Practice Perspective

The Use of Music to Promote Purposeful Movement in Children with Visual Impairments

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Music plays a major role in the education and development of all children. Although the use of music in the education process may seem obvious to most professionals, there are only a few studies that discuss the effect of music on the purposeful movement of students with visual impairments (DePountis, Cady, & Hallak, 2013; Desrochers, Oshlag, & Kennelly, 2014; Sapp, 2011). A large percentage of teachers of students with visual impairments and other professionals use music and movement to some degree when working with students. The author of this article has extensive past experiences working as a music therapist collaborating with occupational and physical therapists in a rehabilitative therapy setting while using music to promote movement for people with disabilities including those with visual impairments. The same strategies are proving beneficial in a music classroom setting to increase students' participation through movement activities. The purpose of this Practice Perspective is to provide evidence and examples of music activities that can promote the purposeful movement for students with visual impairments.

Music and movement

Supporting evidence from the field of neuroscience and music therapy suggests that people can learn or relearn movement through activities that require moving to external auditory stimuli like music. Rhythmic entrainment is the ability of a person to automatically synchronize his or her physical movements to the metrical structure (meter or "the beat") of music (Trost et al., 2014). Neurological processing of meter is a consistent, repetitive, and predictable duration of time that involves "temporally-precise two-way interactions between motor planning regions and auditory regions of the brain" (Patel & Iversen, 2014, p. 11).

Manipulation of music's metrical structure proved beneficial for increasing the duration of students' movement as well as decreasing the need for verbal prompts from the teacher. Activities such as marching and simple dance sequences allowed students to synchronize movement to the beat. With live music, the tempo could be increased or decreased or stopped and started according to the beat in a game-like context. The use of props proved beneficial for some students with more severe disabilities. Students who were willing to grasp a parachute or scarves could move to the beat in a more passive manner while the teacher actively moved the prop.

Movement through instrument playing

Playing musical instruments is an effective way to promote purposeful movement and reaching in the upper extremities of students with visual impairments. Research suggests that Therapeutic Instrumental Music Playing (TIMP) can promote functional movement when individuals are encouraged to play musical instruments in nontraditional ways (Thaut, 2005). The key component for increasing movement and making it functional is the location or placement of the instrument based on a person's individualized need. This approach proved beneficial for students with more severe disabilities, including those with deafblindness. After introducing an instrument with hand-under-hand assistance, preferred instruments were placed in close proximity to students, which allowed them to participate in a manner that reinforced concepts of left or right, crossing midline, reaching over their head, and increasing range of motion. In addition, students with vision performed on percussion instruments in which

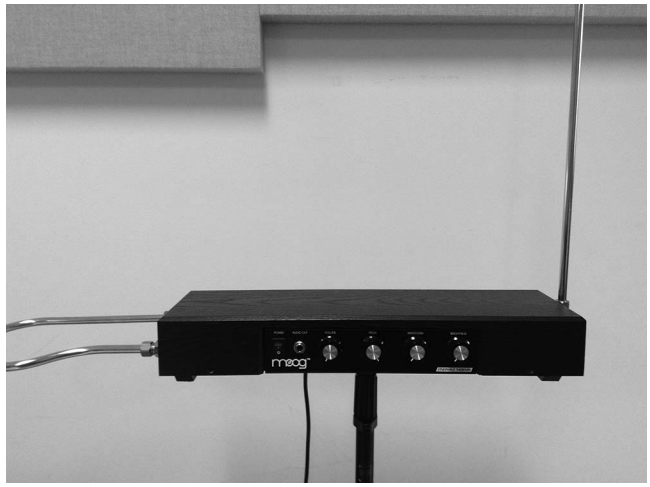

Figure 1. The Thermin device.

they were required to visually track the drum beat. The teacher would alternate placing paddle drums on the students' right or left side and high or low. This activity promoted range of motion and crossing midline, as well as increasing the duration of movement that usually lasted for the entire song with minimal verbal cues from the teacher.

Music technology and movement

Incorporating music technology like the Thermin (see Figure 1) and the Soundbeam (Figure 2) was a fun and motivating way to promote the purposeful movement of students. Soundbeam is a touch-free device that uses sensor technology to translate body movement into music and sound (Soundbeam, n.d.). It has two microphone-like motion sensors placed on stands in two separate locations, and sound is produced by the proximity and direction of body movement in relationship to the motion sensors. Signals received by the Soundbeam motion sensors can connect to Musical Instrument Digital Interface (MIDI) controls and other media, making the amount of available sounds and timbres almost limitless. These two musical devices made the experience of music class more enjoyable and musically rewarding for some students. Anecdotal evidence from the classroom suggests that some students demonstrated overt signs of enjoyment with these more novel instruments. Students stated that they were intrigued by the fact that they could produce sound without actually touching the instruments. The students also became very intrigued about the science behind the instruments, and thus increased their range of motion when trying to make drastic changes in sound and to test the limits of the devices' capability.

Auditory discrimination, sound localization, and movement

Separate activities were used with elementary students who exhibited independent travel skills and conceptual knowledge of auditory stimuli.

"Find the shaker" activity

One example of an activity is the egg shaker game. Most students were familiar with the tactile and auditory components of an egg shaker, which is a percussion instrument like a maraca that is shaped like an egg. The teacher hid the egg shaker in an undisclosed place in the classroom (usually on a desk or under a table on the floor). Students were

Figure 2. The Soundbeam device.

informed that they were to travel and find the egg. The teacher played a drum, and when the student was traveling in the correct direction of the egg, the teacher's drum got louder, and when farther from the egg the drum got softer. Students took the cues from the drum and began to travel in the direction of the egg shaker. When the drum was really loud, students knew that the egg was close, and students began to switch from travel techniques to search techniques and protective techniques to find the shaker. Student responses to this activity were overwhelmingly positive.

Drum activity

The second activity required students to use sound localization and auditory discrimination, as well as perceive distance. Three drums of different sizes with high, medium, and low sounds were placed at the end of a hall in various locations. Students were required to travel to the bass drum with the lowest pitch. This game was challenging for some students because of the greater distance that needed to be traveled and the similarity in timbres between the drums. Students had to make auditory discriminations and find the source of the desired sound while the other instruments masked the sound source.

These two activities proved beneficial for elementary students with no or mild additional disabilities with applying conceptual knowledge of sound and travel techniques in a fun way. Students were excited to apply these skills in the context of a music activity. Students with some vision found these activities remedial, but they enjoyed performing on the instruments, helping the teacher or participating with the use of blindfolds.

Recommendations

The following activities and strategies proved effective with helping some elementary students with visual impairments, including those with additional disabilities, to develop individualized music routines that required purposeful movement for accurate participation. Instruction was individualized for students based on their needs and abilities. The appropriateness of music activities was determined by the level of difficulty (not too easy or hard) and the movement required for accurate participation. Based on the successful outcomes that some students demonstrated, the following are recommendations that may be beneficial for professionals striving to effectively use music with their students.

Moving to the beat

The metrical structure of music can be used as an additional tool to promote movement. A person's ability to rhythmically entrain the movement of their upper and lower extremities to the metrical structure of music is an ability that can "take place without major

contributions from cognitive learning efforts" (Thaut, 2005, p. 141). Instead of organizing music by genre or student preference, music can be organized by fast or slow tempi that align with students' ability or their need for movement. A recent groundbreaking study from the field of music therapy suggests that people with visual impairments demonstrated improved gait parameters, especially with cadence, when walking to the beat of an external auditory stimulus during cane travel exercises (Molloy-Daughtery, 2013). The use of music therapy techniques such as rhythmic auditory stimulation and patterned sensory enhancement, a technique that uses pitch, volume and other musical dynamics to affect movement, can be helpful with maximizing students' movement through music feedback. Also, the uses of Dalcroze Eurhythmics activities can be an exciting way for students to move expressively to music while learning new musical concepts such as rhythm and meter (Dalcroze Society of America, n.d.).

Therapeutic instrument music playing

Musical instruments require gross and fine motor movement for accurate participation. Although preferred instruments can provide motivation for students to move, instrument location is what makes movement functional. Having students play instruments in a nontraditional manner can require them to cross midline and increase their range of motion, and can help with understanding concepts of laterality and directionality. Student preference, instrument location, type of movement, and musical feedback are all considerations for music professionals striving to increase a student's purposeful movement through playing musical instruments.

Conclusion

Students receive feedback from multiple sources within their environment. Effective student feedback is more than just verbal responses from teachers; it also includes situations that reveal to students the discrepancies between their cognitive intentions and behavior outcomes. At the heart of using music to produce movement is the idea that students will receive immediate, auditory feedback based on what they did or did not do. This type of feedback can be effective for students. Accurate participation in music requires the refining of motor skills and the associated cognitive processes.

Music activities can provide a motivating, complementary learning modality for students with visual impairments to increase and improve purposeful movement. When students are given the opportunity to practice movement activities in multiple contexts, like in the music classroom, skills are more likely to be enjoyed and to transition to environments outside the classroom. It is hopeful that some of these strategies can assist professionals with applying music in meaningful ways for their students.

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Research Report

A Theory-Based Physical Education Intervention for Adolescents with Visual Impairments

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Regular physical activity participation can have a positive impact on overall health. However, school-aged individuals with visual impairments tend to be less physically active than their peers without disabilities (Haegele & Porretta, 2015). Fortunately, preliminary intervention research suggests that physical activity levels of those with visual impairments can be improved (Haegele & Porretta, 2015). For example, Cervantes and Porretta (2013), using a social cognitive theory–based intervention, examined the effect of an after-school physical activity program on adolescents with visual impairments. Their study offered a nine-lesson program to four students at a residential school over a five-week period. Results indicated that leisure-time physical activity levels were enhanced by the intervention (Cervantes & Porretta, 2013).

Social cognitive theory is considered among the most acceptable models for understanding health promotion behavior (Motl, 2007). It is a general theory of human behavior that stipulates that people are active agents in their own lives as they generate thoughts, feelings, and behaviors (Bandura, 2001). The model of causation which is central to social cognitive theory is triadic reciprocal determinism, which suggests that one's behavior, personal factors, and environmental influences influence each other bi-directionally (see Figure 1; Bandura, 2001; Motl, 2007). The reciprocal nature of human functioning in social cognitive theory allows researchers to direct interventions at several interrelated constructs in order to change behaviors. Common constructs exploring influences of physical activity behavior, central to the program implemented by Cervantes and Porretta (2013) and to this study, are self-efficacy, self-regulation, outcome expectancies, and social support.

The need to increase physical activity at an early age has stimulated the development of school-based interventions for all students. Research suggests that school-based interventions can successfully increase physical activity (Kriemler et al., 2011). However, few studies focusing on individuals with visual impairments have been conducted. Thus, the purpose of this study was to determine the effects of a social cognitive theory–based physical education program on the leisure-time physical activity among adolescents with visual impairments. In this study, the successful social cognitive theory–based after-school program utilized by Cervantes and Porretta

