly surprising synaptic integration in the tertiary areas of the cerebral cortex. It could possibly be the aforementioned observed myelination of the great cerebral commissures combined with more complex frontal lobe activation.

Further research questions raised by relevant literature include: what is the relationship between audiation and spatial cognition? How does the concept of audiation translate and apply to deaf musicians, and could an accessible measure of music aptitude be designed? Could data from the MAP actually be used to design lessons that bring students closer to flow state in any systematic way?

The most common criticism of the practice of measuring musical aptitude is that it is an exclusionary method of classifying students– that it may deepen the cultural divide between musician and non-musician. To assuage these concerns, The website of the Gordon Institute for Music Learning (2012) offers the following:

> "It is NOT [emphasis original] the purpose of aptitude testing to identify students for inclusion or exclusion in music activities. All children have the right to a comprehensive musical education. Music aptitude testing helps music teachers meet the unique needs of each student."

Gordon responded to this issue himself in 1987 (p. 3):

> "There is a common opinion among lay-persons, musicians, and educators that any test is not to be trusted. That is unfortunate. Such an attitude is probably a result of the desire to believe that all persons are created equal. Because aptitude test scores clearly reinforce the fact that persons are not equal in their potential to achieve, tests are disregarded or discredited by many. It must be remembered, however, that there is a difference between persons being created equal and persons receiving equal rights under the law."

The investigation of musical aptitude is fraught with ethical, philosophical, psychological, and physiological concerns, the majority of which are beyond the scope of this paper. However, the simple fact remains – every year new studies use Gordon's measures as a cornerstone of their research and teachers of all levels use them to track students. These measures must continue to be approached with a critical mindset, or as Gordon (1967) writes, "used with caution and wisdom."

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