

The Creation of an Integrated Set of Musical Instruments

for Mentally Disabled Children

Tepika Rodsakan⁺ and Bussakorn Binson⁺⁺ (Thailand)

Abstract

The research aimed at creating an integrated set of musical instruments for mentally disabled children as off-the-shelf instruments may not always be suitable in terms of weight, size, shapes and may entail complicated playing methods. Additionally, four Thai songs were composed for this set of instruments and the results in terms of perception and reactions to the elements of music, i.e., rhythm, melody, and sound were examined. The resultant set of instruments can be described as follows: The set takes the form of a towable rectangular cart stylized as a colorful, playful animal and is comprised of five different types of musical instruments. It includes those that can be struck, blown, plucked, bowed, and shaken with most of them being removable. Depending upon the manner used, the instruments can be played by as many as eighteen children simultaneously. The four compositions utilize Thai traditional melodic scale with short and repetitive melodies. With experiential samples from eight mentally disabled children, the results reflect a positive perception and reaction to rhythm, melody, and sound.

Keywords: *Mentally Disabled Children, Integrated, Musical Instrument, Thai Musical Instruments, Music Perception, Recognition and Response*

⁺ Tepika Rodsakan, Lecturer, Srinakharinwirot University, Thailand. email: tepika_joy@hotmail.com.

⁺⁺ Dr. Bussakorn Binson, Associate Professor, Faculty of Fine and Applied Arts, Chulalongkorn University, Bangkok, Thailand 10330. voice (and fax after 4 rings): +662 218-4582, email: bsumrongthong@yahoo.com, website: <http://pioneer.netserv.chula.ac.th/~sbussako/>

Introduction

Mentally disabled children are defined as those who have less or slower development than the mainstream population in terms of skills and abilities such as: adaptation to society, communication, use of public services, self-care, self-control and academic learning. According to the intelligence quotient (IQ) test, mental disability can be classified into 4 functional levels: 1) IQ 50-70: high, 2) IQ 35-55: medium, 3) IQ 20-40: low, and 4) IQ 20-25: very low. Mentally disabled children are in general, deficient in at least two of the skills areas mentioned above (Binson, 2010:83). Previously, some research has found that music helps improve these skills; thus, musical instruments, music and songs can play a key role in their skill development. However, there remains a lack of suitable musical instruments designed especially for those with disabilities.

Presently, the musical instruments utilized in teaching mentally disabled children are conventional ones such as traditional Thai instruments and Carl Orff's musical instruments. However, since these instruments were created for mainstream population groups they are in most cases not suitable for mentally disabled children in terms of weight, size, shapes and entail complicated playing methods. Furthermore, some of their sounds can be very high pitched, like the Thai fiddle *Saw Duang*, and the Thai gong set known as *Khong Wong Lek* which can unnecessarily upset disabled children who tend to be very sensitive to such frequencies (Sumrongthong, et al., 2004). In addition, due to their cultural context disabled children may feel alienated from unfamiliar songs using Western scales.

For the above mentioned reasons, this research aimed at creating an integrated set musical instruments for mentally disabled children utilizing the Thai pentatonic scale. This means a scale consisting of Do, Re, Me, Sol, La out of the Thai Diatonic scale which has seven equidistant tones (Do, Re, Me, Fa, Sol, La, Ti). It was observed that mentally disabled children tend to be drawn towards sound producing instruments and respond with various movements such as tapping, applauding and other bodily motions or singing which are considered expressions of creativity. It is believed that these reactions can be utilized as a supportive contribution to their social adjustment.

Music for Mentally Disabled Children

Today music is recognized for its potential to assist in the acceleration of child development, whether they are mainstream or disabled. Consequently musical instruments too, can play an equally important role in facilitating physical, mental, social, and intellectual development. According to the research of Marie Foregeard, et al. (2008) in the book titled "Practicing a Musical Instrument in Childhood is Associated with Enhanced Verbal Ability and Nonverbal Reasoning," practicing playing music is associated with improvements in child development both directly and indirectly. Musical training may enhance auditory discrimination, motor skills, vocabulary and non-verbal reasoning. Therefore, many music scholars have been considering the incorporation of creative musical concepts in promoting childhood development – leading to the invention of innovative music processes and the creation of new musical

instruments exclusively for children. Based on these precepts, John R. Sosok, Brooke Abercromble, Brad Emerson, and Adam Gerstein invented an educational music instrument for children. Their instrument is a musical toy that allows one or more musical passages to be played and longer ones to be assembled. It consists of a base with a signal processing unit and five receivers along with five “building” blocks that are inserted into the receivers. When the blocks are engaged by the receiver, a musical sequence, or passage, is played. The musical sequence is dependent upon which block and which face of the block is engaged by the receiver as different block/face combinations produce different musical sequences. Thus, the resulting musical sequences played are location and orientation dependent. Apart from the invention of musical instruments for children, certain musical instruments are now being developed specifically for mentally disabled children. These type of instruments can be an effective key in assisting and enhancing their development.

The use of musical instruments is a central component of many clinical music therapy practices, and recent technological advances and modifications to instruments have enhanced their accessibility and versatility as a therapeutic medium. Examples of wonderful technological advances in musical instruments from recent literature include the integration of microprocessors with Internet connectivity that offer a much wider selection of user input methods including: voice recognition, eye-tracking, gesture-tracking together with magnification and amplification usability improvements to aid individuals with sensory (e.g. hearing or vision) or motor deficits. Such modifications have the potential to transform music therapy and education for children with neurodevelopmental disabilities (Yuezhou Yu, et al., 2004). Customized and modified music instruments can aid children’s accessibility to music and more importantly they can enhance the development of children with disabilities.

Research Tools, Design, and Methods

The content of this research project consisted of the construction of a set of integrated musical instruments for mentally disabled children and the composition of specific repertoires together with the procedures to evaluate them. The data collection method used the qualitative approach paired with participant observation. The usability and effectiveness of the instruments with the new compositions was also conducted.

Tools and Measurement

In this research project the following tools and measurements were employed:

1. Interview form: This form was used to record responses from music teachers, disabled children specialists, the children’s parents and psychologists.
2. A perception and reaction to musical elements evaluation form: This form was completed by observers and was developed and approved by three experts. It is comprised of nine questions that rate children’s perception and reaction to musical sounds, rhythm, and melodies with each parameter divided into five levels. The results obtained were later evaluated into individual assessments.
3. A questionnaire surveyed the level of satisfaction in using the integrated set of

musical instruments. It was completed by five music activity experts familiar with working with disabled children.

4. The integrated set of musical instruments itself.

Construction of the Set of Integrated Musical Instruments and New Repertoires

1. The designer applied a collection of related concepts of toy making for 4-5 year olds i.e. employing bright, vivid colors, animal motifs, tow ability, with the enjoyment of assembling and removing parts to develop a safe and integrated set of musical instruments for Thai children with disabilities utilizing the Thai pentatonic scale in the key of C (Do Re Mi Sol La). Different instruments were included so that each sound producing method namely: struck, blown, plucked and bowed, was represented.

2. Four specific musical pieces were composed for the set of instruments where each one offered a different aspect of traditional Thai music. i.e. disjunctive melodic progression, repeated melodies, gap-fill (with melodic gaps that provides opportunities for performers to fill them), and improvisation (that allowed for individualized improvisation over an ongoing rhythmic foundation).

Testing with the Integrated Set of Musical Instruments

Before testing began, parameters were set regarding perception and reaction to musical elements: rhythm, melody and sound, by observing different musical skills, i.e., listening, singing, physical movement, instrument operation, musical creation and musical notation comprehension. The children would, in turn, express their perception and reaction through clapping, tapping, singing, and physical portrayal of a musical piece through patterned and free form movement as well as patterned musical instrument operation, repertoire-related creativity and other expressions. Eighteen 30 minute test sessions were conducted with mentally disabled children studying at the Panyawutthikorn School.

Research Population

The sample was eight mentally disabled children, 8-10 years-old with a functional age of 4-5. The group had been tested and confirmed by a psychologist as having intelligence quotient scores between 50-70, being non-sound sensitive and without multiple handicaps.

Research Process and Methods

The research proceeded as follows:

Step 1 – Research Preparation and Creation

1. Examination of documents and related research.
2. Presenting the research proposal to the Committee for Human Research Ethics Screening, 1st Division, Saha Sataban Institute, Chulalongkorn University to receive official research ethics approval.
3. Interviewing specialists and other disabled-children-related caregivers. This included two music therapists, two disabled children specialists, two parents of disabled children, and a psychologist. The data obtained were then used as

preliminary research support for the design and construction of the integrated set of musical instruments for mentally disabled children.

4. Communicating with the administrator of Panyawuttikorn School for permission to acquire a sample group of their students and data collection.
5. Observation of the behavior of the Panyawuttikorn School's sample group during five sessions of music activities. The sample group was then subjected to a series of inquiries regarding perception and reaction to the activities as well as musical instruments.
6. Conducting four test sessions of traditional Thai musical instruments with the sample group under the supervision of a special education expert, a music activities specialist and teaching staff to determine the sample's perception and reaction levels for the musical elements: sound, rhythm and melody. These results then served as a source for the design and construction of the integrated set of musical instruments for mentally disabled children.
7. Recording the observations of the sample group on the observation form that covered perceptions and reactions to musical elements: sound, rhythm, and melody.

Step 2 – Construction of the integrated set of musical instruments

1. Designing the integrated set of musical instruments.
2. Preparation of raw materials.
3. Construction.
4. Composing the four musical pieces for the set of instruments.

Step 3 – Testing the sample population with the integrated set of musical instruments

1. Testing the integrated set of musical instruments with the sample group at the Panyawuttikorn School over five 30-minute sessions; to determine their perception and reaction to musical elements: sound, rhythm, and melody. Each sample member would rotate to play the different types of musical instruments in the set. These tests were conducted under the supervision of a special education specialist, a music activities specialist and the teaching staff.
2. Recording the observation results on the observation forms for the sample group regarding perception and reactions to the musical elements (sound, rhythm, and melody).
3. Inviting five disabled children specialists to observe the sessions and complete a questionnaire concerning the satisfaction levels expressed through the usage of the integrated set of musical instruments.

The Integrated Set of Musical Instruments

The appearance of the integrated set of musical instruments is shown in Figure 1 and takes the form of an imaginary pink creature measuring 40 x 60 x 30 cm in width, height and depth respectively. It is constructed primarily of rubber tree wood and can be towed into class with its attached-retractable cord whose handle is a MP3 player/recorder. The main body is a rectangular box-like form from which different instrument types can be drawn out and played through plucking, bowing, striking, blowing, shaking or striking a resonant key. Each individual instrument has been tuned to match the traditional Thai pentatonic scale, consisting of the notes: Do, Re, Me, Sol and La. Each tone is represented by a color: red, orange,

yellow, green, and blue respectively. This integrated set of musical instruments can be played by 18 children simultaneously.



Figure 1. The Integrated Set of Musical Instrument for Mentally Disabled Children.



Figure 2. Close-up of five small hand shakers that are easily available to children when the cart is wheeled into the classroom as announced by the rotating sound makers integrated into its wheels. Additionally, the shakers serve as color-coded handles for levers for playing the xylophone instead of the included mallets that require more coordination.

Figures 1 & 2 features the integrated set of musical instruments which is comprised of several types that create sounds via a variety of methods. For the struck instruments, there are two xylophones with five aluminum bars producing the notes: Do, Re, Me, Sol and La. The xylophone keys can be struck by pressing down the handles located on both side of the box or by using a pair of mallets. There is also a removal circular drum with a cowhide head held in one side of the set. The plucked instruments has 5 stainless steel wires suspended along its body and tuned by bridges to produce the notes: Do, Re, Me, Sol, and La. Similarly, the two bowed instruments are essentially identical to the plucked instrument, but are played with a bow. The wind instruments are wooden flutes drilled with two holes, which produce three notes: Do, Me, Sol. The ten shakers are filled with plastic beads and can serve as color-coded handles for learning the notes of the xylophone when not utilized by larger groups. Traditional xylophone mallets are included as well. The wheels of the set contain colorful plastic beads which produce sounds and provide visual enticement for the children when the set is being rolled into the classroom. Apart from these instruments, there is an MP3 player with a built-in speaker and recorder for looping capability and four specially composed pieces recorded for this set of integrated instruments.

The melodic movements of the four musical pieces are limited to the C pentatonic scale and the compositions are noted down for all the instruments. The length of each composition is about 2-4 musical lines, using short and repetitive musical passages. Each piece contains different features such as disjunctive

melodic progressions, repeated melodies, jagged melodic progressions, constant rhythmic patterns, syncopated rhythmic patterns and/or dialogue-like melodic progressions. The tempo of the repertoires varies from slow to medium to fast, along with melodic variations that include non-melodic gaps to allow the players to improvise their own melodies to encourage their creativity.

Findings

This integrated set of musical instruments was designed with the purpose of integrating both theoretical and practical concepts of Thai traditional music into educational and recreational activities of mentally disabled students. With its toy-like appearance, the set was found to easily arouse children's attention and keep them engaged in musical activities without feeling forced or under therapeutic treatment. The instrument's "tow ability," a characteristic of toys for 4-5 year-olds, helps strengthen gross motor skills as children walk with or tow the instrument. Furthermore, with its toy animal motif it can capture children's attention. The set's instruments are five different types of individual musical instruments that can appeal to children's changing interests. The integrated instrument serves as an all-in-one musical tool that can be played by as many as 18 children simultaneously. Apart from musical aspects, this study aimed to improve other capabilities of the children. For example, the inclusion of different geometric shapes for the individual instruments and various parts encourage development of the children's capacity to observe figures and estimate size. The decision to vividly color-code the different notes reinforces color distinction and aids in tone awareness and recall. The incorporation of different instruments and their differing playing techniques assist in improving fine motor skills and hand-eye coordination. The sizing of the set of instruments were intentionally proportionate to the level of physiological development of the sample group to ensure the instruments were accessible without incumbrances.

Discussion

The integrated set of musical instruments was designed to enhance the musical, physical, emotional and social development of children with mental disabilities. As the set is a flexible classroom tool, it offers more opportunities for expanding its role as developmental goals arise. There are many music-based activities related to subject-based learning it can support as well as social interaction and language use. The instructions of how to play could also be varied according to the number of participants and the classroom situation. One way to utilize the set is with small groups for activities to encourage socialization and interpersonal communication. Regular musical activities within classroom can be used to promote a stronger sense of camaraderie and teamwork in the classroom as they assist each other in practice sessions. The instructor can encourage individual expression while modeling a sensitivity to group dynamics and mutual respect for other's creative participation. This set of instruments offers another opportunity for children to learn about teamwork and how to negotiate with others.

Additionally, it is recommended that the children be urged to learn to play a variety of instruments once they have mastered a tune with their first one, as

it is important to provide exercises that encourages a range of hand and limb coordination, muscle development and a sensitivity to cadence.

Even though the set's intended use is with mentally disabled children, it offers an easily approachable collection of instruments in a portable storage unit for mainstream classrooms as well for basic musical skill development.

The author is aware that this set of instruments is a prototype and needs further refinement to increase the sound quality of some of the instruments.

Conclusion

The integrated set of musical instruments for mentally disabled children was created as a prototype to serve as a model for further consideration into the development of more musical instruments for children with disabilities. Its construction and guidelines for use combines the concepts of traditional Thai music, sound, and tuning with color coding for developing both hand-eye, hand-ear, and eye-ear coordination of the target population via the pathway of enjoyable musical experiences. Additionally, its toy-like appearance serves to draw children's attention in using the set in a positive way. The integrated set of instruments has undergone seven reviews by specialists leading to improvements and revisions resulting in its present configuration and feature set. The four musical compositions intended for use in conjunction with it were composed using Thai traditional music principles. They are melodically restricted within the pentatonic C scale (Do, Re, Me, Sol, and La). Each composition consists of short melodic phrases of repetitive notes with a unique identity. The tempos of the pieces vary, but they are also arranged to afford children opportunities for repetitive reinforcement, melodic variation, and free form rhythmic creativity. The test results of the sample group showed overall positive results in terms of perception and reaction to the musical elements, namely: rhythm, melody and sound. Moreover, this integrated set of musical instruments was designed to suit the needs of children with mental disabilities to enhance their physical, emotional, social, and intellectual development through group musical activities.

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