

Use of Microcomputers in the Music Therapy Process of a Postviral Encephalitic Musician

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Music therapy, a process-oriented modality of treatment, provides a powerful means of self-expression for handicapped persons.^{1,2} People who suffer from a handicapping condition often display pronounced difficulty in independently creating music,³ particularly when the problem involves the central nervous system. The available literature in music therapy and augmentative communication does not document the application of computer technology in the music therapy process. The neurological literature is sparse and inadequate, dealing primarily with anatomical localization and the functional loss of various musical abilities.⁴

In rehabilitation medicine, there is a broad range of methods available to the clinician to assist the patient in the music-making process.⁵ The clinician can assist the patient to play a musical instrument, such as a guitar or a drum. The patient can engage in group singing or can express himself through the use of pre-recorded music. However, until recently, there were very few options available that allowed near

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independent functioning by the handicapped person.

Recent developments in technology have inspired a new genre of instruments to create music. With the introduction of these instruments, new opportunities arise and avail themselves to the handicapped user. The patient's music-making process is altered, and therefore many of the handicapping conditions that prevented the patient from creating music before can be negotiated. The patient can engage in musical performances and improvisations or create original compositions with the aid of this new form of technology and treatment.

These instruments are computer-based digital synthesizers that can be controlled through a wide array of input devices, allowing the user to augment present levels of skills and function. The method utilized is in relation to and commensurate with the severity of the handicapping condition.

The power of music therapy, combined with the potential of microcomputers, creates a new horizon in music making for the disabled person. A micro or personal computer can serve as the host to several different and complex musical instruments that can be used to create music. The components that make up the system may include synthesizers, rhythm computers or drum machines, and computer sequencers.

These electronic instruments allow the user a broad spectrum of musical sounds and colors that may be used to create musical compositions.

The Patient

Currently at Goldwater Memorial Hospital, a research project is under way to investigate the use of computer technology by the severely physically disabled to create music. This project is under the direction of Dr. Mathew Lee, in cooperation with the Micro-Computer Committee and the Augmentative Communication Unit of the Department of Rehabilitation Medicine.

The goal of the project is to investigate the possibilities of enabling a severely physically handicapped person to create music with minimal assistance. It is intended to allow the subject complete control of the music-making process, with allowances for assistance only in non-musical matters such as switching computer disks and controlling the mechanical parameters of the machinery that require physical interaction.

The subject of this study, a 27-year-old black male, was a professional musician prior to his illness. Since the onset of viral encephalitis, he has been hospitalized at Goldwater Memorial Hospital. He is a spastic quadriplegic, with dysphagia, anarthria, and pseudobulbar palsy. Prior to this hospitalization, Mr. B. was a guitarist who lacked formal training in all areas of music. Due to the severity of the handicapping condition, the reintroduction of the guitar into his music-making process was not an option.

It became necessary to design a system that would allow the patient to bypass his physical difficulties while creating music. The lack of the ability

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to create music caused the patient to appear depressed and to withdraw from many activities he had enjoyed prior to his illness. He expressed the desire to resume his music making and was willing to experiment with this new procedure.

The subject was aware of the potential use of the available current technology, and had been outfitted with a communications system that enabled him to communicate effectively and efficiently. The system, the Express-3 communications device, allows the user to synthesize speech, print messages, and control a computer. This system utilizes synthetic speech and infrared light technologies. The use of this technology has become commonplace in many consumer items such as automobiles and household appliances.

Treatment plans were formulated through an interdisciplinary team of clinicians. Criteria for assessing the areas of need to be addressed were set by analyses of the patient's current level of functioning, with consideration of his current psychosocial functioning.⁶ Figure 1 illustrates the relationships of the allied professions that were drawn upon to create this method of treatment. Discussion of the communication system's capacity to interface with and to create a computer music system ensued.

The System

After careful analysis of the possibilities, it was decided to utilize a system consisting of (1) Apple IIe microcomputer, (2) Mountain Computer Music System (MCMS), (3) the Express 3, (4) the Apple Keyboard Interface for The Express-3, (5) the Viewpoint Optical Indicator, and (6) Panasonic Stereo system for the amplification of the Mountain Computer Music System. As shown in Figure 2, the components were assembled in a manner that would allow the user complete control of the parameters of the system. Figure 3 shows the subject

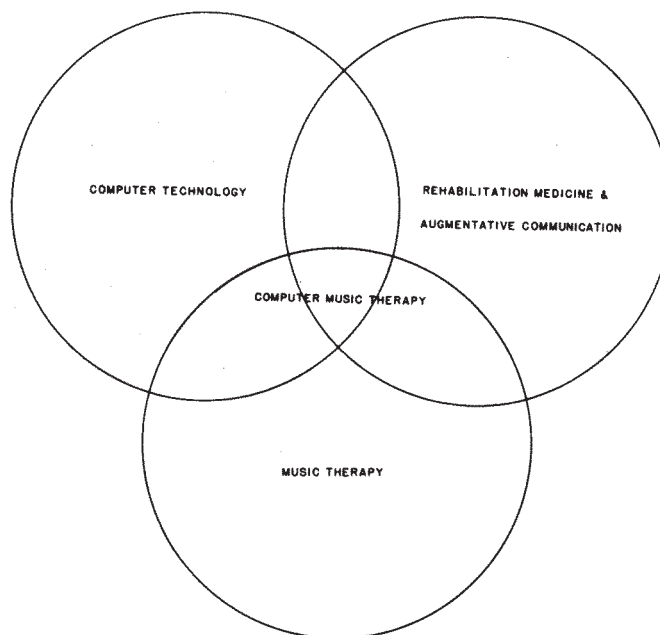


FIGURE 1. Relationships of allied professions drawn upon to use computer technology in the creation of music.

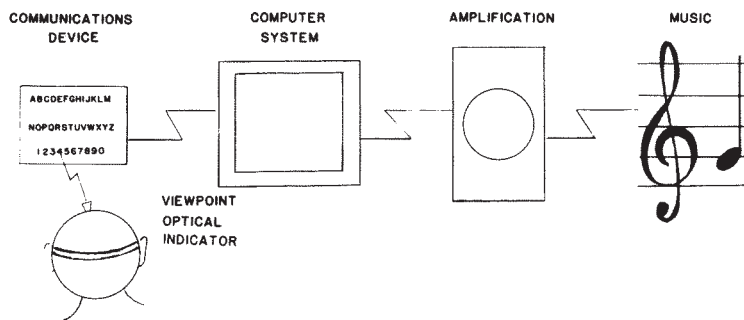


FIGURE 2. The signal chain.

with the components assembled around him.

As shown in Figure 2, the system that was assembled for this project controls a signal that is routed through many channels. The signal chain begins with an infrared light beam that is controlled by head motions of the user. This device, which is strapped around the user's head and located on his forehead, is an indicator that emits a signal that is received and interpreted by the Express-3 unit. This signal then passes through a serial interface which is connected to the host computer. The computer in turn encodes this information to perform the selected commands. After the computer processes the information, the results are amplified and then heard as music. The user may choose from the two levels of commands which are available on the Express-3. They include complete em-

ulation of the characters available on the host computer's keyboard.

Through his interactions with the computer-assisted communications system, the patient was able to communicate his needs to others with considerable success. The patient appeared motivated by his success and was eager to become involved in a process that would allow him to create music without assistance from others.

Stages in the Project

The research project consisted of 20 ninety-minute sessions with the patient and therapist involved in a direct, interactive relationship. There were three stages in the project; the first stage consisted of six sessions, and stages two and three each contained seven sessions. All sessions were recorded on videotape for the review of the clinicians involved with the project.

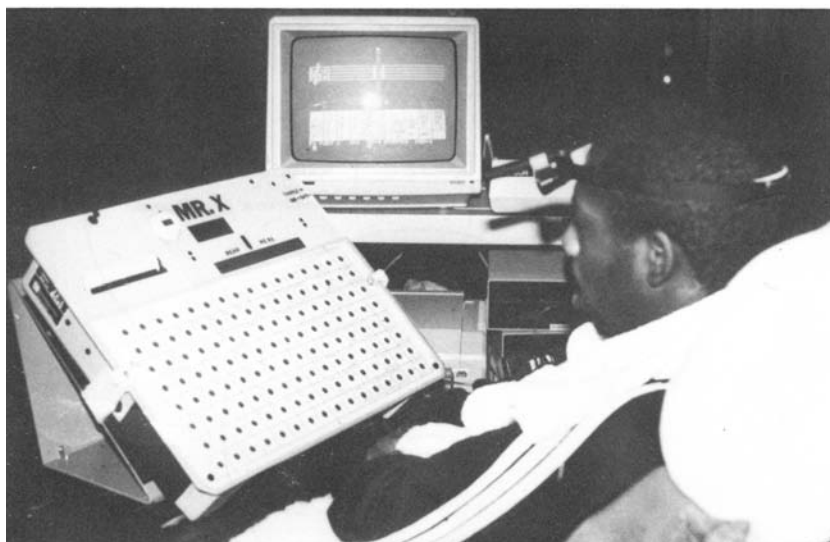


FIGURE 3. Mr B with communications and computer music system.

NOTES:

COMPUTER: C4/Q D4/Q E4/Q F4/Q G4/Q A4/Q B4/Q C5/Q

KEY: Letter refers to the note name
Number refers to the octave range of the note
"Q" refers to the rhythmic value of one quarter note

FIGURE 4. An example of the music that was read from to enter notes into the computer.

Stage one consisted of a tutorial designed to remediate the patient's deficits in music theory. The music theory software from MECC "Music theory" was used in this phase. The subject engaged in drill and practice of the fundamentals of music theory.

Stage two served to instruct the patient in methods of interfacing with and controlling the computer music system. In this phase the subject interacted with the system and the therapist. The goal was to familiarize the subject with the system so that he would be able to create music in a fashion similar to that of his guitar playing that he enjoyed prior to his illness.

Stage three enabled the patient to interact with the computer music system to create music with minimal assistance from the therapist. Figure 4 is an example of the music that he read from to enter the notes into the computer. The music was prepared by the therapist and then encoded into a series of symbols that the subject could enter into his communications device.

The results of this project have proved encouraging. The patient has experi-

enced an enhanced quality of life through his interactions with this project. Prior to his involvement there was a history of reported isolation and withdrawal. With the successful completion of this experience, there has been a sharp decline in his present level of withdrawal and isolation, attributable to his renewed sense of purpose in life by the resumption of his career goal—to be a musician and composer.

As a result of this project, the subject expressed to the therapists an improved sense of self-accomplishment. Many of his musical skills are now commensurate with the skills he enjoyed prior to his illness. Through his successful mastery of music theory and the computer music system, music composition was once again possible. With each accomplishment, the subject's self-esteem and regard appear to be increasing.

Summary

The use of microcomputers in the music therapy process with a quadriplegic patient appears to be a productive and effective modality of treatment. The subject displayed the ability to tap

into the inner resources of his innate musicality to create music within the music therapy process.² As evidenced by the success of this empirical procedure, further research is required to establish a standardized methodology of treatment that will embrace the most current developments in computer and music technology.

The recent development of the Musical Instrument Digital Interface (MIDI) appears promising. With the incorporation of this technology into a music system, there are many more avenues and opportunities for self-expression. The other important benefit of the emerging MIDI technology is that it will bring the cost factor of starting a program such as this into a range that most institutions can afford. A full music system will be available for well under \$4000.00, including the personal computer. While the initial cost of starting a program may be prohibitive, this method appears to be a cost-effective alternative to the traditional methodology of treatment. The institution providing this service can provide a unique and productive alternative for people with musical interests and diminished capacity. There is also the added bonus of exposing people to computer activities that may develop into new job and social skills. The program can augment existing computer programs or serve as the catalyst to begin a new one.

The potential for this modality of treatment to provide successful experiences to many handicapped persons unable to independently create music is vast. As technology develops, along with an increased awareness of the possible applications for the handicapped, there will be new opportunities for the disabled.

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