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Exploring Student Understanding of the Connections Between Music and Literacy

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Exploring Student Understanding of the Connections Between Music and Literacy

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Abstract

It has been found that music training improves attention and recall of memory, two skills that are linked to literacy. Music is also strongly correlated with phonological and phonemic awareness. More research is needed to pinpoint therapy methods that integrate music and are Evidence-Based Practices. The purpose of this project was to discover the extent to which aspiring speech language pathologists are aware that musical experiences aid learning and literacy by conducting a survey of undergraduate speech-language pathology and audiology students at The University of Akron. For the methods of this survey, twenty-eight participants completed a survey that was approximately fifteen minutes long. Two sections- "Background Questions" and "Literacy-Based Questions"- were included in the survey. The project was mixed methods, with some questions being likert scale and others being qualitative short- answer prompts. methods, discussion, etc. After the data was collected and the results were analyzed, one overall theme was noted by the researchers: students are somewhat knowledgeable about the neurological connections between music and literacy, and when asked, students can think of ways to apply music to therapy. However, when asked to discuss music integration in therapy or music appreciation in general, students are more inclined to first view music as a calming, engaging sensory activity, rather than a potential therapy aide.

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Introduction

Communication, the act of receiving and sharing information both verbally and nonverbally, is crucial to personal growth. Being an effective communicator allows people to experience, learn, and reflect on truths that they learn and situations that they observe. All forms of communication are important and have value. For years, Speech-Language Pathologists have devoted their time and resources to researching and understanding effective rehabilitative methods so that every person, whether young or old, feels capable while communicating.

As with any field, speech pathology has evolved and grown based on patient needs and new research. Within the last few decades, the link between language and literacy has become evident. Young children that struggle to acquire speech and language skills during the preschool years are at greater risk for struggling to acquire literacy skills during grade school. Since speech pathologists are experts in speech and language development, it has followed that speech pathologists are qualified to identify at-risk children and recommend intervention.

Written communication is as valuable as oral and nonverbal communication; it is indisputable that written communication is deeply intertwined with everyday life. People must be literate to graduate from school, understand traffic signs, interpret manuals- in fact, literacy's importance cannot be overstated. Yet the importance of literacy extends beyond its everyday uses; being literate is the key to unlocking a world of information that has been stored in the form of writing. For centuries, civilizations across the world have recorded historical events, progressive ideas, discussions of moral principles, laws, and culturally-rich entertainment in the form of written language. Just as it is advantageous for a person to be able to speak and understand a culture's language and nonverbal cues, it is imperative that every person be able to read and write.

The expansion of an SLP's scope of practice to include literacy intervention is not without controversy. Some professionals feel that literacy should be left to specialists in education. Regardless of this debate, it remains that literacy continues to become an integrated part of the field. This project does not claim whether or not the addition of literacy to an SLP's scope of practice is warranted; rather, having accepted the fact that this expansion has taken place, it explores the numerous neurological connections between music and literacy. Can music be used, both in the classroom and therapy room, as a tool to improve literacy? Dozens of researchers have responded to this question over the years with a resounding, "yes".

More research must be conducted on this topic for therapy methods to be uncovered and refined. However, it also recognizes that in order for the findings of this research to be of any benefit to patients, therapists must be educated on this topic. For this reason, a survey of undergraduate speech-language pathology and audiology students at The University of Akron was conducted. The purpose of this survey was to discover the extent to which aspiring speech

pathologists are aware that musical experiences aid learning and literacy. This project asserts that if students are armed with this knowledge, they will be more prepared to enter clinical practice.

Literature Review

Music and Literacy: An Overview

Does music education matter, or is it only an extracurricular that should be offered when taxpayers can afford it? For the past several decades, researchers have uncovered neurological connections between music and literacy. Once these connections are understood, it becomes clear that there are many ways in which music can benefit a student that is struggling with acquiring literacy skills. This finding should be of interest to both educators and speech pathologists whose patients struggle with literacy. Music is directly connected to literacy in that it strengthens areas of the brain that deal with attention and recall of memory, and is highly correlated with measures of phonological and phonemic awareness, all of which are specific cognitive skills that are critical to reading and writing (Posner & Patoine, 2010), (Hansen et al., 91), and (Lamb & Gregory, 1993).

Attention and Music

Improving attention positively impacts learning, memory, and cognitive performance. Being able to focus our attention is key to completing any task. Whether the task be something simple, like counting the number of people in a room, or something involved, like solving a physics problem on an exam, our brains send and receive large amounts of information to and from our

senses, all while “communicating” to other areas of the brain. Focusing our attention, especially for long durations of time, takes energy. Reading is no exception. While reading, our brains must decode the symbols seen, coordinate small muscle movements of the eyes, connect past experience to the information being presented, and repeat these actions until the passage is read (McIntire, 2007). For some children, reading simply demands too much of them.

How then can music help students who struggle to focus their attention? For many children, music is intriguing because it has emotional value. Interestingly, the skills crucial to reading, such as decoding and motor coordination, are the same skills that are strengthened during musical experiences. As that child engages with music, be it listening to or playing an instrument, their brains are “rewired”, creating circuits that are efficient for decoding musical symbols and sending information to both the small muscles of the fingers and large muscles of the respiratory system. This rerouting of neural circuitry is referred to as activity-dependent plasticity. Simply put, brain circuits change in response to daily activities (Posner & Patoine, 2010). This principle has been known to the neurological community for quite some time, but new research conducted by The Dana Foundation suggests that activity-dependent plasticity is not limited to the special circuits that are created by the new activity. Therefore, engaging with music over time changes more than the special music networks. Connected to these special networks are brain structures related to emotion, motor skills, sensory skills, language, and importantly, attention (Posner & Patoine, 2010). Eventually, repetition of musical activity changes the attention networks themselves.

Activity-dependent plasticity holds true for any daily activity. Learning new tasks, such as riding a bike, throwing a football, or tying a pair of shoes, will cause rerouting of neural circuits. Why is it that music is particularly beneficial for improving attention? In “The Music in Our Minds”, author Norman Weinberger (1998) analyzed brain scans done by researchers and found

that music engages the cerebral cortex in ways that other activities do not. These scans of musicians' brains were taken during their performances, and found that almost the entire cerebral cortex is at work during a musical performance (Weinberger, 1998). Sensory, perceptual, cognitive, linguistic, and muscle coordination systems were all highly activated. It is not that other activities are unable to improve attention, but that music is incredibly engaging, and therefore improves attention at a greater pace.

Other research conducted by Posner (2008) supports the idea that music strengthens attention networks through high engagement of the cerebral cortex. This study takes Weinberger's (1998) analysis a step forward by screening performing arts students' brains during a nonmusical, cognitive challenge. Conducted over a three-year time span, this research aimed to determine whether there were cognitive differences present between students engaged in performing arts (namely theater and music) and those who are not. These differences were uncovered by using functional Magnetic Resonance Imaging (fMRI). Functional Magnetic Resonance Imaging allows researchers to see which parts of the brain are activated and to what extent, as activated areas will consume more oxygen, and the level of oxygen is a measure that is monitored by fMRI.

To begin, students were given The Uses of Objects Task, a task that has been proven, by numerous researchers, to indicate divergent thinking. Students were given the name of an object and listed all the different ways that the object can be used. Researchers compiled lists of potential answers, in which uses were labeled "traditional" or "divergent". For example, if the object given was a chair, a traditional answer would be "used for sitting". Other answers, such as "used as prop in a play", would be considered more divergent. While students' responses were being recorded, researchers utilized the fMRI, giving clear insight as to which parts of the brain were being activated by the two groups of students. For all students, the medial fusiform gyri were active

(Posner, 2008). However, for performing arts students only, the left inferior and superior frontal gyri were active as well (Posner, 2008). This finding is key for three reasons. First, these scans demonstrate again that music training engages more areas of the brain even during nonmusical tasks, and supports the argument that music is one of the best activities for increasing attention. Secondly, when the left inferior and superior frontal gyri were activated, students gave more creative answers. The ability to problem solve using “out of the box” thinking when faced with new tasks is arguably important for decoding unfamiliar vocabulary. Researchers noted that this finding needs to be looked into more closely. Finally, and perhaps most importantly, both the left inferior and superior frontal gyri are linguistic areas of the brain that are important for retrieving linguistic symbols from working memory, which refers to the attention aspects of short-term memory (Cowan, 2008).

Memory and Music

Both the concept of activity-dependent plasticity transfer and the finding that high engagement of the brain quickly alters attention networks make it clear that music training can aid the acquisition of literacy skills. However, being literate is also affected by the student’s ability to recall information from their memory. As mentioned before, music training directly strengthens the left inferior and superior frontal gyri, which deal with working memory. Working memory is defined as, “memory as it is used to plan and carry out behavior” (Cowan, 2008, p.323). For example, if someone is calculating surface area of room, they make measurements of the length and width of the walls. These intermediate measurements are stored in their working memory so that they can quickly retrieve them during their final calculations. Reading, too, depends on working memory. As you read each sentence of this paper, you store certain words and phrases in your working memory so that you can later process and “file” them away in your long-term memory.

Long-term memory is defined as, “a vast store of knowledge and a record of prior events” (Cowan, 2008, p. 323). While working memory is important for the time that we are actually reading, long-term memory is important for connecting the newly read information to previous experiences. These experiences serve as retrieval cues so that the new information can be brought to mind more easily. Long-term memory is also important for sight identification, or recognizing and decoding the words that we see (Mizener, 2008). It follows that music, though it improves a student’s working memory, needs to also improve a student’s long-term memory in order to aid literacy.

In “The Effect of Familiar Melody on Initial Learning and Long-term Memory for Unconnected Text” (Rainey & Larsen, 2002) researchers conducted an experiment that looked at the benefits of music as a mnemonic device, a system that improves memorization. This experiment tested whether or not adult students would learn unconnected text (lists of items or names that have no meaningful connections) in less time if the text was learned as song lyrics. Researchers also tested the student’s long-term memory of that unconnected text, and hypothesized that students who learned the information as a song would have better retention.

The unconnected text that was used was a series of pro baseball players’ names from Cleveland. Students were permitted to see the list of names for the first two recordings, in which the names of the players were either spoken or sung to the tune of “Pop Goes the Weasel”. Then, the students would listen to the recordings repeatedly. The experimenter made note of how many times the recordings were played. Once the student felt that they had learned the list, they would turn to the experimenter and attempt to list the names. If an error was made, the student would continue to listen to the recording and try again. One week later, the same students learned the names of players from Boston. However, those who had listened to the spoken recordings the

previous week switched to the sung recordings, and students who had first listened to the sung recordings switched to the spoken recordings. Surprisingly, students who learned either set of names through the spoken recordings learned just as fast as students who learned through the musical recordings (Rainey & Larsen, 2002). This finding cast doubt on the ability of music to positively impact memory. However, at the conclusion of the experiment, students were asked to recite the lists they had learned. Long-term recall was significantly better for students who learned the list of names through music, and it took much less time for those students to relearn the list (Rainey & Larsen, 2002). Researchers suggest that this is because music is a mechanism that serves as a cue for information retrieval. In part, the melody and lyrics are stored together. Familiar tunes allow easy storage and access to unfamiliar text.

Taking this research a step further, it is important to note that the connections between music and long-term memory run deeper than the relationship discussed in Rainey and Larsen's (2002) study. Other researchers note that long-term memory can be categorized into two broad groups- declarative or procedural memory (Hansen et al., 91). Declarative memory refers to facts, like names, addresses, and details about past events. Procedural memory, on the other hand, refers to memory that sequences how to do certain tasks, different ways to do that same task, etc. (Hansen et al., 91). The differences between the two impact learning in significant ways. For example, declarative memory allows a student to play one song, and only that song, correctly. Procedural memory, on the other hand, allows that student to apply the concepts learned in one song to other songs, so that the student can truly begin to make music. Reading, like music, is only mastered when the procedures are mastered. What, then, makes music so beneficial for literacy in this regard? When music parameters like listening for rhythm, pitch, and appropriate tempo are understood, they are stored in long-term procedural memory (Hansen et al., 91). These same

parameters are important for speech and literacy, and when a music student has mastered them inside the confines of the practice room, they can then use that knowledge to help them master literacy inside the confines of the classroom. Music, it seems, impacts recall in ways that are as valuable as its impacts on attention.

Music, Phonological Awareness, and Phonemic Awareness

In order to tie music with literacy, it is important to define other skills related to literacy; two other skills required for literacy include phonological and phonemic awareness. Phonological awareness is acquired when children understand that words are made of different sound units and can be broken down into syllables (Mizener, 2008). Similarly, phonemic awareness is the ability to discriminate between phonemes, or sound units in a language that are distinct from each other and carry meaning (Mizener, 2008). In other words, when a child recognizes that the word “might” has three sounds, /m/, /aɪ/, and /t/, and that those same sounds can be rearranged and used in other words, like “time”, a child is ready to truly read.

The third and final way that music possibly prepares a child to learn to read is by strengthening that child’s ability to perceive and discriminate pitch. How is pitch related to phonological and phonemic awareness? In “The Relationship Between Music and Reading in Beginner Readers,” authors Susannah Lamb and Andrew Gregory (1993) studied eighteen children (with an average age of 5;1) and tested them in three areas: musical ability, phonemic awareness, and reading. Musical ability was tested by playing sets various chords (some single notes, two notes, and three notes). After hearing two chords, children were asked whether they sounded the same or different. Some sets varied by perfect fourths and major thirds. Other sets were the same. Phonemic awareness was tested by using rhyming words. Children were asked if the words began or ended with the same sound. Finally, reading was tested through several tasks in which students

had to identify words, match letters to sounds, point to identical words, and finally, read fifteen words commonly used.

After all the data was analyzed, Lamb and Gregory (1993) found that students who performed well on the pitch discrimination testing did best on the reading tests and were also able to complete the phonemic awareness tests without much error (Lamb & Gregory, 1993). Music trains the ear to listen carefully to pitch, and over time, perfects a child's ability to discriminate. Phoneme discrimination, just like musical pitch, relies on the listener's ear to discriminate between the frequencies of speech sounds by picking up on auditory cues such as formants and fricative noise. The researchers noted that it is sensible to reason that this ability could be related to discriminating pitch in music (Lamb & Gregory, 1993).

Recent studies also support Lamb and Gregory's findings. In "Training in the Arts, Reading, and Brain-Based Imaging" (2008), the results of a three year longitudinal study were summarized. In this study, forty-nine children aged 7;0 to 12;0, reported the number of hours they received fine arts training (dance, music, and theater), both in and outside school environments. Then, students underwent a series of standardized reading tests throughout the three years to determine the extent to which they were phonologically and phonemically aware. Researchers analyzed the data and calculated correlation coefficients. Within year one of the study alone, children who reported training received, on average, ten points more on the phonological awareness tests than children who did not report training (Wadell, 2008). However, this difference decreased the second year and interestingly, did not exist the third year. Despite this unexpected trend, students who received more fine arts training still showed more improvement in reading fluency when the entire three years were analyzed and charted as a whole (Wadell, 2008). It is also worth noting that when each type of arts training was studied independently, music had the highest

correlation to improvement of reading skills (Wadell, 2008). To further study this finding, researchers used Diffusor Tensor Imaging (DTI) and found the corpus callosum correlation. Pathways that connect the temporal lobes of the brain are important for auditory and music perception (Wadell, 2008). Researchers measured axonal diffusion, and discovered that more diffusion, which could possibly be explained by increased music training, was an indication of a stronger reader with higher sense of phonological awareness.

While the findings regarding music, pitch discrimination, phonemic awareness, and axonal diffusion are all exciting, it must be noted that both Wadell's (2008) research and Lamb and Gregory's (1993) research report only correlation, not causation. In other words, while the existence of a relationship between music and phonological/phonemic awareness has been proven, more research is needed to prove that music training directly causes an increase in these skills. The discussions surrounding pitch discrimination and axonal diffusion serve well as possible neurological explanations for the existence of the relationship, but these explanations must be proven in research to have further merit.

Concluding Thoughts

In conclusion, music training improves attention and recall of memory, two skills that are undeniably linked to literacy. Music is also correlated with phonological and phonemic awareness. For these reasons, it seems that music instruction could become an effective and intriguing approach to helping students who struggle with literacy. In order for this to happen, research that looks at music inside of the therapy room should be conducted, pinpointing exactly how music can be used as a therapy tool. In addition, both current speech pathologists and students of speech pathology would need to educate themselves on such findings, ready to use music as an approach to help their students.

Methods

The researchers decided to determine the extent to which first-year graduate Speech-Language Pathology students at The University of Akron understood the research findings. Taking that a step further, the researchers also decided to gauge the students' willingness to incorporate music into therapy for literacy. Both these goals were accomplished through the use of a survey that was created by the researchers.

The survey was conducted on January 31st, 2017. Students enrolled in the graduate-level literacy course were asked to sign an informed consent form. There were twenty-eight participants, and the survey was designed to take approximately fifteen minutes to complete. The survey was divided into two sections- "Background Questions" and "Literacy-Based Questions". The project

was mixed methods, with some questions being likert scale and others being qualitative short-answer prompts.

“Background Questions” focused on the participant’s history in regards to both music and literacy. Students were asked to rate their appreciation for music and specify any musical training, including the type and duration of that training. In addition, students were asked to rate their literacy skills and indicate the age they learned to read, who taught them to read, etc. The purpose of this section was to capture the participant’s personal dealings with both music and literacy so that when the data was analyzed, it was possible to examine whether or not the participant’s history correlated with their understanding of the similarities between music and literacy.

“Literacy-Based Questions”, by contrast, examined the extent to which participants were familiar with the facts and findings on music and literacy. Questions varied in their focus. Some were focused on literacy alone, some were focused on music alone, and some tied the two disciplines together. A series of statements about these areas were made, and students were asked to indicate the degree to which they agreed or disagreed with that statement. Another section of the survey asked participants to give their opinions about whether or not music could help speech clients with specific disorders (ex. phonological disorder) and explain their answer. Finally, participants were asked if they would be willing to incorporate music into therapy.

Once the surveys were completed, the data was entered into spreadsheets and analyzed. Qualitative answers were coded by comparing the participants’ answers and identifying common themes. Key words, phrases, and tones were noted and assigned a corresponding number so that the data could be analyzed and the most common themes could be determined. In contrast, likert scale questions were analyzed to determine the most frequent response in addition to the average

response. After determining the results, the researchers focused on the most interesting findings and created charts and tables to highlight the key points.

Results

Twenty-eight students participated in the study, with twenty-seven being female and one being male. Of these students, the average age was 23.6, with all participants being between twenty and forty years old. It should be noted that two participants chose not to list their ages.

Question 1: “Rate your appreciation for music; explain why you circled the number you did.”

The first question asked the participants to rate their appreciation for music on a scale of 1 to 10, with 1 indicating a low appreciation and 10 indicating a high appreciation. The average and most frequent answer was 8. From this, we can conclude that most of the participants value music very highly. The next part of this question asked the participants to explain their ratings. After comparing all participants’ answers, the researchers established themes and common patterns, assigning numbers to each theme. The answers varied greatly, so twelve keywords were identified

to capture all the participants' opinions and intentions. A code of 1 indicates that the student's answer wrote that they "enjoyed" or "liked" music. A code of 2 represents "feeling, relaxing, and being emotionally helped" while listening to music, 3 represents "admiration" for music, and 4 means that the students indicated an appreciation but do not analyze the different aspects of music, which they felt was a key part of music appreciation. A code of 5 was assigned to answers that admitted having little to no musical background or knowledge; 6 represents the phrase "central to life", and 7 indicates that the students did have a background in music. A code of 8 means that the students wrote that music helps them express themselves, a code of 9 means that the students wrote that they appreciate all aspects of music. A code of 10 represents listening to music everyday, 11 represents a feeling of worship while listening to music, and 12 represents music being a hobby. The most common answer was 1, with eleven of twenty-eight students reporting that they enjoy music. Nine responses were coded with 2. One response was given a 3, two responses were given a 4, four responses were given a 5, five responses were given a 6, three responses were given a 7, two responses were given an 8, four responses were given a 9, two response were given a 10, two responses were given an 11, and one response was given a 12. **Question 2: "How would YOU define 'music appreciation'?"**

Expanding on this thought, the following question asked the students to create a definition for "music appreciation". The following themes were coded: 1 represents "valuing and seeing benefits in music", 2 represents "appreciating all aspects of music", 3 represents "understanding music", 4 represents "experiencing emotion while listening to music", 5 represents "feeling that music is personally important", 6 represents no response, and 7 represents "having an enjoyment or love for music". The most common answer was 2, with ten of twenty-eight participants indicating that "music appreciation" is defined by appreciating all aspects of music". Some students

elaborated on this definition further, indicating that a knowledge of different composers, genres, etc. is key to music appreciation. The rest of the results are as follows: four responses received a 1, four responses received a 3, one response received a 4, three responses received a 5, three responses received a 6, and eight responses received a 7.

Question 3: “Have you ever learned to sing or play an instrument?”

This question looked at the participants’ musical background. Responses were coded as follows: 1 represents no previous instruction in singing or playing an instrument, 2 represents instruction in singing, 3 represents instruction in playing the violin, 4 represents instruction in playing the flute, 5 represents instruction in playing the piano, 6 represents instruction in another instrument not previously listed. The most frequent responses were 2 and 5, with eleven students reporting a background in either singing or playing the piano. Seven responses received a 1, eight responses received a 3, five responses received a 4, and eight responses received a 6.

Question 4: “Have you ever participated in a school-related music ensemble? If so, at what age did you participate in that ensemble?”

To find out more about the participants’ musical backgrounds, the next question looked specifically at their experiences with music in the school. Responses were coded as follows: 1 represents being a part of choir for four or more years, 2 represents being a part of choir for under four years, 3 represents participating in orchestra, 4 represents participating in band, and 5 represents no experience. Though splitting choir participating at four years may seem arbitrary, it was done to differentiate between students who sang in a choir for middle or high school only and students who sang in a choir for a longer time span (ex. elementary school through high school). The most frequent response was 1, with eight students reporting choir participation for four or more years. Eight responses were coded with a 2, seven responses were coded with a three, six

responses were coded with a 4, and four responses were coded with a 5. The age of participation was also asked. The four students who did not participate in music received “not applicable”, fifteen students reported music experience in music school only, and nine students reported music experience for at least the entire duration of high school; some of these students participated in school-related music for more than four years.

Question 5: “At what age did you begin to learn to read?”

Once data was collected on the participants’ music backgrounds, the survey shifted focus and inquired about the participants’ academic backgrounds in regards to literacy. Though the question asked for the participants’ specific ages, many responded by using a grade level instead of an age. The researchers were hesitant to assume that an answer of “Kindergarten” meant five years old, though children traditionally enter Kindergarten at the age five. For this reason, answers that used a numerical age were coded separate from answers that used a grade level. Codes are as follows: 1 represents an age of two or three, 2 represents an age of four, 3 represents an age of five, 4 represents an age of six or seven, 5 represents a grade level of Kindergarten, 6 represents a grade level other than Kindergarten, and 7 represents an answer of “unsure” or no response. The most common answer was 3, as seven students reported learning to read at the age five. Three responses received a 1, five responses received a 2, three responses received a 4, five responses received a 5, two responses received a 6, and three responses received a 7.

Question 6: “Who taught you to read?”

For this question, participants were asked to list who first taught them to read. The data was coded with 1 representing parents, 2 representing teachers, 3 representing “other”, and 4 representing “unsure” or no response. The most common answer was 1; twenty-five participants

reported that their parents taught them to read. Fifteen responses received a 2, three responses received a 3, and two responses received a 4.

Question 7: “As a child, did you find learning to read to be particularly challenging? If so, describe the obstacles you faced and how you overcame them.”

This question looked at whether or not the participants found learning to read challenging as a child. A code of 1 was assigned to answers of “no challenges”, a code of 2 was assigned to answers of “yes, sounding out words was challenging”, and a code of 3 was assigned to answers of “yes, writing was challenging”. Responses that reported challenges were split into two categories because writing is strongly tied to reading and decoding words, but still different. An overwhelming majority of the participants reported experiencing no challenges, with twenty-three answers receiving a 1. In comparison, only three responses received a 2, and two responses received a 3.

Question 8: “Rate your literacy skills as a college student.”

This question asked participants to rate their literacy skills as a college student on a scale of 1 to 10, with 1 indicating that their literacy skills were below average, and 10 indicating that their literacy skills are above average. The most frequent rating was 8, with eight students rating their skills as an 8. Three students rated their skills as a 4, one student rated their skills as a 6, five students rated their skills as a 7, and three students rated their skills as a 9. An average rating of 6.57 was calculated.

Question 9: “Explain why you circled the answer that you did.”

To collect qualitative data on the participants’ literacy skills in college, this question asked for an explanation of the previous rating. Codes were assigned as follows: 1 represents a feeling of being an average reader, 2 represents a feeling of being an above average, quick reader, 3

represents feeling experiencing comprehension and processing difficulties, and 4 represents experiencing vocabulary difficulties. A code of 5 was assigned to answers that specifically said that textbooks are more difficulty to understand than “everyday” books. Answers that noted that it is easy to understand material were coded with a 6, and answers that reported an extensive vocabulary were coded with a 7. The most frequent answer was 3, as thirteen students expressed that they experience difficulties with comprehension. Four responses received a 1, six responses received a 2, three responses received a 4, four responses received a 6, and three responses received a 7.

Likert Scale Questions

For the next section of the survey, students were asked to rate the extent to which they agreed with a series of statements. Most of these statements looked at the connections between music and literacy. For each statement, students could rate whether or not they agree by circling one number on a scale of 1 to 5, where 1 indicated that they “strongly disagree”, 2 indicated that they “disagree”, 3 indicated that they were “unsure”, 4 indicated that they “agree”, and five indicated that they “strongly disagreed”.

- “Music and phonemic awareness are correlated.”: The most frequent rating was 4, with fourteen of the twenty-eight participants circling 4. Ten participants circled 3, three circled 5, and one participant did not respond. The average rating was 3.7.
- “Music has emotional value.”: The most frequent rating was 5, with twenty-four of the twenty-eight participants circling 5. The remaining four participants circled 4; the average rating was 4.86.

- “Acquiring literacy is a relatively easy cognitive task.”: The most frequent rating was 2, with twenty of the twenty-eight participants circling 2. Three circled 3, four rated 4, and one participant did not respond. The average rating was 2.4.
- “Both music and literacy impact brain networks.”: The most frequent rating was 5, with eighteen of the twenty-eight participants circling 5. Ten participants circled 4, and the average rating was 4.6.
- “Attention networks in the brain are important, but cannot be strengthened.”: The most frequent rating was 2, with seventeen of the twenty-eight participants circling 2. Ten circled 1, and one circled 3. The average rating was 1.7.
- “Reading music is much like reading words.”: The most frequent rating was 3, with eleven of the twenty-eight participants circling 3. One student circled 1, five circled 2, eight circled 4, and three circled 5. The average rating was 3.3.

Question 10: “Could music integration in therapy help a child with a phonological disorder? Please explain.”

For this question, participants were asked to give their opinions on whether or not music integration in therapy could help a child with a phonological disorder. To ensure that the explanations that participants provided were preserved, the answers were coded according to the following: 1 represents that participants answered yes because the rhythm of music will help with language patterns and rules, 2 represents that participants answered yes because children are more attentive to prolonged sounds/rhythms, 3 represents that participants answer yes for another reason, 5 represents that participants answered possibly, 6 represents that participants answered that they were unsure, and 7 represents no response. The most frequent answer was 1, with nine participants citing the relationship between musical rhythm and rhythm in language as a way that

music integration could help with phonological disorders. Four answers received a 2, three received a 3, seven received a 4, one received a 5, three received a 6, and one received a 7.

Question 11: “Strokes and TBIs can result in a patient being unable to read or recall words. Could music integration in therapy help a patient in this position? Please explain.”

This question is similar to the previous question; instead, it looked at participants opinions on whether or not music integration in therapy could help a client with reading and recalling words. Codes are as follows: 1 represents that participants answered yes because music helps with memories and recall, 2 represents that participants answered yes because music stimulates different areas of the brain, 3 represents that participants answered yes because music evokes relaxing emotions that aid learning, 4 represents that participants answered yes for another reason, and 5 represents that participants were unsure. The most frequent answer was 1, as nine participants reported that music helps with memory and recall of information. Seven responses received a 2, three received a 3, six received a 4, and seven received a 5.

Question 12: “As a clinician, would you be willing to incorporate music into your therapy methods? Explain why or why not.”

The final question of the survey looked at the participants’ willingness to incorporate music into therapy. Answers were highly variable and coded according to the following: 1 represents a willingness because music is calming and a familiar connection, 2 represents a willingness contingent on the patient’s response to music, 3 represents a willingness so long as the therapy methods are considered Evidence-Based Practices, 4 represents a willingness in order to motivate clients, 5 represents a willingness, noting that it is important for Speech-Language Pathologists to be willing to do what is necessary in order to help their clients, 6 represents a willingness contingent on the disorder, 7 represents that the participants were hesitant because they have no

personal music background, 8 represents no response, and 9 represents a willingness for another reason. The most frequent response was 9, with eight students expressing willingness for a reason that was unique and different from all other responses. Six responses received a 1, six responses received a 2, five received a 3, three received a 4, two received a 5, three received a 6, two received a 7, and one received an 8.

Discussion

After the results were analyzed, one overall theme was noted by the researchers: students are somewhat knowledgeable about the neurological connections between music and literacy, and based on the brief survey, seemed to have a basic understanding of the subject. When asked, students are able to think of music in the context of therapy and are capable of some discussion. However, when asked to discuss music integration in therapy or music appreciation in general, students are more inclined to first view music as a calming, engaging sensory activity, rather than a potential therapy aide. This theme is persistent throughout the survey and is worth examining.

To begin, the first two questions of the survey indicated that there is a difference in the way students reflected on the concept of “music appreciation” versus an actual definition of the same term. When asked to rate and explain their appreciation for music, an overwhelming majority of students thought of “music appreciation” as a very personal matter, one tied to emotions and feelings. In fact, the three most common responses were tied to emotion and personal feelings. In comparison, some students thought of this term in a more academic sense, placing emphasis on analyzing the components of music and having a wide knowledge of music. When asked to produce an actual definition of “music appreciation” in the next survey question, the same group of students leaned toward a more academic definition of the term, as eighteen responses had an emotion tied to them and fourteen responses were more formal in nature. Note, however, that definitions tied to emotion still had a slight edge.

The same theme is evident in the last three questions of the survey. When asked if music could help a child with a phonological disorder or a patient with a stroke or TBI, in both questions, around half of the students responded with knowledge about the connections between music and rhythm, music and stimulation of the brain, etc. However, when asked if they would be willing to

incorporate music into therapy in general, a common response was that they would be willing due to the calming, emotional ties that patients often have with music. Another response was that music motivates clients. Though nine commonalities between the students' answers for this question were established, not one cited a neurological connection between music and therapy, even though students were able to cite these connections in previous survey questions. This suggests that perhaps students are knowledgeable about the subject, but do not readily see the practical implications of music integration in therapy.

Outside of that, it should be noted that the likert scale questions given to students, which focused mostly on the connections between music and therapy, produced responses that show evidence of student knowledge of this subject. Statements such as "Both music and literacy impact brain networks," and, "Attention networks in the brain are important, but cannot be strengthened," were rated almost unanimously with the correct answer. Almost every student strongly agreed with the first statement, and almost every student disagreed with the second. Of five statements that examined student understanding of content, only one, "Reading music is much like reading words," produced mixed results.

Limitations

There were a few limitations with how this study was conducted. The first is that some survey questions produced somewhat unclear responses. For example, several preliminary questions asked the students to list the ages at which they participated in various musical activities. Rather than listing a chronological age, such as "seven years old", many students listed grade levels, like "second grade". Though the average age of a second grader can be inferred, it is always best to not assume information when conducting research. For this reason, responses that contained grade levels were coded differently than responses that contained chronological ages, even though

the approximate ages that both groups of students responded with were likely the same. This occurred several times within the study and resulted in different data. In future studies, the researchers would be clear to specify for chronological age, providing examples and noting the difference between age and grade level.

Along those same lines, other questions could have been worded more objectively. For example, question five asked, “At what age did you begin to learn to read?” At first glance this common question seems straightforward. However, it was brought to the researchers’ attention that a definition of “beginning to learn to read” should be provided; do we begin to read when we learn our alphabet, when we associate letters with sounds, or when we sit down with our first academic reader? Clarity helps to ensure reliable and valid data points.

Another limitation of this study was the sample size. Just twenty-eight students participated in the study, and all twenty-eight students were from the same university. In order to obtain more reliable research, it would be necessary to conduct this study at a variety of different universities with a much larger sample size, preferably at universities across the country, so that the sample would be diverse as well.

Future Research

The potential for future research within this project is great, and there are a number of different directions that the research could take. For example, a more detailed analysis of the data could be done, looking at how each students’ background in literacy and music experience impacted both their knowledge of music integration in therapy and their willingness to apply that knowledge in future clinical situations. This sort of analysis could reveal that students with a certain number of prior musical background are more comfortable using music in therapy. Trends

between students who struggled with literacy as a child versus those students who found literacy to be relatively easy might also be established.

The survey could also be expanded to test multiple populations, not just students. It would be interesting to see how knowledgeable seasoned clinicians are about this subject; questions dealing with clinician situations would likely produce very different answers from that of the students. Taking that another step, differences between clinicians who specialize in different areas may exist. For example, speech pathologists working in a medical setting might have more creative ideas about how to use music in therapy for a patient who had a stroke or TBI, whereas speech pathologists in a school setting might have ideas more bent toward treating articulatory and phonological disorders. This survey could also be modified to give to parents or clients. Questions would focus less on the actual knowledge of the neurological connections between music and literacy and more on the patients' perspectives on music integration in therapy. Collecting data on questions such as, "What are your thoughts on music? Would you like to use music in therapy?" could help clinicians see the value in using music during therapy, or possibly deter clinicians based on the findings of that survey.

Finally, the survey itself could be changed regarding the order of the sections. In this survey, the music section preceded the literacy section. In a way, the order of the questions may possibly set up a frame of mind for the participants, predisposing them to have favorable opinions toward music integration. By switching the order of the sections, different results may arise. In order to test this, the same population would need to take both versions of the survey.

Conclusion

In conclusion, music training improves attention and recall of memory, two skills that are undeniably linked to literacy, and therefore could potentially be integrated in therapy; students at The University of Akron demonstrated knowledge about these neurological connections, but many students saw music as more of an emotional experience rather than a therapy tool. For this reason, more research is needed to validate previous findings, using a large and diverse sample of students from schools in different regions of the country. The potential for future research is great in both understanding the neurological connections between music and literacy at a greater depth and for gauging aspiring clinicians' willingness to integrate this research into therapy.

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APPENDIX A

Consent form

The University of Akron

School of Speech-Language Pathology and Audiology

Exploring Student Understanding of the Connections Between Music and Literacy

INFORMED CONSENT

Introduction: This research project aims to determine how much first year graduate speech-language pathology students understand about the neurological connections between music and literacy. You are being invited to participate by completing a survey. This project is being conducted by Heather Owens, an undergraduate student who is studying Speech-Language Pathology and Audiology at The University of Akron, and is under the advisory of Dr. Scott Palasik.

Participants: First-year graduate students enrolled in literacy courses, which are offered in the summer of 2017.

Exclusionary Criteria: There are no exclusionary criteria.

Procedures: This survey will be taken before students have been taught the content of the literacy course, and will include both closed and open-ended questions. These questions will focus on the neurological connections between music and literacy, looking at the ways that students might choose to integrate music with therapy practices. Another section of the survey will be dedicated to the students' musical backgrounds.

This survey should take approximately 15 minutes, depending on the length of answers to the questions. If you choose to participate, please sign this form below and return it to the researcher.

Contact: For any questions or concerns regarding this study, please e-mail Dr. Scott Palasik at spalasuk@uakron.edu or Heather Owens at hro5@zips.uakron.edu

Risks and Benefits: There are no risks expected with this study. Participants can benefit by adding to the research about the ways students understand the correlations between music and literacy.

Payment / Costs: Participation is not required; there will be no financial payment for choosing to complete the survey.

Confidentiality: All personal information, such as your age and gender, will be kept confidential and will not be reported. Only the results of this study will be reported. This consent form will be stored separate from the survey so that your name is not associated with your answers.

Questions: If you have any questions you can contact **Scott Palasik** at 330-972-8185 (spalasuk@uakron.edu). This project has been reviewed and approved by The University of Akron Institutional Review Board. If you have any questions about your rights as a research participant, you may call the IRB at (330) 972-7666.

The University of Akron

School of Speech-Language Pathology and Audiology

Consent: I understand that this study is being conducted for the purpose for an undergraduate research honor's project at The University of Akron. Through this document the researcher has explained how the study will be completed, what I will have to do, and how long my participation is required. I am aware that my full participation in this study is voluntary. I am aware that no compensation will be provided for completing this questionnaire. By signing this form I consent my participation in the study and will answer all questions to the best of my ability.

Participant Signature (Consent to Participate)

Date

Survey

The University of Akron

School of Speech-Language Pathology and Audiology

Exploring Student Understanding of the Connections Between Music and Literacy

General Questions:

Age:

Gender (please circle one): Male Female

Background Questions:

- Rate your appreciation for music. An answer of 1 represents a low appreciation and an answer of 10 represents a high appreciation. Please circle only one number.

1 2 3 4 5 6 7 8 9 10

- Explain why you circled the number that you did.
- How would YOU define “music appreciation”?
- Have you ever learned to sing or play an instrument? If so, please list which instruments and how long you have played them for.
- Have you ever participated in a school-related music ensemble (ex. choir, band, etc.)? If so, specify your role in that ensemble and for how long you participated.
 - If you answered “yes” to the above question, at what age did you participate in that ensemble?

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The University of Akron

School of Speech-Language Pathology and Audiology

- At what age did you begin to learn to read? Who taught you to read (parent, teacher, etc.)?
- As a child, did you find learning to read to be particularly challenging? If so, describe the obstacles you faced and how you overcame them.
- Rate your literacy skills as a college student. An answer of 1 represents below average, and an answer of 5 represents above average. Please circle only one number
1 2 3 4 5 6 7 8 9 10
- o Explain why you circled the answer that you did.

Literacy-Based Questions

- For each of the following statements, please circle only one answer that best represents your opinion

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
-Music and phonemic awareness are correlated.	1	2	3	4	5
-Music has emotional value.	1	2	3	4	5
-Acquiring literacy is a relatively easy cognitive task.	1	2	3	4	5
-Both music and literacy impact brain networks.	1	2	3	4	5
-Attention networks in the brain are important, but cannot be strengthened.	1	2	3	4	5
-Reading music is much like reading words.	1	2	3	4	5

**The
University
of Akron**

School of Speech-Language Pathology and Audiology

- **Could music integration in therapy help a child with a phonological disorder? Please explain.**

- **Strokes and TBIs can result in a patient being unable to read or recall words. Could music integration in therapy help a patient in this position? Please explain.**

- **As a clinician, would you be willing to incorporate music into your therapy methods? Explain why or why not.**