

Tools for Instruction: The Reflections of Music Students with Visual Impairment

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[Abstract]

This paper discusses the four tools of instruction for musicians with VI (henceforth, Visual Impairment): auditory input and memorization, verbal instruction, haptic sense and technical devices. Based on the concepts of mediation, mastery and appropriation, this paper highlights the fact that the four tools work as mediational means in learning and practicing music. To investigate this theme, the authors conducted, as participation research, observation and interviews with 9 teachers and 7 students with VI at a specialized school for students with VI. By analyzing the interview data, this paper found that musicians with VI utilize various channels for communication, instead of visual input, as meditational means for communication. Meanwhile, musicians with VI also experience many difficulties in practicing and performing music in front of the audience. The discussion of this paper will expand our understanding on music training of those with VI and suggests for the development of various alternative approaches for helping musicians with VI.

* Key words: Visual Impairment, Mediation, Appropriation, Auditory Input, Haptic Sense, Technical Devices

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I . Introduction

On stage, I try to keep facing the audience. However, at a certain moment in the middle of my singing, because I can't see anything, I'm wondering if my posture is OK. Then, a feeling of anxiety makes me uneasy and distracted. My posture is wrongly directed and my eyes keep looking down at the floor. Such high tension and pressure makes my face harden. There is no way to check my facial expression, which is important for a singer. (...) I want to have 'eye-contact' with the audience in order to have a rapport with them. But I rarely have such feeling because I can't get any feedback. I have no idea whether the audience is listening to me or if whether they are moved by my singing. (SP, Post-natal blind for 25 years long, Voice student)

For the Visually Impaired (henceforth, VI), learning and performing music is a very challenging task. For example, VI students cannot get instant feedback from checking their teacher's responses or from looking at a mirror for self-correction. Such deficiency of instant feedback is a primary cause that makes the VI nebulous, confused and helpless. As another example, during rehearsals, VI students always place radio receivers in their ears in order to get instruction from teachers or directors. Consequently, they cannot easily distinguish their own sound from the sound of the ensemble. This situation makes it hard for them to hit the exact pitches, become focused and improve their own sound. Overall, the difficulties encountered by VI students in their task of practicing music are numerous. Then, how can the VI overcome these obstacles caused by the paucity of vision?

A single medium alone will not be sufficient help for teaching music to the VI. VI students drill and practice a piece of music via direct auditory input, recorded materials, haptic method and/or verbal instruction. They also rely on rote memorization for mastering and more automatized playing. These days, the development of technical devices provides additional help in a various ways: e.g., the play-along cassette, which replaces music Braille, can streamline memorization efforts and equalize the mechanics of music Braille reading in comparison to the standard printed music. This paper discusses these alternative channels of visual input for the VI to employ in their learning and practice of music.

Based on the concepts of mediation, mastery and appropriation, this paper stresses that there are multiple alternative tools of vision that work as mediational means for the VI to utilize in exercising a piece of music. For alternative tools, this paper highlights the four main media of instruction: auditory input and memorization, verbal instruction, haptic sense and technical devices.

The purpose of this study is to examine how VI music students manage to perceive, interpret, and practice music by overcoming the barrier of blindness. To pursue this aim as a qualitative study, the authors administered semi-structured interviews (consisted of 10 open-ending questions) with nine music teachers and their seven VI students in a school for VI.

By investigating the way as to how the VI can utilize these various tools of mediation for communication, it will allow for the expansion of our understanding in the music experience of musicians with VI; furthermore, it will inspire us to develop more convenient and effective ways of music education for VI students.

II. Theoretical framework

1. Mediational means of musicians with VI

1) Mediation

The relationship between a music player (an agent) and a musical instrument (a medium) is a mediational relationship, which consists of mediated actions. As Moss(2009, p. 245) argued, all musicians are indeed individuals-operating-with mediational-means, and their instruments, such as strings, percussions, keyboards, wind instruments and even vocals, are all media. This mediational means used by music players may or may not require vision in the task of practicing an instrument, rehearsing and performing a piece of music. Therefore, since VI music players cannot rely on vision, they have to develop and use other senses, capacities and utilities, which are referred to as mediational means.

Using a variety of mediational means, such as enlarged printed notation, embossed Braille music, recorded music or technical supports such as refreshable Braille display, they accomplish the task of music practice and performance. Among others, Braille music is strongly recommended in order to gain direct access to the music score for figuring out the original notation of the music piece(Gibson 1979). However, learning and reading Braille music is considered difficult and time-consuming(Goto, Gotoh, Minamikawa-Tachino, & Tamura, 2007; Homenda & Sitarek, 2011).

Then, what mediational means do VI musicians prefer to employ? First of all, the most popular medium of assistance for the VI is tape or digital recordings, which can serve as surrogates for actually

reading the printed notation on paper. The recording of the ensemble during rehearsal has at least two purposes: to gain an understanding of the overall structure of the music and to practice along with the recording in order to recreate the memory of the ensemble rehearsal. Musicians with VI also largely rest on auditory memories. For instance, according to the interviewees of this paper, nine musicians out of eleven reported that it was much easier to employ memory when performing ensemble parts rather than relying on other cultural tools. As such, for musicians with VI, learning by ear to memorize music literature is a necessary tool. Lastly, verbal instruction is another meditational means for the VI worthy of mentioning. Verbal explanations about the format of printed music, the shapes of print notes and symbols and the linear motion of notes are an irreducible part of music instruction.

In short, the tools for practicing music as meditational means used by musicians with VI are as follows: Braille music notation, enlarged printed notation, auditory scan of recorded ensemble parts, technical supporting devices, verbal explanation and auditory memory by directly listening to others' playing. Ultimately, all of these are one of the cultural tools that facilitate the VI's efforts to learn and practice music (Wertsch, 1997).

2) Mastery and appropriation

One of the key points of judgment for the accomplishment of a musical performance is the degree of mastery of the performed musical pieces. Mastery is the result of a mediated action that is present in the connection between agents and mediational means (Wertsch, 1998). Mastering a music piece or music literature for

performance is a crucial goal of all musicians. In order to accomplish this task, musicians with VI rely highly on memory(i.e., 'learning by ear'). One of the reasons as to why musicians with VI prefer to employ memorization is that memorization is more apt for appropriation than other mediational means. Wertsch(1998) defined appropriation as a sense of ownership over the tools, tasks or processes associated with a mediated action. In this way, memory seems to play an important role in the facilitation of appropriation for effective performance of a music piece, particularly for the VI who cannot get instant feedback from their sight.

In this information processing of memorization of musical scores, the form of processed data is not linguistic, nor visual; it is the acoustic sound representing the musical signs of the score. Since music is defined as an art form whose common elements are pitch(which governs melody and harmony), rhythm(which consists of tempo, meter and articulation), dynamics and the sonic qualities of timbre and texture (Nattiez, 1990), music is a complex set of musical signs that music players need for memorization. Therefore, when musicians with VI master a music piece, they have to rely not on their visual input or capacity, but on as many as possible various tools of mediation. Under this circumstance, it is significant to provide and secure all available tools of practice in order to master the target piece of music.

In short, VI musicians are appropriating tools, such as musical instruments, Braille music, tape-recordings and other technical supports, with which they can engage for the purposes of facilitating memory in order to pursue their satisfactory and mastery level of music performance.

2. Alternative mediational means to the visual input

1) Auditory input and memorization

Human learning begins with taking information from the environment, where the reception of information relies heavily on visual input (Bronson, 1982). However, VI individuals have to rely on other sources of input in order to acquire information about the world, and they have to develop other media and strategies for taking and manipulating information. Naturally, for musicians with VI, the auditory input or the sense of hearing is the most critical and significant source of handling music. In fact, it is normal for them to practice music by learning by ear or via replaying the recorded music. They, then, try to memorize the music as much as possible because they believe from experience, it is the most effective way of enjoying and practicing music.

2) Verbal instruction

Learning and cognition of human beings are the result of historical and cultural experiences of our daily lives; moreover, learning itself is the consequence of divergent activities relying on multiple bodily senses (van Lier 2000, p. 247). Among many channels for learning, spoken language plays a crucial role because of its inherently dialogical and immanent characteristics (Bakhtin, 1981). Here, 'dialogical' means that it is a bi-directional and mutually influential activity, and 'immanent' means that the reaction or feedback is direct and instant. These two factors make communication through spoken

language a highly effective means of instruction for the VI as well as for the sighted. In this sense, for musicians with VI, the use of spoken language is inevitable, not because they cannot rely on their sight, but because language is the most effective and influential medium of communication and learning.

3) Haptic sense

It is argued that people have a surprising ability to remember abstract haptic stimuli even after very little exposure(Enriquez & MacLean, 2008). The haptic sense system of the human body plays a key role in everyday life experiences, such as holding a fragile glass or pressing small buttons on a remote controller. In order to successfully communicate with the outer world, our sense system is supposed to send and receive precise stimulus or signals under the detailed feedback system. The VI heavily rely on this haptic sense by trailing the minute pressure control of the fingers and the acute sense of finger tips in order to perceive haptic signals or to read Braille signs(MacLean, Pasquero, & Smith, 2005).¹⁾ In fact, VI musicians are strongly recommended to learn literary Braille and music Braille for literacy. Equipped with the knowledge of Braille, they can independently explore the world of literature and music as much as they want(Stephens 1989).

4) Technical devices

Technology can help the connection between people and the

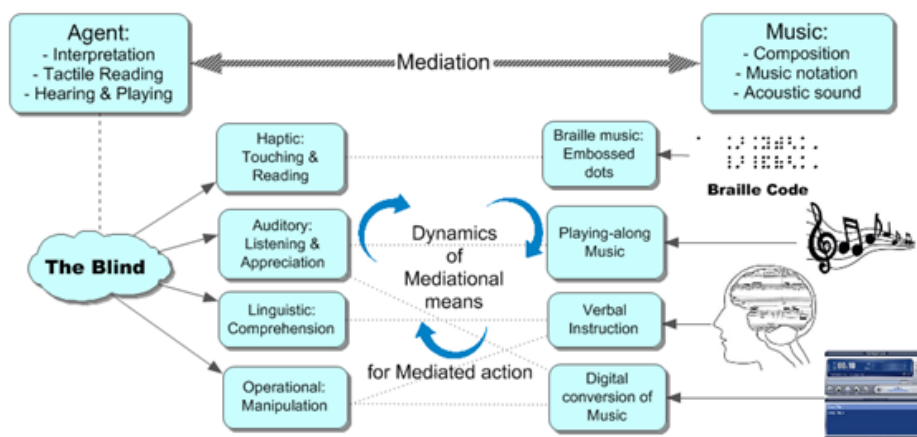
1) For instance, it is reported that blind people learning Braille shows a gigantic increase in the cortical representation of the dominant reading finger after 2 months of learning (Boniface & Ziemann, 2003).

intangible material world around them. When our visual or aural sense are overloaded or handicapped, we can receive and parse abstract information via other alternative channels, such as olfactory or haptic sense(Ramstein, 1996). One of the alternative ways as to how the VI can employ information is through haptic or tactile sense. The touch from the fingertips is the most common and adept channel of interaction for the VI as well as for the sighted people. This is also true for the musicians who deal with diverse musical instruments which are mostly designed for the manipulation of human fingers.

Furthermore, touch can be a channel through which technology can directly receive and speak to our perceptions(MacLean, Pasquero, & Smith, 2005). By developing technical devices, we can encourage the VI to utilize other senses than their visual sense and provide them with more chances to interact with the materials with various modalities. In fact, it is challenging to become adept to the technical devices because such skills require time and effort. Nonetheless, having such technical devices, VI musicians are bestowed with the dynamics of meditational means by utilizing other senses than their vision.

5) Dynamics of meditational means

Musicians with VI, though they lack visual capacity, employ and utilize various meditational means in order to access, practice and master a piece of music. The dynamics of meditational means is epitomized in the following [Figure 1].



[Figure 1] The dynamics of meditational means for musicians with VI

The dynamics of meditational means for musicians with VI is four-fold: haptic, auditory, linguistic and operational devices developed by technical advancement. VI musicians can use their haptic sense to detect the music symbols represented in Braille music by touching the embossed dots. However, their primary means of communication is auditory; they listen to play-along music recorded by a CD player or that originally played by other musicians. They also have verbal explanation from an instructor about the handling of musical instruction or the music itself. Furthermore, they can also utilize diverse technical devices specially developed and customized for musicians with VI. Having these alternative meditational means, the VI musician can practice music almost at the equivalent level as the sighted musician who can access the standard music. In the next section, we discuss the potentials and limitations of these alternative approaches by investigating a music performance group at a blind school.

III. The Study

1. Setting

The target site for the data collection of this paper is one of the nine special schools established for the students with visual impairment in Seoul, Korea. This school provides special education programs for the VI at all ages: from a kindergarten program to a post-secondary program. Currently, the number of registered students is about 120 in total, and there are about 40 students registered to study in the tertiary program. This tertiary program is mainly aimed to train students for their vocational needs, which is two-tracked: one is a chiropractor program and the other is a musician program.

This school also runs a professional music performance group, which was established in 2004 as the first professional music performance group of musicians with VI in Korea. This group is filled with students who have finished the tertiary music program as well as others who have received admission through an audition. Since there are only two active professional music performance groups in Korea, including this group, many VI musicians who wish to become professional musicians take the audition in order to join this group. The group consists of 20 musicians with VI; it organizes, practices, and performs many sub-divisional teams for the public audience, such as brass ensemble, chamber orchestra, percussion ensemble, choir and a group sound.

2. Participants

The participants of this study consist of 9 teachers and 7 students in the school. Teachers instruct the students of the tertiary music program and also train the music performance group for an ongoing performance geared toward the public audience. Student participants are recruited from those who are both registered in the music program and who have joined the performance group. Among the participants, MJ, who is the piano teacher, is one of the co-authors of this study. The following [Table 1] shows the profiles of the participants:

<Table 1> Profile of the participants

Division	Participant ID.	Gender/Age	Visual Status	Teaching/learning Experience	Specialty
Teacher	KS	Male / 52	Sighted	8 years	Voice
	HJi	Male / 42	Sighted	4 years	Percussion
	MS	Female / 44	Sighted	9 years	Choir
	JH	Male / 45	Congenital blind	6 years	Piano
	Dir	Male / 55	Sighted	10 years	Trumpet
	BW	Male / 32	Sighted	13 months	Composition
	MK	Female / 31	Sighted	8 months	Cello
	MJ	Female / 35	Sighted	3 years	Piano
	KY	Female / 43	Sighted	6 years	Braille translator
Student	SH	Male / 21	Congenital blind	3 years	Trumpet
	NY	Female / 45	Post-natal VI	2 years	Voice
	HJu	Female / 21	Congenital blind	3 years	Piano
	KB	Male / 45	Congenital blind	3 years	Percussion, Voice
	SP	Female / 54	Post-natal blind	2 years	Voice
	KJ	Female / 22	Congenital blind	1 year	Flute
	MY	Female / 22	Congenital blind	3 years	Oboe

3. Data gathering method

The two authors collaborated with each other, as participants' action research, in planning, literature review, data-gathering and -analysis and the writing of this paper. The first author, who has majored in special education, took charge of determining the conceptual framework and reviewing the literature, while the second author, who is a music teacher, took charge of data-gathering and analysis. The second author has taught at the school for three years as a piano teacher and as an accompanist for the music performance group.

The interviews with the participants were scheduled in advance and administered with each for approximately 40 minutes. As a semi-structured interview, the second author asked each question one by one, as open-ended questions and improvised various questions depending on the responses of the participants. The major interview questions are provided in the appendices [A] for the teacher interviewees and [B] for the student interviewees.

All the interviews were recorded with a voice-recorder, and then, transcribed. The two authors have met over 30 times in a weekly basis for about 8 months in order to conduct work for planning, data analysis and the writing of this paper. Since the second author of this paper is an insider of the target school, she provided a detailed explanation and a deep interpretation about the tools of music instruction for the VI.

IV. Analysis and discussion

1. Auditory input and memorization: The primary alternatives

The strategy of memorization of auditory input needs to be examined by the following three questions regarding the auditory and memorization skills of musicians with VI: 1) What is the nature of memorization of music for musicians with VI?; 2) Do musicians with VI have better auditory memory than the sighted?; and 3) What are the problems or limitations of the high reliance on auditory input and memorization?

First, the nature of memorization of music for musicians with VI is that the auditory input is no doubt the most important alternative way of perceiving music, and the auditory input must be followed by the inner process of memorization of the music. Musicians with VI place heavy reliance on memory for playing music because it is the working mechanism of the human brain when there is no aid of vision (Rolls, 1997). In this study, many musicians with VI attested that they must rely on memory, as shown in the following excerpt:

The beginning part is the most difficult. We cannot confer to the music score and we have to memorize the whole score; we have to recognize in advance, not only the musical notes, but all the supplementary information about the music score. In the beginning, it is critical to have every detail of the music score in mind. (JH, Piano teacher, Congenital blind)

Second, it is regarded that musicians with VI have better auditory memory than the sighted, which justifies their reliance on auditory memory in diverse tasks and activities. For instance, it is hypothesized that the blind has better memory than the sighted for auditory verbal information (Rder, Rsler, & Neville, 2001). According to this study, blind participants' memory performance was superior to that of sighted controls; moreover, blind people encode auditory verbal material more efficiently than the sighted controls. However, such outstanding sensitivity of the VI to the auditory input is not a sufficient factor in practicing music:

I am not satisfied with my practice of music mainly by listening to it. It is not accurate because we cannot see the score. If the teachers tell us the rhythm, tone, beat or the lyric lines of the music, we just feel it and roughly do it. That's the hardest thing. (SP, Post-natal blind, Voice student)

Third, there are consequently several limitations of the auditory input in reality. Though the strategy learning by ear is a very useful and handy approach to learning music for the VI, many students in the present study stated that it is stressful to employ the memorization strategy because most practices require them to have too much highly developed memory skills. To shift the focus away from the reliance on memory (i.e., learning by ear), opportunities to engage in other substitute strategies, such as recording, referring to Braille music, or having technical supports, should be provided as a suggestion. The following excerpts imply such notion.

I have to record the music and the lesson. Sometimes I,

myself, do the recording with my cell phone. I have to record the whole lesson† and then I have to practice it measure by measure, having the earphone in my ears. It takes time† but I have no choice. (KB, Congenital blind, Percussion student)

I can presume the rhythm, beat or the tone of the music by listening to the music source. But I am not sure about the exact articulation or pitch, so I want to see the original score. Then the teacher gives the standard music score to the assistant. The assistant plays it by the piano or records it, especially for my (flute) part, for practice. (JS, Blind, Flute student)

In short, the lack of visual input and compensatory use of auditory sense may force the VI to develop diverse strategies for memorization (Röder & Rösler, 2003). The mechanism that processes this auditory input in our cognitive system is the instant and short term memory (Conrad & Hull, 1964). The problem of this mechanism is that it is not sustainable, nor easy to manage, until it reaches the phase of long term memory. Therefore, until the VI student memorizes the whole piece of music, the student is required to consult with Braille music from time to time or to record necessary parts of the music source.

2. Verbal instruction: The basic medium of communication

Verbal instruction is no doubt the primary medium of communication and learning. The VIs have to, first of all, rely on

linguistic communication:

I have attended another specialized school for the blind. At the school, it was hard to experience everything verbally. Since I have not learned Braille sufficiently, the written exam was done by my assistant on behalf of me. Sometimes, I had to respond verbally to the teachers instead of submitting a paper answer sheet. (JS, Blind, Flute student)

In practicing music, the situation is very similar to the scene representing how the VI takes a music lesson:

It is difficult to have a lesson by "listening only." It takes a couple of times more for me than for the sighted. Since we cannot consult with the score with our own eyes, the teachers have to keep us informed [verbally] about every detail of the score. (NY, Post-natal blind, Voice student)

Verbal instruction is a critical component of instruction, which is well identified in the normal procedure of music instruction: i) teachers begin their instruction by providing information about the key and the meter in which the piece is played; ii) they show an exemplary play through the piece in order to provide the pitches and rhythms; iii) they talk through the part in order to explain where markings, such as accents or dynamics, are indicated; iv) they instruct students to listen to the recording completely in order to gain familiarity with the part, and finally, v) they encourage the students to begin with the section that sounds most easily achievable (Smaligo, 1998, pp. 286-7). As shown in the above procedure, except in phase 'ii' where the teacher models the playing, verbal instruction and communication is an

essential part of the lesson for the VI.

However, verbal instruction has some limits, particularly for those who learn and practice a musical instrument:

There is limitation in explaining everything verbally; to teach cello, for instance, it is necessary to show them how to grip the bow and how to modulate the minute muscles of the hand for fingering and sweeping. It is much more effective to instruct the motions and gestures for handling the instrument via touch than just telling the students in words. (MK, Sighted, Cello teacher)

In the above cases, the use of haptic sense is an essential part of a musical instrument lesson. In this sense, haptic input, such as touching, groping or tactile impression, is an indispensable source of communication for musicians with VI.

3. Haptic input: Communication through the entire body

Reading literary Braille or music Braille is a typical task of using the haptic sense for the VI. However, reading Braille is not easy for the VI, when they are not fully accustomed to it. If they are postnatal VI, the task becomes more challenging because it takes time to train their haptic sense:

Because I'm postnatally blind, I'm very slow at reading Braille music. I have never tried to feel and differentiate such minute stimulus in my life. It's something really strange. I'm just in the middle of learning [the Braille

*codes for] Do, Re, Mi, Pa, Sol... (NY, Voice student,
Post-natal blind)*

Reading or consulting with Braille music is cumbersome for music players because they have to handle their musical instruments as well as touch Braille music by taking turns.

This haptic sense has a couple of idiosyncratic characteristics different from the other sensory modalities; i.e., it is bidirectional, very intimate or personal and spreads out over the entire body. First, the term 'bidirectional' means that it provides us with the close-coupled feedback, which enables us to perform sensitive reception and minute controlling. Second, it is a personalized reception of signals; e.g., others can see the same thing that I see, while they cannot feel the same thing that I feel. Third, the route of haptic sense is distributed over our entire body through the skin, though the fingertips are the main channels for perceiving signals for the VI (Newman, Hall, Foster, & Gupta, 1984).

Among these characteristics, the intimacy and individuality is the most peculiar trait of the haptic sense. By employing haptic sense, the lesson, whatever it instructs, could be very direct, precise and tailored. The following excerpts are examples representing how the haptic input is used in various lessons:

Voice: To explain how to use head voice, the teacher positioned my hand to the point on my forehead (NY, Post-natal blind, Voice student)

Voice: In vocal training, the body itself is an instrument. So it should be relaxed and the breath should be smooth... Sometimes, their body is too stiff. I emphasize that the

*singer should notice the subtle changes of their own body.
(MS, sighted, Voice teacher)*

*Percussion: To make a sound, it is best to touch it by the
hand† the hands take the role of the eyes. (HJ, Sighted,
Percussion teacher)*

*Composition(theory): It is helpful to use the hand and body
motion to explain the pitch, step or the interval. For
example, to teach the interval, I tell them to pile up their
fists to calculate the intervals of the sounds. (BW, Sighted,
Composition teacher)*

*Trumpet: Since they cannot look at themselves through a
mirror, it's hard to have self-correction for their postures. I
have to touch their posture one by one. (Dir, Sighted,
Director/Trumpet teacher)*

*Piano: I realized that from exercising pedaling... I even
tried to step correctly as the teacher explained. But she
told me that it was wrong. I just hoped that I could see. ...
She touches and corrects my foot work when it is
necessary. (HJu, Congenital blind, Piano student)*

The haptic sense from feeling, touching, and manipulating experience is also a significant channel of learning for the musicians with VI. Nevertheless, haptic input is also limited or partial in delivering information. For instance, it is not easy to imitate a motion

from the information gained only by touching:

Someone told me that the shape of a wastebasket is columnar. But ... to be honest with you, I cannot imagine how the 'columnar' shape is like. When I touch it by my own hands, I just feel some smooth and round surface of it. I could not actually tell the actual three-dimensional form of the wastebasket. (JH, Congenital blind, Piano teacher)

For musicians with VI, alternative approaches are suggested for development by combining multiple senses or modalities of sensual input. For instance, recently, there has been an application invented by combining the touch input with the auditory feedback in order to serve the visually impaired people (Ferati, Mannheimer, & Bolchini, 2011). Such technical devices are additional means of communication supporting the handling of music for musicians with VI.

4. Technical support: The advancement of devices in both analog and digital areas

With the sheer advancement of technology, there are more and more cutting-edge devices developed for assisting musicians with VI. The development of technical support can be also classified into three channels: auditory input (recording the source music for repetitive playback), haptic input (translating a standard music into Braille music) and digitalization of analog music for dynamic utilization. These three channels of technical support are, in fact, not separated but intermingled with each other.

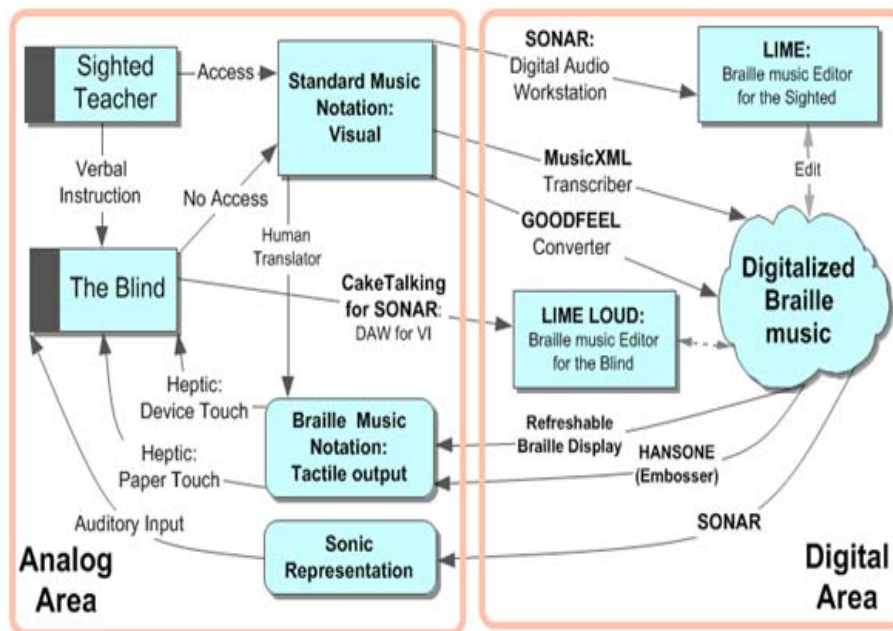
Since musicians with VI cannot access standard music notations, they can be translated into Braille music by a human translator into

an analog mode or by a computer into a digital mode. For the case of the digital translation, newly developed software automatically converts print music to Braille music, allowing anyone to scan the printed music into a database from which Braille can be printed. In this way, musicians with VI can use CakeTalking for SONAR with which they can edit the music source by having an auditory feedback from the program; they can also edit the codes of Braille music itself with the help of LIME LOUD. This digitalized Braille music notation represents the sound throughout the digital audio workstation, such as SONAR, or is sent to an embosser for the creation of printed Braille by such device as HANSONE(a Korean embosser).

For the computer-based musical formats, MusicXML can be used as a transcription system (Bortolazzi, Baptiste-Jessel, & Bertoni, 2008, p. 310); the principal use of these ASCII files is to emboss the data on paper for the blind such that they can read it using their finger-tips. Using MusicXML, one can transcribe music scores to Braille music notation, which then can be transformed to an embosser for the creation of printed Braille. Using software similar to word processing, the transcriber can then correct, copy, move, delete and save the data in the file. Otherwise, a scanning and converting program, such as GOODFEEL, can be used to make standard music notation automatically transcribed into digitalized Braille music data.

There are also alternative outlets as Refreshable Braille Display or a computer screen display with instantaneous onscreen Braille to text and text to Braille conversion capabilities(Rose, Hasselbring, Stahl, & Zabala, 2004). Such application allows music teachers, the majority of whom are sighted, to quickly and efficiently locate a paragraph, sentence, phrase or even a single word reference in a document, which is usually very difficult to do with print Braille. It is without saying

that digitalized Braille music notation can be translated into synthetic music and be saved as a portable audio format(i.e., MP3). In this way, such flexible and inherently transformative potential of digitalized Braille music allow musicians with VI to access music at their optimal convenience. These technical supports from analog and digital devices can be arranged and depicted in the following [Figure 2]:



[Figure 2] Technical support for musicians with VI from analog and digital devices

The figure above clearly shows the dynamic relationships between the devices in the analog and digital areas. In the analog area, the VI receives instruction from the teacher, touches the embossed Braille signs on both paper and on the device and hears the source music

directly from their ears. In the digital area, the source music is converted or translated into different formats ready to be presented to the VI for their optimal appreciation.

However, it is meaningful to state that there are some noteworthy caveats in the current level of technology. First, the conversion between standard music and Braille music is not symmetric because standard music is more complicated and involves more information compared to Braille music (Bortolazzi, Baptiste-Jessel, & Bertoni, 2008). Therefore, it is difficult to code every detail of standard music notation into Braille music.

Second, the quality of computerized translation of standard music notation into Braille music is not satisfactory. Since the syntactical structures of standard music and Braille music are different - e.g., many-to-one mapping for standard music and many-to-many relation in case of Braille music-(Homenda & Sitarek, 2011), it engenders the computer program to become confused in automatically converting between them. According to a professional human translator of Braille music(KY, Sighted, Braille translator), most of the current translation programs show more than 10% of translation errors, which is beyond the acceptable level; under such circumstances, manual revision and reexamination by a human translator is indispensable.

Third, though Braille remains a system of powerful and enduring utility almost two centuries after its invention(Braille Authority of North America, 2011), the international standard for the coding system of Braille music has not yet been settled. For instance, to translate digital documents to Braille music as well as to code Braille dots, the ASCII format has been used by mapping Braille cells to an ASCII character; however, it has to be conducted according to a translation table, which is different from country to country(Goto, Gotoh,

Minamikawa-Tachino, & Tamura, 2007)²⁾.

In short, these technical devices will help musicians with VI to a great extent. Thanks to such convenient support from technical devices, musicians with VI can explore more freely the world of music without being confined to their loss of vision.

V. Conclusive discussion

This paper discussed the four tools of mediation for musicians with VI: auditory input and memorization, verbal instruction, haptic sense (including Braille music) and technical devices. As Moss (2009) argued, the task of learning a musical instrument does not necessarily require vision. For instance, Antovic, Bennett, & Turner(2012) argued that musical conceptualization in blind children is similar to that of their sighted peers, and that the abstract domain of music is primarily conceptualized through the spatial, rather than visual, modality. This means that the lack of visual input cannot be a critical factor that determines the potential of musical achievement of the VI.

Musicians with VI, despite their loss of vision, endeavor to learn and practice music employing these various tools as meditational means. This being said, it is important to devise and develop various different or multimodal channels of communication by which musicians with VI can appreciate, enjoy and practice music as much as they desire. On the other hand, this paper also disclosed some obstacles and hardship that VI musicians encounter in their music practice. That is,

2) As a score description language, MusicXML is proposed to exchange music-score information via network, and digital score information can be obtained through an internet using the score viewer.

it is also true that musicians with VI still have many difficulties and feel helpless, particularly in the task of performing music in some social contexts.

Smaligo (1998) suggested several approaches to help visually impaired musicians: (a) encourage students to create their own instructional aids; (b) develop their own methods for practicing a piece of music; and (c) provide them as much technical support as possible available to them. Beyond these efforts, it is strongly suggested to listen carefully to the voices of VI students as to what they feel, think and want on a regular basis.

In fact, the shortage of assistance for helping musicians with VI originates in, among many reasons, i) the scarcity of teachers who have knowledge and skills both in special education and music education, ii) the lack of specialized schools providing special education service and music program and iii) the deficiency of teaching materials for music education and well-developed instruction strategies. In many schools, teachers are normally overwhelmed by what they are required to do, unable to locate suitable resources and not be supported the necessary tools. Therefore, in future research, it is suggested to study and discuss more in depth, particularly in terms of detailed instructional approaches for each of the four meditational tools.

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Appendix A:

Questionnaire for the Music Students with Visual Impairment

Name(pseudonym)		Age & Gender	
Major in Music		Physical status	
Years in the institute		Length of disability	
Taken courses		Specialty in Music	

Please respond to the following questions and provide me your own experience or episodes.

1. What are the problems or difficulties in taking music lessons as musicians with VI?
2. What are the problems or difficulties in performing music and career development as a student with VI?
3. What do you think were the most successful learning experiences as a student with VI?
4. What do you think were the least successful or hard experiences in learning music?
5. What do you think is the most convenient tool for music performance?
6. What do you think is the most effective tool for music performance?
7. What would you suggest for the effective strategies of music instruction for musicians with VI?
8. What do you think should be changed or improved in terms of instructional support for musicians with VI?
9. What do you think should be changed or improved in terms of school environment for musicians with VI?
10. Please suggest or provide me any ideas about music education for the students with VI.

Appendix B:

Questionnaire for the Teachers in the Institute

Name(pseudonym)		Age & Gender	
Major in Music		Physical status	
Years in the institute		Experience in special edu.	
Courses in charge		Specialty in Music	

1. What are the problems or difficulties in teaching music for musicians with VI?
2. What do you think are the original causes of such problems of difficulties?
3. What do you think were the most successful teaching experiences as a teacher for the students with VI?
4. What do you think were the most effective teaching strategies for the students with VI?
5. What do you think is the most convenient tools for music performance?
6. What do you think is the most effective tools for music performance?
7. What would you suggest for improving music lessons for musicians with VI?
8. What do you think should be improved in terms of the technical support or school environment for musicians with VI?
9. What do you think the qualifications of being good music teachers for the students with VI?
10. Please suggest or provide me any ideas about improving music education for the students with VI.

[국문초록]

시각장애 음악전공자들의 회고를 바탕으로 한 음악 교수방법론 탐색

김 미 정 · 박 휴 용

본 논문은 시각장애를 가진 음악가 혹은 학생들이 음악을 가르치고 익히는 과정에 활용하는 네 가지의 교수수단, 즉 청각입력을 통한 암기, 구두지도, 촉각정보, 그리고 기술적 도구들에 대해 논의하였다. 본 논문은 시각장애인이 이러한 교수수단을 통해 음악을 익히는 과정을 매개(mediation), 숙달(mastery)과 전유(appropriation)의 개념적 틀을 통해 분석하였으며, 이 네 가지 방법들이 매개수단(mediational means)으로써 음악을 배우고 익히는데 활용되고 있음을 논의하였다. 저자들은 참여연구를 통해서 서울의 한 맹학교 음악전공과에서 음악을 배우고 가르치는 9명의 음악(특수)교사와 7명의 시각장애 학생들의 수업을 관찰하고 인터뷰를 수행하였다. 본 연구는 인터뷰 및 관찰자료의 분석을 바탕으로, 시각장애 음악학생들이 시각을 통한 정보입력을 대신하는 다양한 매개적 수단을 통해 교사와 소통하기도 하지만, 동시에 청중 앞에서 공연할 때는 또한 여러 가지 어려움을 경험할 수밖에 없음을 확인하였다. 본 연구의 논의를 통해서 시각장애 음악학생들을 위한 음악교육에 있어서 그들이 겪는 어려움을 이해함과 동시에 보다 효과적인 음악교육을 위해 필요한 다양한 가능성들에 대한 이해를 넓힐 수 있을 것이다.

* 주제어: 시각장애, 매개, 전유, 청각입력, 촉각지각, 기술적 도구

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