Music's Influence on Cognitive Development

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Music's Influence on Cognitive Development

Abstract
Many people have disputed that music affects brain development. Often, people will challenge the idea that music can lead to an enhancement of higher brain functioning. However, it has been demonstrated, through varied use of music that people benefit from music's impact on both hemispheres of the brain, which make learning easier. Through the collection of multiple resources, my research study will focus on the various benefits of music with regard to cognitive development. The action research study will be based on music integration at the elementary level and its impact on student learning and motivation. I will survey various classroom teachers to understand the involvement of music in their curriculum and music services offered to students with special needs. The goal of this research study is to investigate the relationship between music and brain growth with regard to student learning and motivation within the classroom. I hope to find a strong connection between engaging children with music at various levels and development. Also, I am hoping to find an increase in student motivation when music is integrated within the curriculum. This topic was chosen because of its impact on my childhood. I grew up with music in my home and in various classroom settings. I felt that music helped me to remember things when they were put to music. In first grade my teacher would play her guitar and we would sing songs. To this day I still remember "Down by the Bay..." a song about creating rhymes. I feel that this had an influence on my achievement because it always kept me thinking and learning new things keeps my brain exercised.

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Music’s Influence on Cognitive Development

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Many people have disputed that music affects’ brain development. Often, people will challenge the idea that music can lead to an enhancement of higher brain functioning. However, it has been demonstrated, through varied use of music that people benefit from music’s impact on both hemispheres of the brain, which make learning easier.

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Music’s Influence on Cognitive Development

Have you ever heard a catchy song that remained in your head and no matter how hard you tried to defeat it, you sang the chorus over and over? How many times have you read a story in a book and repeated a paragraph word for word, over and over? My point exactly! Researchers believe that music has the ability to positively affect brain development in young learners (Strickland, 2001/2002). Can research support this theory or does research suggest that it is a mere hypothesis with little support? If music does in fact benefit learning, then how can we use it in the classroom to successfully teach students? In this literature review, I will present research-based articles that provide evidence supporting music’s benefits on children, the specific subjects influenced by music, and the ways in which music has been presented in the classroom.

In this review, the term “music” will be used, which has a broad understanding. For the sake of the reader, the term “music” is defined as “any musical instruction given in school-choral, general, or instrumental” (Kelstrom, 1998, p.39).

Does music influence learning?

Researchers have believed for years that music can stimulate brain development. According to the Mozart Effect, “The idea is that infants and young children can benefit from early music exposure and training” (Caulfield, 1999, pg. 119). The initial study of the Mozart Effect done by Francis Raucher and Gordon Shaw along with colleagues, focused on college students, not infants, which they claimed to be the main reason for the study. Data collected from the study indicated that subjects who listened to
Mozart’s Sonata for Two Pianos in D Major improved their performance on IQ spatial reasoning tasks but this effect wore off after only 10 minutes (Caulfield, 1999, pg. 119). Their theory stated that there was “significant, temporary, short-term spatial reasoning gains just from listening to Mozart rather than other types of music” (Caulfield, 1999, p. 119). Although there was proof of gains in short-term spatial reasoning, the research findings also made people question whether music only affects short-term reasoning or if it does in fact help create long-term success for children.

Davies (2000) explained, “Optimal learning occurs when the two hemispheres of the brain work together. Any teaching strategy, such as music, that integrates the functions of both hemispheres uses the natural design of the brain to make learning easier, faster, and more fun” (pg.148). Technically speaking, when both halves of our brain are working in synch or in collaboration with one another learning is optimized, thus allowing children to take in what is happening more efficiently.

Although the benefits of music are often questioned, there is evidence to suggest that music does create higher brain functioning in those familiar with music in general. However, research shows that complex brain functioning is more dominant in music professionals (who work with and understand music and all of its components) as opposed to novices, but there is evidence to prove that higher brain functioning is apparent in both types (Reimer, 2004). Reimer also added, “Of central importance to music education is that all musical engagements, whether at the level of novice or professional—all the way from young children to seasoned veterans—activate both brain hemispheres and involve cerebral cortex activity and memory retrieval mechanisms”
(p.23). In an attempt to explain the value of music in the classroom, he states, “...every musical experience that we offer our students affects their brain, body, and feelings. In short, it changes their minds permanently, and, if we are conscientious, it does so progressively. We call such a process learning” (Reimer, 2004, p. 25). Music is unique and through research we have evidence to prove that no matter the depth by which we delve into music, it is beneficial.

According to research done using six to eleven-year-olds, it was found that there was a positive association between duration of music lessons and IQ. In the study, students ranging in age were given music lessons for various lengths of time. The study results documented that children who were exposed to music lessons saw slight improvement in cognitive ability but the results were long lasting among those children (Schellenberg, 2006, p.457). Schellenberg also added that, “musical training leads to improved performance on a wide variety of tasks involving music perception and cognition” (2006, p. 457). In a similar study done by Schellenberg (2004), further evidence was found which supported the idea that music lessons enhance IQ. In this study six-year-olds were the main participants. The 144 participants were assigned randomly to one of four groups. Two groups received either keyboard lessons or Kodály voice lessons (using hand signs, rhythmic syllables and folk songs) for one year. The two other control groups received either drama or no drama lessons. After students completed their training, each performed an IQ test. The results included evidence that IQ scores increased for the children who were given drama, keyboard or singing
lessons. Children who were given drama lessons had an average increase in IQ of 4.3 points and the music lesson groups had an average IQ increase of 7 points. This evidence further proves that music training aids in an increase in IQ. The students presented with drama lessons did show an increase in social behavior that was not seen among those with only music lessons (Schellenberg, 2004).

Music not only helps us to retain what we are studying but it also allows us to pull stored information at a future time. Music "...creates a stronger neural connection, which in turn makes it easier to remember information. As an example of how this involvement works, think of a favorite song," explains Davies, "As you 'play' the song in your head, chances are you will trigger memories associated with the song" (2000, pg. 149). This type of connection helps us to retrieve multisensory memories stored within the brain.

A study done in Albuquerque, New Mexico, analyzed fifth grade students who took the Comprehensive Test of Basic Skills (CTBS). It was found that nearly one-fourth of the students, who were also enrolled in a music program for at least two years, scored better on all parts of the test than the total group of 5,299 students who took the test (Kelstrom, 1998, p. 36). Although there is not great detail about what types of music lessons the students were enrolled in, the data proves the benefits of music instruction on achievement scores. A similar study was done using 71 four to six-year-olds to discover the potential relationship between structured music curriculum and cognitive development. Children were tested using the Stanford-Binet Intelligence
Scale and a Young Child Music Skills Assessment. After being tested, half of the participants were involved in a 75-minute weekly lesson that spanned over 30-weeks of the year. After students completed the program and were re-tested using the same tests, the results concluded that there were considerable gains for the children who were participants in the music program. The research suggests that there is a great association between early music instruction and spatial-temporal reasoning abilities (Bilhartz, Bruhn & Olson, 2000, p. 615).

Research conducted to explain the relationship between music and the frontal lobes found that in general, music increased activity within the left frontal lobes, which is associated with happiness (Strickland, 2001/2002, pg. 101). This may in turn explain why music creates an environment with less tension. “Music in the classroom reduces stress, increases productivity, regulates energy, and creates a relaxed, supportive learning environment” (Davies, 2000, pg. 150).

Along with this, “there is clear evidence that music affects brain waves and physiological states,” says Yoon. “In Japan, a study was conducted to gauge the influence of music on the stress levels of adult hospital patients. One group of anesthetized surgery patients listened to music on headphones while another group did not. The ‘music’ group had lower stress levels in the blood” (2000, pg. 24). This research may transfer to children and prove that children with anxiety may lower their stress levels when music is included daily in the learning process.
Do teachers feel as though they are sufficiently prepared to integrate music in the classroom?

A survey was prepared for college students entering the field of elementary education. The survey was used to determine the purpose, format and content available to education majors who took fundamental music courses. The purpose for this study was to verify if classroom teachers were being prepared to integrate music into their daily curriculum. The results of the study showed that most candidates who were taking music courses felt adequately prepared for music instruction within their classroom. Those who were already classroom teachers felt as though they were not as prepared for instructing music-based activities within the classroom (Gauther & McCrary, 1999).

Many schools offer music courses to help candidates feel more confident in their implementation of music throughout the everyday curriculum. This article provided evidence that not all universities equip their teaching candidates with the same knowledge of the music curriculum. This article leads me to believe that music is indeed becoming an important component in the daily curriculum across the United States and it seems as though colleges and universities are gradually trying to update their course offerings to meet the needs of the classroom teacher.
What school subjects are affected by music's benefits?

We ask this question over and over: Why does learning music transfer to other areas of the curriculum? Specific subjects in school are affected by music integration because of the complex nature of understanding music and its intricate components. The following evidence provides reasons to support the true capability of music’s effect in a general education class.

In a study done with a high school social studies and science class, students were placed into two groups. One group was given lessons based on a “socio-music curriculum” where they integrated music into their social studies and science instruction. The other group received regular classroom instruction without music integration. The students were then tested on their knowledge of social studies and science items. According to the research, it was found that the group of students who were introduced to a socio-music curriculum scored higher on social studies and science items than those who were not a part of the performance group (Eady & Wilson, 2004, p.244). Although this study was a bit hard to follow because there was little detail as to the type of music instruction that was given and lack of numerical evidence, the results again proved that students with music instruction were on average performing better than the students who do not receive any music instruction.

In Iowa, a study was done to gather information on whether the mathematics scores of eighth-grade students would improve after receiving music instrument instruction (Check & Smith, 1999). Some students were given private music lessons while others were given lessons with a group, using a keyboard.
"Analyses indicated that students who had private lessons for two or more years performed slightly better on the composite mathematics portion of the ITBS (Iowa Tests of Basic Skills) than did students who did not have private lessons. In addition, students who received lessons on the keyboard had significantly higher ITBA mathematics scores than did students whose lessons did not involve the keyboard." (Cheek & Smith, 1999)

Yoon (2000) explains that according to a study done on children in grade school, "Music learning develops the perceptual skill necessary in reading. Studying a musical instrument develops auditory discrimination that has a positive influence in the development in phonetic skills" (pg. 17). She also explains that, "The skills children gain in listening to music will provide a solid framework for successfully attending to language in print. The singing-reading connection fosters a love for reading while learning how to read (Yoon, 2000, pg. 17). This connection to music proves that playing an instrument and listening to music both benefit early childhood learners.

In a similar study, the researchers stated that “if early reading skill is closely linked to skill in processing the auditory components of speech, it is reasonable to hypothesize that the auditory analysis skills necessary for music perception may also be associated with reading development” (Anvari, Trainor, Woodside & Levy, 2002, p.113). The purpose of the study was to discover if in fact there was a relationship between music perception and early reading development in four to five-year-olds. The results of the study were found to confirm a connection with both phonological awareness and reading development. Based on the research findings, it was also
suggested that "music and speech may depend on many of the same basic auditory processes, and hence, early skill with music might enhance reading acquisition to the extent that reading depends on the same basic auditory analysis skills (Anvari, et al., 2002, p.113).

Given the results of previous articles, and his study on piano lessons and video games, Holden's research provides evidence that music benefits the brain. Research indicates that children who take piano lessons score higher on math performance tests (Holden, 1999). Three groups of second-graders were given either piano instruction plus a math video game to help them learn ratios, proportions and to rotate shapes mentally, or computer-based English language training and a mathematics video game, or no special training at all. When the results were calculated, the group given piano lessons scored 15% higher than the English group on the test about the computer game and 27% higher on the questions based on math ratios and proportions (Holden, 1999, pg.2007).

A connection between music and math was also found during a neurological research study. It was documented that "higher brain functions of abstract reasoning as well as spatial and temporal conceptualization are enhanced by music activities. Activities with music can generate the neural connections necessary for using important math skills" (Church, 2000/2001, p.50). Church also points out that "music is considered a right-brain activity, while math is a left-brain activity. When combined, the whole child is engaged not only in the realm of thinking, but in all the other domains of social-emotional, creative, and physical development" (2000/2001, p.50).
A group of first graders were chosen to receive a 40-minute daily lesson for seven months on how to listen to folk songs and to recognize melody and rhythmic components. A control group of similar IQ, age and socioeconomic status were not given this treatment. When tested on reading, the experimental group scored in the 88th percentile on their tests and the control group scored in the 72nd percentile. Both groups were taught by the same teacher (Weinberger, 1998, p.38). This research proves that music, when studied often, seems to benefit children’s development in and outside of the classroom.

*How is music used in the classroom to enhance learning? How can it be used in the classroom?*

According to research conducted to explain the relationship between music and the frontal lobes, it was found that in general, music increased activity within the left frontal lobes, which is associated with happiness (Strickland, 2001/2002, pg. 101). “Songs in the classroom can enhance the enthusiasm that children feel toward their work. A song about metamorphosis piques the students’ interest as they sing the words and melody and read about caterpillars turning to butterflies” (Diefenbacher, 1999, pg. 32).

Davies explained that a study done on children in preschool where the children either played an instrument or sang in groups resulted in the children dramatically increasing their performance on spatial-reasoning tasks, such as puzzles and mazes (2000, p.150).
Also, playing background music in the classroom has been known to increase the overall attention of students. In a study done that introduced background music in the classroom, it was concluded that music did not increase achievement, but it did motivate those students who were otherwise almost always unmotivated in the classroom (Eady & Wilson, 2004). Davies suggested that teachers

"...locate pieces of music that you and your students will find soothing such as classical selections or those that re-create sounds of nature. Play three or five minutes of relaxing music at the beginning and end of the school day, after lunch, and before tests." (2000, pg. 150)

According to McIntire (2007), music can help children with difficulty in school learn how to read, write, speak and listen. She explains, “Tommy has trouble memorizing spelling rules, but after his music teacher sets the rules to a catchy tune, he remembers them, and his spelling performance greatly improves” (pg. 44). She makes the case that literacy and music go hand in hand. It refers to our ability to communicate by reading, writing, listening and speaking. Music encompasses the use of all of these abilities and can help a struggling learner in the classroom (McIntire, 2007, pg. 44).

A study done with senior high school students proved that today’s popular music could help reinforce the study of history. The students who were presented with lyrics of popular songs that could address a history topic were seen to have a greater gain in their scores based on particular topics than the others (Eady & Wilson, 2004, p.245).
Not only does it benefit children to listen to music, but also allowing them to play and explore music creates a greater understanding of other parts of their curriculum. Students are being introduced to many ways of integrating music with their daily curriculum through various other forms. In another approach, technology and music work hand-in-hand through a device called a *Musical Instrument Digital Interface* (MIDI). Through this device students can compose music, edit, and re-create music through a computer monitor. "MIDI technology can encourage divergent thinking through improvisation and composition" (Eady & Wilson, 2004, p. 247). This type of device will bring technology into the classroom. Those students who enjoy the benefits of music will likely enjoy the technology integration, which is heavily present in our society today.

While it is critical that children between the ages of one and four are introduced to music, it is important that this continues into their elementary and secondary years of school. Scott explains, "During the first two to three years of elementary music instruction, children should be immersed in active music making. They should be led to explore sounds, tunes, beat, rhythm, and movement. Children should be comfortable experimenting with music" (2004, pg. 24). Music-literacy aids in the ability of a child to be successful in school (Scott, 2004, pg. 20). Children develop in various ways at different ages. Kenney (2004) states that children, "...construct their own knowledge by trying to make sense out of whatever is around them, and they develop skills by manipulating what they find interesting" (pg. 29). "Providing a music environment is
an effective way to help young children gain music knowledge, skills, and dispositions in terms of how they view the world” (Kenney, 2004, pg. 29). Allowing children to sing whole group is as important as allowing them to sing individually. Vocal exploration can lead to a literate rich environment where students learn to read and write.

McIntire suggests using music in the classroom for various reasons, such as: decoding skills (because music and reading use sounds and symbols), listening skills (they both require imagination), rhythm skills, communication skills (verbal and written responses), vocabulary development (new words and meanings often encountered), expressive ability, memorization, and motor development through playing instruments and creative movement (2007, pg.46). Students can “rewrite the lyrics to familiar songs. Younger grades can work on phonological awareness by substituting individual rhyming words” (McIntire, 2007, pg. 46).

Conclusion:
The goal of this review was to find information that could either support the notion that music has an effect on learning or deny the claim based on research compiled through studies. Although the majority of the reviews provided evidence in favor of the benefits of music, there were some articles that found little significance between music and development.

While most of the articles provided detailed accounts of studies administered and seemed valid in their findings, there were some that contained little detail about the
actual study and its implications; therefore, it makes it hard to prove the validity of the research. Unless we have a 100% participation rate among the population studied it is hard to generalize the results based on a whole population.

Music seems to certainly benefit many students who encounter it, however, there are worries that not all students will benefit from music in the same way. Davies explains, “Although some music often promotes learning, it may interfere with some students’ concentration, particularly those with attention disorders” (2000, pg.149). She says that it is best to observe your students when music instruction is being offered to see if it is a distraction for those with attention deficits, and then adjust instruction according to individual needs.

Based on the research by Arthur and McCrary (1999), it was found that there seems to be a split between teachers who feel adequately prepared to integrate music instruction in the classroom and those who do not feel as prepared. When taking into consideration the needs of each learner it can be hard for a teacher to base the general instruction around individual needs, let alone the music instruction. The research article provided in this review stated that colleges and universities are working toward providing quality music education courses that will enable classroom teachers to feel confident in their implementation of music on a daily basis. It seems as though the more confident the teacher feels in their instruction, the more the student will benefit from the lesson. Hopefully, this will continue and we will see an increase in the number of teachers feeling well prepared to handle the task of integrating music into the classroom on a daily basis.
Although there are many articles being published that have provided evidence of music’s benefits, additional research would add validity to the theory relating music to development. Strickland argues that,

“If consistently effective and efficient musical interventions are to be developed, however, much more work needs to be done to pinpoint which parts of music or musical instruction enhance brain growth and learning. Identifying and funding carefully controlled studies that target specific musical effects on children’s growth and development would provide important information for educators to use in their efforts to develop an enriching atmosphere in the classroom.” (2001/2002, pg. 103)

The research used in this literature review does provide evidence of cognitive enhancement in conjunction with music; however, we cannot assume that in all of the cases stated that music is the main factor contributing to why some students perform better than others. Differences in socioeconomic status, race, gender, and age can skew results significantly from one study to the next. By narrowing studies and choosing specific populations for research, we will be able to identify the exact types of musical instruction that are creating a difference in cognitive development and implement these in schools across the country.

Like most studies, there is always controversy in the way people are chosen, the degree by which they are tested, and the intended results. Through enhanced additional testing, we should be able to successfully conclude if in fact music coincides with cognitive development and to what degree it affects the brain.
Method:

Purpose: The action research study is based on music integration at the elementary level and its impact on student learning and motivation. Various classroom teachers will be surveyed to gauge the involvement of music in their curriculum and music services offered to students with special needs.

Data Collection: Surveys will be given to teachers in primary grades from a district in Upstate New York to access the means by which music is used in the classroom formally and informally. I will send out anonymous surveys that will be completed and returned to me through Email. Participants will be made aware that the information they share will be used for research purposes.

Data Analysis: Data will be analyzed by checking the responses to see how many teachers use music in the classroom, the means by which they use the music and if any special need learners have music reinforcement outside the classroom and their attitude about music's benefits.
Results of Action Research:

- 4 surveys were returned
- Participants included:
  - 1 Kindergarten special education teacher
  - 3 First grade general education teachers

According to data:

- Question 3: How do you feel about using music in the classroom?
  - All teachers felt as though music is effective and enhances instruction.

- Question 4: Do you use music in the classroom? If so, how do you use it?
  - All teachers use music in the classroom. They use it for transitions, breaks, for help understanding curriculum, calming students, learning instruments.

- Question 5: How does music help your students?
  - It is helpful for memory, teaches information that needs to be remembered, fun, promotes reading, and engages students.

- Question 6: What is its impact on behavior in the classroom?
  - Children can have fun but it can also be calming, redirects students, and motivates students.

- Question 7: Are there any negative implications to using music in the classroom?
  - 1 teacher said “No”
  - 3 teachers said that students can get overexcited, makes them act silly, or hyper.
Question 8: Do you have any students in your classroom diagnosed with a disability? If so, do these children obtain any special music services and what are they?

- 3 teachers said "No"
- 1 teacher has two students with a disability. They receive music therapy 2 x/week for 30 minutes.
Discussion:

After reviewing the survey results from the four Kindergarten and first grade teachers, I realized that the information presented was exceedingly similar. I will admit that I did expect the feedback to have a positive light.

The third question was given with the intention to identify if teachers felt that music was beneficial when integrated into the classroom and all four explained that it was. They mentioned that it was effective and enhanced classroom instruction. I did not expect any surprises for this question.

The fourth question asked if the teachers used music in their classroom and how they used it. It was mentioned that they primarily use it for transitions, breaks, for help understanding the curriculum, calming students, and learning simple instruments. I was surprised to see the comment about learning simple instruments and wished that the teacher had expanded on what instruments were used and how she went about teaching this type of music in the classroom.

The fifth question inquired about how music helps students. Their answers generally stated the same concept: it is helpful for memory, reinforces information that needs to be remembered, it is fun, promotes reading, and engages students. They did not mention anything about improved achievement scores, but did mention that it helps memory and promotes reading. In the literature review I found many articles that mentioned music's benefits on mathematics. I was interested to see if the teachers mentioned math, but did not. It might be too early at this age to gauge if music does anything for this subject specifically.
The sixth question was asked with the intention to understand how music visibly affects behavior. The teachers pointed out that it calms students, redirects their attention and can be a motivating source. This leads me to the next question because the teachers primarily said that music only does positive things I wanted to know if there was anything negative about integrating music.

Question seven asked if there were any negative implications to using music in the classroom. Three of the four teachers explained that there could be negatives to using music. They mentioned that it could cause overexcitement, therefore, causing students to lose control. One teacher said that there was nothing negative about music use. It surprised me that there was somewhat a contradiction between two answers on the survey. The teachers mentioned that music calmed and also that it overexcited. I am assuming that the type of music and the way in which it is used aids in the student response.

The last question, which asked about children with special needs receiving music therapy, was answered by only one teacher. The Kindergarten special education teacher was the only one who could speak to this question. She explained that two students receive music therapy services two times a week for 30-minutes. It was surprising to me that she had two students receive these services because I had never realized how important music was to students with special needs to have it scheduled into a program. If these students are receiving music services as often as they are, there must be specific reasons as to why the students should receive this.
Conclusion:

As I set out on my journey to understand the benefits of music, I realized how important music was to me as a child, thus the reason for me researching this theory. I loved when my teachers used music in the classroom to reinforce or teach a concept. Music allowed me to learn more effectively.

I am very happy with the information I found pertaining to this topic. Although there is much more research needed on this topic, I am glad to see that there are many studies being done to find the true potential of music integration. I do not doubt that much of what I found in my research is true about music’s benefits, although I feel that additional, more controlled research should be done by a reputable research committee.

Although I only received four surveys from teachers at the Kindergarten or first grade level, I was happy with the information given. It seemed as though the teachers were unanimous in their response to music’s effectiveness.

I found this project to be worthwhile because it taught me a lot about the potential benefits of music in the classroom and at an early age. I hope to continue researching this topic in the future. By then I am hoping that we will know music’s true benefits, along with concrete evidence to prove the theory.
References


Appendix 1.

Letter of intent:

04/02/08

Dear Educator:

Hello, my name is Julie Nicolich. I am a graduate student in the special education program at St. John Fisher College. A requirement in my program is the completion of a Capstone research study. As part of the action research portion I am required to survey professionals who can effectively speak on the topic being researched.

I am interested in further understanding the impact of music on children in the classroom. With this survey I will be able to understand the intensity by which educators use music and if they feel that it has positive benefits for the students.

All information provided will be held confidential. You do not have to provide your name on the form. By completing this survey you are giving consent to participate in this research study. Please type in your responses and email the completed survey to Julie_nicolich@hflcsd.org by Thursday, April 10. Thank you for your cooperation!

Sincerely,

Julie Nicolich
Appendix 2.

Survey Form

Action Research Survey: To be completed by participant.

1. What type of position do you hold?

2. What age/grade level do you work with?

3. How do you feel about using music in the classroom?

4. Do you use music in the classroom? ______ If so, how do you use it?

5. How does music help your students?

6. What is its impact on behavior in the classroom?

7. Are there any negative implications to using music in the classroom?

8. Do you have any students in your classroom diagnosed with a disability?
   If so, do these children obtain any special music services and what are they?