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A New Synthesis of Sound and Tactile Music Code Instruction in a Pilot Online Braille Music Curriculum

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Employment opportunities for persons who are severely visually impaired (that is, those who are blind or have severe low vision) are often extremely limited (Crudden, Sansing, & Butler, 2005; Moore, Wolffe, & McDonnall, 2010). Music and music-related careers have served as viable employment for many persons who are visually impaired (Jacko, Cobo, Cobo, Fleming, & Moore, 2010). Given the wide array of issues facing students with visual impairments who want to pursue careers in music and the expansion of online distance education programs, there is an ongoing need to enhance the training curricula that is used for such programs.

Instruction in music is no longer as common as it once was because of limited budgets and other issues. Students who are blind, because of the lack of support for braille instruction, have been even more seriously affected by the erosion of music instruction. At a time when even the most basic braille instruction is becoming more elusive and evanescent, students who complete the braille music course have expressed their delight at being able to access the same information their sighted peers do from sheet music. The core curriculum for students who are visually impaired (that is those who are blind or have low vision) tends to strongly focus on functional skills, orientation and mobility, independent living, and career skills (Hatlen, 1996). Although music is undeniably one of the fine arts, music instruction is approached as a career skill by Miami Lighthouse. Alumni of the Miami Lighthouse Better Chance Music Production Program have gone on to careers in a variety of positions in the mainstream music industry and to higher education at music schools such as the Berklee College of Music and the New World School of the Arts.

In order to offer its comprehensive braille music course to a wider audience not limited by geography, Miami Lighthouse for the Blind and Visually Impaired, in collaboration with The Carroll Center for the Blind (CCB) in Newton, Massachusetts, began offering an online distance learning braille music curriculum in the summer of 2013. This first-of-its-kind online instruction for braille music was developed over a two-year period by a Miami Lighthouse instructor. This report describes how the new distance learning braille music program prepares students for further study and careers in the mainstream music industry.

Background

In standard musical notation, symbols, not letters, represent pitch, duration, key, volume, and other elements of critical information. For musicians who are visually impaired, music scores need to be transcribed into braille music notation by knowledgeable braille transcribers. Braille music is nothing new, Louis Braille himself included musical notation in his original tactile notation system. When braille was being developed in the early 19th century, reading music was as much a part of literacy as any kind of reading, since people often played music at home using sheet music and instruments.

The decipherment of music notation is a highly complex process, because the symbols and words included in it represent an art form that is subject to interpretation. The

precise intent of composers has been encoded with special notation for more than 1,000 years. Along with all the musical notes in standard music notation are a dizzying array of interpretive signals that range from graphic symbols that indicate volume changes to the words, traditionally in Italian, that indicate volume, style, and approach.

The use of computers for transcribing braille began in the early days of computer use, before it was common for individuals to have personal computers (PCs) at home (Patrick & Friedman, 1975), and braille music was included. However, less than 15% of printed music has been transcribed into braille. Blind musicians must either play "by ear" or rely on instruction by a sighted musician, methods that are fraught with potential for error and prevent a musician who is visually impaired from experiencing first-hand the fullness of the composer's intent in a musical score. Braille music has largely fallen by the wayside; it is not regularly taught in schools, including at schools for visually impaired students. However, the Internet enables visually impaired and sighted individuals alike to access music in electronic audio files and as printed music scores. Musical Instrument Digital Interface (MIDI) software, a cornerstone technology of the Miami Lighthouse Better Chance Music Production Program, is widely used in the music industry to encode information about pitch and volume, but not interpretive remarks and symbols. MIDI has been accessible to visually impaired users since screen-reading technology became part of commonly used electronic operating systems.

Goto, Gotoh, Minamikawa-Tachino, and Tamura (2007) proposed a transcription system that would transform a file in MusicXML format to braille music notation using a structural model of braille music notation, which resulted in braille scores that met international standards. This fairly recent breakthrough makes it possible for braille music scores to be provided to people who are visually impaired by way of the Internet (Goto et al., 2007). Braille music notation is not the only tactile approach to learning music; there is, for example, the Weasel Project, a system developed in the United Kingdom. With Weasel, a keypad is combined with a polyvinyl chloride tactile overlay to deliver information about a piece of music (Challis, 2006).

According to Crombie, Lenoir, and McKenzie, "For music production and consumption systems, the 'workaround' nature of traditional accessibility enhancements could be replaced by a naturally available transformation and representation feature" (2003, p. 46). The Internet and web browser–based learning tools provide just this sort of transformation and representation for braille music. Crombie and colleagues warn, however, "With every modification of the models that are used for music analysis, representation[,] and synthesis, additional effort has to be invested to synchronize the consumption and production opportunities for print-impaired users with those of the average end user" (2003, p. 47). The Miami Lighthouse, an agency that serves approximately 1,500 people who are visually impaired annually, is accustomed to making curricula accessible according to the criteria outlined by Crombie and colleagues.

A number of authors, including Jacko and colleagues (2010), Krolick (1996), and Smaligo (1998), have noted that the challenges of teaching music to blind students can seem insurmountable to a sighted teacher. "Blind students are a low-incidence factor in the overall population; in an entire career[,] a music teacher may encounter such a student only once or twice. Overwhelmed by what seems to be required, but unable to locate suitable resources, the teacher may still try to do the right thing despite having virtually no tools" (Smaligo, 1998, p. 23). The Miami Lighthouse course offers a way for motivated older teens and adults to receive personalized instruction and work at their own pace.

Cattaneo and colleagues (2008) found evidence that visually impaired students can employ different cognitive mechanisms compared to sighted students, some of which are apparently compensatory. Relying on a different mode of perceptual input, students who are visually impaired who are learning braille music, for example, bring a differently organized mental process to their studies than would a sighted music student. However, visually impaired people can have "plastic functional reorganization mechanisms" that enable them to learn material just as thoroughly as sighted individuals, and often very effectively (Cattaneo et al., 2008). Although Hatlen and Curry (1987) supported music instruction in programs designed specifically for visually impaired students (that is, the opposite of mainstreaming), the students at the Miami Lighthouse have traditionally learned alongside sighted peers, since both groups tend to benefit from this approach in various ways. However, since braille readers require different instruction and materials than do sighted classmates, a new approach was needed for music education in order to better access the needs of braille readers.

Braille music course

The Miami Lighthouse Better Chance Music Production Program features 26 lessons in braille music notation. The curriculum was designed to provide students around the world with access to braille music notation through the use of Job Access with Speech (JAWS) screen-reading software and a standard QWERTY keyboard. The Miami Lighthouse program uses MIDI with JAWS to instruct students in music production and composition techniques, and with this training, alumni of the program have found a variety of jobs in the mainstream music industry—as sound engineers, musicians, composers, and the like (Jacko et al., 2010).

Because of the braille reading proficiency required, the course is designed to be taken by students in their late teens and by adults. Not all people who are visually impaired are able to learn to read braille music (Crombie, Dijkstra, Schut, & Lindsay, 2002). A contracted braille reader has command of 23 words that are contracted to single characters; this goes beyond rudimentary braille and is a prerequisite for participation in the online course. The braille music course combines screen-reading technology with tactile instruction, since many students use their own electronic braille displays at home to access printed materials. The students are provided with a glossary written by a certified music instructor and are taught to read complete musical scores that have been transcribed into braille, not substitutions for them. Each interactive lesson is designed to be completed in 45 minutes, with activities for practice and review between lessons.

As a web-based braille music course that requires screen-reading software such as JAWS both for reading lessons and completing homework, students also need to have access to and knowledge of the use of braille notetaking hardware and software. Students may use braille notetakers or braille displays to access the course materials—instructors can also provide students with the lessons in braille-formatted compressed files upon request. The web pages on which the course is housed are designed to be accessed by individuals using screen readers, so all the braille dots included on the pages are in analog braille, with Arabic numbers. Students use Perky Duck or Duxbury Braille Translation software for writing assignments, which they submit to their instructor as e-mail attachments.

According to Crombie, Lenoir, and McKenzie, "Creating accessible media requires a whole range of processing stages and involves many different people and tasks" (2004, p. 97). The authors found this assertion

to be very true; the assistive technology distance learning instructor (the second author) at the Miami Lighthouse developed the braille music curriculum in conjunction with a music education and curriculum specialist (the third author) from Miami-Dade County Public Schools. The author of the curriculum (the second author) is a composer who is one of only a score of braille music experts in the United States who have earned the Library of Congress music braille transcription certification. He also wrote, developed, and has been teaching the Miami Lighthouse braille music curriculum to students on site since 2010.

Participants

The pilot program for the braille music course included four students (two females and two males) from Florida, Virginia, and Massachusetts, who ranged in age from 14 to 50 years. The group included two Caucasians, one African American, and one Hispanic. All participants expressed a desire to become more proficient in reading braille music.

A few years ago, Miami Lighthouse pioneered instruction in music for visually impaired clients with great success (Jacko et al., 2010). Miami Lighthouse is tracking the completion rates and will follow up with all participants to help determine how the program has affected their success as musicians if they choose music as a career path. The following are excerpts from interviews with students who completed the program.

"Lydia," a student from Florida who began the course in July 2013 and graduated in January 2014 said:

> I am very happy with my results, and I am confident that my time spent in this course was and is a wise investment. The lessons were thoughtfully planned and easy to follow. It was a pleasure completing the assignments because they helped me to fully understand the content and enabled me to gain some valuable transferable skills that will be beneficial to me in the future. . . . Thanks a million to [program director] Mr. Choi for his vision and his passion. I personally witnessed a teacher who is very excited about teaching braille music. He is very willing to answer any question, play or sing a note or measure, and he will even write a score to illustrate the example. I will recommend this course to anyone: you will never regret it. My proof is this: I am now able to use my braille music hymnbook more effectively whereas prior to this course I would skip a hymn because I did not recognize the symbol. This course has made a difference.

"Kathy," a student from Massachusetts, who began the course in January 2014 and graduated in June 2014, said:

> I liked the course. I was able to take the lessons successfully using JAWS and the braille sheet music I embossed. I think it helped me and it was a good thing to learn before going to Berklee for college. I've already recommended the course to some blind friends of mine.

Mr. Choi shared his own reflections on Lorna and Kristin's work in the course:

> Lydia diligently studied . . . She not only passed the exams but also submitted four required recording assignments using BrailleNote's recording feature, and three writing assignments with Perky Duck.
>
> Kathy diligently studied . . . She not only took four exams but also submitted three required recording assignments and one writing assignment, using Perky Duck. She accomplished her goal through this online course.

Although these comments reflect anecdotal evidence that the program is effective, additional empirical research is needed to evaluate its impact on employment outcomes and career advancement for persons who are blind.

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