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## The Effect of Music Therapy Services on the FIM Scores of Patients with Aphasia in Neurorehabilitation

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THE EFFECT OF MUSIC THERAPY SERVICES ON THE FIM  
SCORES OF PATIENTS WITH APHASIA IN NEUROREHABILITATION

By

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*I would not be here without the unconditional love and support from my mom and grandma  
Leslie Bash and Michelle Criner*

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## **ABSTRACT**

Neurologic Music Therapy is a type of music therapy based in neuroscience research and is utilized in neurorehabilitation settings. The purpose of this retrospective study was to investigate the effect of music therapy services on Functional Independence Measure scores on patients with aphasia secondary to a stroke in a neurorehabilitation setting. Participants ( $N = 90$ ) were adults 18 – 81 years old who were previous patients at a southeastern rehabilitation hospital between the years of 2016 and 2017. Participants were cross matched into music groups and non-music groups based on age, gender, and if music therapy services were received and t-tests were calculated for comprehension, expression, and social interaction Functional Independence Measure score changes , although the means for the music group were higher on all measure than were. Overall results indicated no significant differences between the music and non-music groups on any of the FIM score changes. Findings suggested that music therapy may contribute to and benefit patients with aphasia in a rehabilitation setting and is a unique contribution to the interdisciplinary team Limitations are discussed.

# CHAPTER 1

## INTRODUCTION

Neurologic Music Therapy (NMT) is increasingly integrated into neurorehabilitation settings due to advances in research. When looking specifically at language rehabilitation, research has shown a strong connection between speech and music when pertaining to strengthening the respiratory system, improving articulation, reducing fluency issues, and bypassing damaged neural connections within the brain (Thaut, 2005). While the role that music therapy plays within speech and language rehabilitation is not fully understood, the development of instruments such as the fMRI have increased our understanding of the effect that music has on all parts of the brain. Current research suggests that music and singing are able to bypass damaged neural pathways that occur in speech and language disorders. (Thaut, 2005). Further research confirmed these findings with extensive imaging data. One magnetoencephalographic study showed that musical syntactic processes occur in the same location where language is processed. This led researchers to believe that existing music therapy protocols could contribute to speech and language rehabilitation, especially in people affected by aphasia (Hartley, Turry & Preeti, 2010). These protocols have been studied and implemented by neurologic music therapists working in medical and neurorehabilitation settings.

It is important that music therapists utilize these protocols in a way that is consistent with the patient's rehabilitative goals. These goals are often determined by speech language pathologists or therapists using assessment tools such as the Functional Independence Measure (FIM). Utilizing music therapy services in conjunction with speech therapy can lead to improvement of not only spontaneous speech but motor planning as well (Raglio et al., 2016). Current research has given insight to future researchers about the effects of music therapy not



only on speech and language rehabilitation, but rehabilitation populations in general. As a result, it is important that music therapists collaborate with neurorehabilitation specialists to close this research gap.

### **Operational Definitions**

One type of neurorehabilitation assessment tool was examined for the purpose of this study: The Functional Independence Measure (FIM). This assessment is a standardized tool used throughout the United States by medical and neurorehabilitation facilities. For the purpose of this study, categories and definitions of the FIM instrument were adapted from a literature review by Glenny and Stolee (2009) and a professional blog post from Marconi (2012). These include the following:

*Functional Independence Measure:* An assessment with eighteen categories of activities of daily living on a seven-point ordinal scale designed to measure physical and cognitive disability and focuses on burden of care. Scoring of the Functional Independence Measure can range from 18-126 points and determines a baseline for each patient when they enter and leave a rehabilitation facility. This creates a standardized measurement tool that could be administered by clinicians and non-clinicians to assess patients in all age groups with a wide variety of diagnoses.

*Comprehension FIM:* The comprehension category utilizes a seven-point ordinal scale to assess the patients' understanding of either auditory or visual communication. For example, written language comprehension would be examined under this category. The test administrator would give the patient a written passage and rate the patient's ability to understand the material using a Likert-type scale. Scores at the bottom of the scale (1) indicate greater assistance is required to process written information.

*Expression FIM:* The expression category utilizes a seven-point ordinal scale to assess the patient's ability to vocally or non-vocally express language. For example, spoken or use of gestures or sign language. The test administrator would use spoken language or gestures and rate the patient's ability to understand the language using a Likert-type scale. Scores at the bottom of the scale (1) indicate greater assistance is required to process spoken information.

*Social Interaction FIM:* The social interaction category utilizes a seven-point ordinal scale to assess skills that are related to participating within therapeutic and social situations. For example, how one deals with one's own needs together with the needs of others. The test administrator would observe the patient's abilities to interact with staff or other patient's and rate the patient's social abilities using a Likert-type scale. Scores at the bottom of the scale (1) indicate greater prompting is required to interact socially.

### **Purpose**

The purpose of this study was to investigate the effect of music therapy services on speech goals in patients with aphasia secondary to a stroke in a neurorehabilitation setting as measured by Functional Independence Measure scores.

### **Research Questions**

1. Do Music Therapy services affect the comprehension FIM scores of patients with aphasia in a neurorehabilitation setting?
2. Do Music Therapy services affect the expression FIM scores of patients with aphasia in a neurorehabilitation setting?
3. Do Music Therapy affect social interaction FIM scores of patients with aphasia in a neurorehabilitation setting

## **CHAPTER 2**

### **REVIEW OF LITERATURE**

#### **What is a Stroke?**

According to the Centers for Disease Control and Prevention, more than 795,000 people in the United States have a cerebral vascular accident or stroke each year (Stroke facts, 2017). Due to the number of people it affects, stroke is the leading cause of long-term disability and costs the United States an estimated \$34 billion per year. (Stroke facts, 2017). A stroke occurs when the blood supply to part of the brain is blocked long enough for a blood vessel to burst and brain cells begin to die (Stroke, 2019). Multiple factors can cause a stroke including chronic high blood pressure, age, and underlying neurologic disorders. There are three different types of strokes that can occur: Ischemic, Hemorrhagic, and Transient Ischemic Attack (TIA). Ischemic strokes are due to blood vessels in the brain clotting from a disruption in the blood supply and account for 87% of all strokes. Hemorrhagic strokes occur when compromised blood vessels rupture with the most common cause being uncontrolled high blood pressure (Types of stroke, 2019). A transient ischemic attack has similar symptoms to an active stroke, but they typically last only a few minutes and do not cause permanent damage. This type of stroke acts as a warning for a second, more aggressive stroke (Transient ischemic attack, 2019). Depending on the severity of the stroke, it can take anywhere from 3 months to several years to recover fully, if at all. After the first three to six months of recovery, the brains plasticity starts to slow down and it becomes more difficult for the brain to make new neural connections.

Complications of a stroke may include fatigue, pain or numbness in affected side, paralysis, vision problems, memory problems, or could lead to other diagnoses (The days and months after a stroke, 2019). Not all complications of a stroke are permanent, however some of

the symptoms will never fade and will lead to a permanent diagnosis. For example, if paralysis or hypertension becomes permanent following a stroke, then it will become a permanent diagnosis. Other diagnoses that are caused from a stroke are dysphagia, dysarthria, apraxia, and aphasia.

Aggressive inpatient rehabilitation is recommended starting one to two weeks post stroke (Stroke recovery timeline, 2019). Factors that can contribute to the length of time to recover from a stroke are age, severity of stroke, location of the stroke, frequency of therapies and types of therapies necessary. Therefore, it is necessary that people who experience a stroke seek immediate aggressive rehabilitation and engage as much of the brain as possible.

After a person is hospitalized for a stroke, they will typically transfer to an inpatient step-down facility for rehabilitation. Strokes can affect a person's cognitive, sensorimotor, or language abilities, depending on the type of stroke a person has incurred. Various rehabilitative treatments are available after a stroke including physical therapy, occupational therapy, speech therapy, and art or music therapy. Each of these therapies aids in the rehabilitation process and addresses all areas of the brain separately, however music therapy is able to address multiple areas of the brain at the same time because it is processed in multiple areas simultaneously. After about 2-6 weeks of participating in an inpatient program, a person will then be discharged to return home and start outpatient therapies either in home or at a local clinic. Furthermore, in some communities, stroke survivors are able to interact with people in similar situations and work on increasing their communications skills as a community and in a community setting.

### **What is Aphasia?**

When a stroke affects the language center, it can result in a communication disorder known as aphasia. Aphasia is defined as “an impairment of language, affecting the production or comprehension of speech and the ability to read or write” (Aphasia Definitions, n.d). Roughly

25-40% or 198,750-318,000 of stroke survivors acquire aphasia, and these numbers make aphasia more common than Parkinson's Disease and Cerebral Palsy (Aphasia Definitions, n.d). A stroke is the most common cause of aphasia each year next to brain tumors and acquired traumatic brain injuries. While aphasia does not decrease a person's intelligence, it may decrease their expressive and receptive language skills. This makes basic communication of wants and needs difficult for someone with aphasia.

There are two main types of aphasia: expressive and receptive. Expressive aphasia, or Broca's aphasia occurs when a person is able to comprehend aural dictation but is unable to word find and produce words or phrases themselves and receptive aphasia, or Wernicke's aphasia, which occurs when someone is able to produce language freely but is unable to fully comprehend aural or written language (Baker & Tamplin, 2019). Other types of aphasia include but are not limited to non-fluent aphasia, fluent aphasia, and global aphasia. These are subcategories of aphasia. Speech therapy and music therapy are therapies that can directly address speech and language domains. Some goals for someone with aphasia include returning to pre-stroke life, increase functional communication skills, increased social interaction, and increase coping skills (Palmer, Witts & Chater, 2018). Speech therapists provide multiple interventions that help with articulation, word finding, comprehension, reading, writing, and intelligibility. While traditional therapies such as speech are helpful to the patient, adding music therapy has neurological benefits that traditional therapies cannot surpass.

### **Music Therapy and Aphasia**

The American Music Therapy Association defines music therapy as "the clinical and evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional..." (AMTA, 2019). Music therapy is an

adaptive therapy that can be used in many domains including motor, cognitive, and speech and language. The auditory system is equipped to recognize auditory signals with speed and precision making music a good medium for rehabilitation (Thaut, 2013). Likewise, music is a multimodal stimulus, activating multiple areas of the brain during music activities (Leonardi et al., 2018). For example, research suggests that singing can recruit multiple areas of the brain that overlap with those involved in the production of speech. Music is also intrinsically motivating and has a wide range of interventions, so it is important that it be included in interdisciplinary neuro-rehabilitation programs.

Neurologic Music Therapy (NMT) has fixed interventions that address all domains in neurorehabilitation including sensorimotor, languages and cognition. Michael Thaut defines Neurologic Music Therapy as a research-based system of 20 standardized clinical techniques for sensorimotor training, speech and language training, and cognitive training (Thaut, 2014) This type of music therapy is specific to neurorehabilitation as it addresses common goals found in a neurologic population. Each intervention has been researched to evaluate the neurologic connection in the brain while the intervention is demonstrated. In recent years, this has proven to be more effective with the development of fMRI and other research technologies. Imaging research has shown that “Cortical changes in brain damaged patients during music interventions indicate activation of bilateral networks across the frontal, temporal and parietal lobes, cerebellum and limbic areas, stimulating cognitive, motor, and emotional processes” (Magee, 2019). One study concluded that “structural integration involved the rapid and selective activation of items in associative networks and that language and music share the neural resources that provide this activation to the networks where domain-specific representation resides” (Patel, 2012). The shared functionality between music, speech, and the brain aids in the

recovery of aphasia when music therapy interventions are involved. Furthermore, there are two shared functions of music and speech that are important: (1) music and language share aural and production features and (2) music and language have shared resources when they are used for functional communication (Thaut, 2005). A study completed by Sangeetha Nayak et. al. (2000) compared the difference in Functional Independence Measures on social interaction between music therapy and non-music therapy groups in an inpatient rehabilitation hospital. The researchers found that people who received music therapy had greater increases in mood and social interaction than people who did not receive music therapy while staying in the hospital. This suggests that music therapy is not only beneficial with functional communication and social interaction, but with other categories such as memory recall.

Music benefits people with aphasia because it is able to support memory and retrieval of information such as overlearned songs (King, 2007). For instance, using over learned songs takes the stress off of the brain when remembering lyrics to songs and becomes an innate characteristic during the music activity. Examples of over learned songs include *Happy Birthday*, *This Little Light of Mine*, and songs from a person's early to mid-twenties. Using over learned songs does not only increase memory recall but promotes cognitive recovery and can increase mood (Raglio et al., 2017). One other case study investigated how music therapy affects the therapeutic process of people with aphasia. The researchers concluded that there were significant improvements in phonation and prosody after music therapy interventions (Magee, Brumfitt, Freeman & Davidson, 2006). Other studies suggest that the reason music increases memory and speech is because it is processed bihemispherically meaning that it is processed on both sides of the brain. Previous literature suggested that music was only processed in the right or left hemisphere, but with the creation of fMRI's it is known now that music is processed in both

hemispheres simultaneously (Cohen & Ford, 1995). Neuroscientists are better able to understand how music affects the brain which helps them to investigate deeper into music therapy. Other findings concluded that music therapy is beneficial for someone with aphasia because it increases breath support, the use of articulators, vocal range and intensity, and intelligibility (Tamplin & Grocke, 2008). It is because of this preliminary research that neurologic music therapy can provide standardized protocols that are used within a rehabilitation setting. These protocols address all of the above goals for people with aphasia.

### **Neurologic Music Therapy Interventions**

There are five Neurologic Music Therapy interventions that can be used to address aphasia: Vocal Intonation Therapy, Oral Motor and Respiratory Exercises, Musical Speech Stimulation, Melodic Intonation Therapy, and Therapeutic Singing. These interventions individually address communication, language comprehension, and respiratory support. Multiple interventions can be used during a single session to address multiple goals. All of these techniques can be used with individuals, groups, or as co-treats with speech therapy.

#### **Vocal Intonation Therapy**

Michael Thaut defines Vocal Intonation Therapy (VIT) as “the use of vocal exercises to train, maintain, develop, and rehabilitate aspects of voice control due to structural, neurological, physiological, psychological, or functional abnormalities of the voice apparatus” (2014). VIT addresses aspects of the voice that include pitch, inflection, breath control, timbre, dynamics, and articulation. Soo Ji Kim and Uiri Jo (2013) studied an intervention similar to VIT with six stroke patients. Patients completed 10 sessions with vocal warm-ups, respiratory training, vocalizations, and melodic chants. When comparing pre and posttest results the researchers found that there were significant improvements in articulation and breath coordination (Kim & Jo, 2013).



Overall, vocal intonation therapy intervention works well with patient's with aphasia because it increases prosody of speech. It also prevents speech from becoming monotone in conversation. Conversational prosody is something that can be re-learned through repeated exercise (Tomaino, 2012). One study found that people with neurologic impairments showed an increase in vocal intensity, word finding, and speaking fundamentals when participants received sung instruction rather than traditional spoken instruction during sessions (Cohen, 1992). VIT cues are given with a piano to the patient in order to match pitches, increase phrase lengths, and increase vocal range. Repetitions provide the brain an opportunity to create new neural connections so that the patient can transfer music techniques to routine speech.

### **Oral Motor and Respiratory Exercises**

Oral Motor and Respiratory Exercises (OMREX) provide patients an opportunity to increase breath support, swallowing, and/or practice phonation and physical movements of the lips, tongue, and jaw to produce speech sounds. This technique uses instruments to increase respiratory control and laryngeal coordination in order to ensure that airway does not become blocked during normal respiration. It is recommended that live music be used because it can be adjusted to the pace of someone breathing (Kim, 2010). Exercises for this technique include breathing exercises, oral motor exercise, and vocalizations. Instruments that can be used for this technique are kazoo's, recorder's, whistle's, party horns, and harmonicas. Each of these instruments provides various levels of resistance to ensure that breath support increases. It is important to address all of the aforementioned goals for people with aphasia in order to lay a foundation for the formation of words, phrases, and using proper breath support.

## **Therapeutic Singing**

Therapeutic Singing is an intervention that utilizes all the other Neurologic Music Therapy speech interventions simultaneously. This “catch-all” technique gives the music therapist a way to evaluate someone’s overall progress. It also helps the patient to practice what they have been working on during their therapy sessions. One study by Tamplin et al. (2013) investigated if people with aphasia participating in a choir had a positive effect on communication. Results concluded that people with aphasia who were involved with a choir after 20 weeks reported increases in confidence, peer support, enhanced mood, increased motivation, and positive changes to communication. There are clear benefits to singing for people with speech and communication disorders. In a summary of existing literature on singing protocol in music therapy, several protocols suggested that, “Integrating rhythm into the singings practice was a primary component...” (Tamplin & Baker, p. 121). It was also suggested that the songs are most beneficial when they are patient preferred and have positive and uplifting lyrics to improve speech function. Another study found that singing directly affected the left temporal lobe and allowed patients to use the music lexicon to produce functional speech and that music therapy can activate functioning parts of the brain in someone who is aphasic that traditional speech therapy cannot access (Akanuma et. al, 2014). Yet another study that used fMRI to examine the brain found that singing is able to slow down articulation of words to increase accuracy and also lengthens syllables so the brain can distinguish individual phonemes that together formulate a word or phrase. Furthermore, “chunking” or “phrasing” of words in a song illuminates the right hemisphere because memory is involved while singing (Gottfried, Marchina, & Norton, 2008). A music therapist can use guitar, piano, or voice to accompany people with this intervention. Live music is encouraged so that the therapist is able to control phrasing, tempo, and repetitions to

best meet the needs of the patient. The therapist may also supplement this intervention with percussion instruments that the patients have to shake. Using the motor movement helps with word finding and prosody because the patient is keeping their own tempo to match the therapist.

### **Musical Speech Stimulation**

Musical Speech Stimulation (MUSTIM) is, “the use of musical materials such as songs, rhymes, chants, and musical phrases simulating prosodic speech gestures to stimulate non-proposition speech” (Neurologic Music Therapy Techniques and Definitions, p. 3). This fill in the blank style technique typically uses over learned songs so that the brain does not have to focus on lyrics themselves but rather word finding abilities. A study done by Anna Kasdan and Swarthi Kiran (2018) matched 20 persons with aphasia with 20 healthy individuals and looked at lyric/phrase completion with sung, spoken, or melodic tones. Persons with aphasia produced a higher word accuracy when using sung words than using spoken words and the control group scored comparably in the sung and spoken task while scoring worse in the melodic task (Kasdan & Kiran, 2018). There are multiple modalities this intervention is delivered to a person with aphasia. An example of how this technique is used is “You are my \_\_\_\_\_”. In this example the participant will fill in the word “sunshine” while singing and avoid word finding complications. Another example is using an everyday phrase in conjunction with a melody such as “Please wash your \_\_\_\_\_”. This phrase is typically paired with an ascending or descending pattern on the piano. MUSTIM can also be used as a prerequisite for a person to qualify as a candidate for Melodic Intonation Therapy.

### **Melodic Intonation Therapy**

Initially, this intervention was used by Speech Language Pathologists, but has been adopted and adapted by Music Therapists. Originally, Melodic Intonation Therapy (MIT), “was

developed to improve propositional language or the generative and controlled language production that people use in everyday life to express their ideas” (Zumbansen, Peretz, & Hebert, 2014). MIT utilizes a combination of left-hand movement, intoned words, and repetition to teach people with communication disorders functional everyday phrases. An ideal candidate for MIT is someone who has had a stroke, has poor articulation or restricted speech output, has the ability to produce some intelligible words with familiar songs, and has good motivation, emotional stability, and an appropriate attention span (Norton, Zipse, Marchina & Schlaug, 2009). One study on MIT showed that after one session of including MIT in therapy with people with aphasia that there was a significant difference in carry over (Conklyn et. al, 2012). This suggests that using MIT can greatly impact the recovery of someone with aphasia when used at as an early intervention. Unlike other Neurologic Music Therapy interventions, this one requires a specific procedure to complete, therefore it is important that the Music Therapist to perform it on an ideal candidate.

There are five steps to complete one phrase during MIT. First, the therapist introduces the target phrase by showing a visual cue, humming the phrase, then intoning the phrase while tapping the patient’s hand. Next, the therapist and the patient intone the phrase together while the therapist taps the patient’s hand to the beat. Third, the therapist will start by singing with the patient, but then fade out to see if the patient is able to finish the sung phrase. Then, the therapist models the sung phrase while tapping and the patient immediately repeats the phrase independently in a spoken manner. Finally, the therapist asks the question “*What did you say?*” in an intoned format to which the patient answers with the spoken phrase (Sparks, Helm, & Albert, 1974). While this procedure has changed slightly from Speech Language Pathologists, it still includes the same general steps with varying phrases and melodies. There are no instruments

that are used during this intervention. The therapist can sometimes use a metronome while modeling the intervention, however it should be faded when the therapist fades their phrasing.

MIT can be imperative for people with aphasia because it increases functional communication so that people can communicate their wants and needs to everyone in their lives. Many studies have shown that MIT is appropriate for people with aphasia. One study applied MIT to WH-questions (*who, what, when, where, why*) in a multiple baseline design. Results showed that there were limited gains in WH-questions due to the sample in the study, however there was a positive effect on articulatory accuracy while using general language (Mauszycki, Nessler, & Wambaugh, 2016). However, another study found that over 25 sessions of MIT, a person with aphasia experienced a decrease in aphasia severity characterized by average phrase length, functional communication, and repetition. Caregivers, clinicians, and the spouse of persons with aphasia reported that the participant increased the use of appropriate phrases and word finding skills (Morrow-Odom & Swann, 2013). Both studies revealed positive outcomes when using MIT, however further studies with larger sample sizes would be beneficial to the literature.

### **Purpose of Study**

Though there is some research on music therapy interventions with individuals with aphasia, more research is needed to better understand the impact that music therapy procedures have on expression and receptive speech goals for peoples with aphasia. The purpose of this study was to investigate the effect of music therapy services on speech goals in patients with aphasia secondary to a stroke in a neurorehabilitation setting as measured by Functional Independence Measure scores.

## **CHAPTER 3**

### **METHODS**

#### **Participants and Setting**

The participants ( $N = 90$ ) for this study were adults ages 18 - 81, who had been patients at a Rehabilitation Hospital in the Southeast region of the United States. The hospital provided de-identified patient medical records and goal summaries in order for the researcher to conduct the study. Inclusion criteria for participation in this study were as follows: (1) the patient's medical record must be coded for both a cerebral vascular accident and aphasia, (2) the patient must have been admitted to and discharged from the rehabilitation hospital during the years 2016 and 2017, (3) patients must have been between the ages of 18 and 81, and (4) patients must have had initial and final Functional Independence Measure (FIM) scores in the categories of expression, comprehension, and social interaction within their records. Patients were excluded if they did not meet age requirements, they did not have a matched gender and age pairing, if they were not medically coded for both aphasia and stroke, and if they were not patients from the years 2016 and 2017.

#### **Materials**

The Functional Independence Measure (FIM), a standardized measurement tool that could be administered by clinicians and non-clinicians to assess patients in all age groups with a wide variety of diagnoses. The FIM is an assessment with eighteen categories of activities of daily living on a seven-point ordinal scale designed to measure physical and cognitive disability and focuses on burden of care. Scoring of the Functional Independence Measure can range from 18-126 points and determines a baseline for each patient when they enter and leave a rehabilitation facility. a standardized measurement tool that could be administered by clinicians and non-clinicians to

assess patients in all age groups with a wide variety of diagnoses. Each category is graded 1 – 7 and the scores are used to create goals in each category. The total score determines how functional and independent the patient is. From this number, goals are created by the corresponding therapies and then the test is given periodically throughout the patient's stay. For the purpose of this study the initial and final scores were compared.

### **Design and Procedure**

A retrospective review of medical records was approved by the researcher's academic institution's Institutional Review Board (see Appendix A). This review explored the differences in Functional Independence Measure score changes between a crossmatched group of patients who received music therapy services (n= 45) and a group of patients who did not receive music therapy services (n=45). The non-music group was cross matched with the music group by the researcher. Non-music therapy participants were matched with music therapy participants according to age and gender. If there were multiple participants for one age or gender, then the qualifying participants were put into a number generator (Random.org) and chosen at random. After participants were assigned to a group, pre and post treatment FIM scores in the categories of expression, comprehension, and social interaction were pulled from de-identified patient records. The researcher then ran a series of independent t-tests on the Functional Independence Measure difference scores for each group in each of the three categories (Expression FIM, Comprehension FIM, and Social Interaction FIM).

## CHAPTER 4

### RESULTS

Raw data were analyzed using VassarStats.net. Three Independent t-tests were conducted: one for each of the Functional Independence Measure categories, including Comprehension, Expression, and Social Interaction. An alpha level of .05 was set *a priori*.

#### Participant Demographics

Participant ( $N = 90$ ) were adults, age ranging 18 – 81,  $M = 66.55$ , who were previous patients at a Southeastern rehabilitation hospital in the United States. Of the participants, fifty (55.55%) were of the participants were female, and forty (44.44%) were male with an average length of stay of 17.48 days.

#### Overall Results

Results across the Functional Independence Measure categories of comprehension, expression, and social interaction between music and non-music groups were calculated. Results indicated no significant differences were found between groups.

#### Data Analysis per Research Question

##### Comprehension

Overall results between the music group ( $M = 1.07$ ,  $SD = .827$ ) and non-music groups ( $M = .83$ ,  $SD = 1.12$ ) were calculated. Results indicated no significant difference,  $t(90) = 1.16$ ,  $p < .05$ . See table 1 for all means, standard deviation, and  $t$  test results.

##### Expression

Overall results between the music group ( $M = 1.02$ ,  $SD = .774$ ) and non-music groups ( $M = .822$ ,  $SD = 1.14$ ) were calculated. Results indicated no significant difference,  $t(90) = .96$ ,  $p < .05$ . See table 1 for all means, standard deviation, and  $t$  test results.



## **Social Interaction**

Overall results between the music group ( $M = 1.44$ ,  $SD = 1.43$ ) and non-music groups ( $M = 1.31$ ,  $SD = 1.21$ ) were calculated. Results indicated no significant difference,  $t(90) = .47$ ,  $p < .05$ . See table 1 for all means, standard deviation, and  $t$  test results.

Table 1

*Comparing Music and Non-Music Groups T-tests*

Variable		Group		<i>t</i> -value	<i>p</i> -value
		Music (n=45)	Non-Music (n=45)		
Comprehension	M	1.06	.822	1.16	.248
	SD	(.83)	(1.12)		
Expression	M	1.02	.822	.96	.339
	SD	(.77)	(1.1)		
Social Interaction	M	1.44	1.3	.47	.639
	SD	(1.4)	(1.2)		

## CHAPTER 5

### DISCUSSION

The purpose of this study was to investigate the effect of music therapy services on speech goals in patients with aphasia secondary to a stroke in a neurorehabilitation setting as measured by Functional Independence Measure scores. These changes were investigated, and it was found that there were no significant differences in the changes of scores in the categories of expression, comprehension, and social interaction between the group. While there were no statistical differences found, it was found that the group that received music therapy had a higher mean in expression ( $M=1.02$ ), comprehension ( $M = 1.06$ ) and social interaction ( $M = 1.44$ ). This suggests that music therapy may provide some benefits overall to patients with aphasia.

Results from the present study suggest that music therapy is important when considering treatment in a rehabilitation setting. When considering a full interdisciplinary team, music therapy provides unique benefits because of the connection music has with the brain. Traditional therapies cannot help the brain to reach these new neural connections (Thaut, 2010). This information suggests the music is able to aid in a quicker recovery time because it is able to create connections that traditional therapies would not be able to. Regarding FIM scores, one study showed that overall, people with aphasia had lower cognitive and motor scores at admission and discharge versus people who did not have aphasia after a stroke. The results concluded that people with aphasia had a higher risk of poor social interaction outcomes without therapies (Gialanella, Bertolinelli, Lissi & Prometti, 2011). This preliminary literature can serve as a starting point for future researchers to incorporate different therapies for people with aphasia. The current literature is limited when comparing studies that are retrospective and use the Functional Independence Measure.

## **Limitations**

There were several limitations in this study. First, because this was an observational study, there was little control of the de-identified medical records. Doing a retrospective study does not give the researcher control and also the ability for follow up is lost as well (What are the pros and cons of a retrospective study, 2011). Second, only the years of 2016 and 2017 were available to the researcher, making the sample size smaller, and less likely to review a wide variety of patients and their changes. Another limitation is there was no control for the number of strokes that the patient had previous to being admitted to the inpatient rehabilitation setting. Previous medical history was not investigated due to the format of the de-identified medical records. Furthermore, the type of music therapy interventions was unable to be tracked because the current system did not allow that information to become discrete de-identified data. Without the music therapy intervention used, it was difficult for the researcher to pinpoint which speech goals were being targeted during the session times. Finally, the researcher was unable to control the number of sessions each patient received with music therapy and unable to know if the music therapy sessions directly addressed speech goals every session.

## **Future Research**

Because this study was conducted from an observational prospective, future research should be conducted with current patients in a rehabilitation setting. The researcher should conduct a study and document the types of interventions used during the patients stay and also which speech goals were addressed during the sessions. The researcher should also document if the session was co-treated with a speech therapist. Future research could investigate other standardized tests within speech therapy and within music therapy. For example, such studies

could use a standardized music therapy assessment form from one rehabilitation hospital on all patients in order to track progress throughout treatment.

### **Conclusion**

The purpose of this study was to investigate the effect of music therapy services on speech goals in patients with aphasia secondary to a stroke in a neurorehabilitation setting as measured by Functional Independence Measure scores. Results indicated that there were no statistically significant differences in the FIM categories of comprehension, expression, and social interaction, however the means of the all the music groups were higher. While based on an observational perspective, these findings suggest that music therapy provides benefits to the patients with aphasia in a neuro rehabilitation setting. Future research should examine Functional Independence Measure outcomes with actual patients receiving music therapy services compared to patients who did not receive Music Therapy services but had similar speech goals and amounts of related therapies.

## APPENDIX A

### IRB APPROVAL LETTER



Office of the Vice President for Research  
Human Subjects Committee  
Tallahassee, Florida 32306-2742  
(850) 644-8673 · FAX (850) 644-4392

#### APPROVAL MEMORANDUM

Date: 04/01/2019

To: Alexandria Denne [REDACTED]

Address: [REDACTED]

Dept.: MUSIC SCHOOL

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research  
The effect of music therapy services on the FIM scores of patients with aphasia in neurorehabilitation

The application that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and two members of the Human Subjects Committee. Your project is determined to be Expedited per 45 CFR § 46.110(4) and has been approved by an expedited review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 03/26/2020 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is IRB00000446.

Cc: Lori Gooding <lgooding@fsu.edu>, Advisor  
HSC No. 2019.26938

**APPENDIX B**  
**CONSENT FORM**

[REDACTED]

[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

December 12, 2018

Re: Authorization to conduct research at [REDACTED]

Dear members of the Florida State University IRB,

I am pleased to provide authorization and support of [REDACTED] research project, "The effect of music therapy services on the FIM scores of patients with aphasia in neuro rehabilitation" [REDACTED] [REDACTED] will provide [REDACTED] access to de-identified patient information in alignment with IRB approved procedures described in the study protocol. Brooks does not have a local IRB and will accept the FSU IRB oversight of the project. Thank you for your review of this project. I look forward to working with [REDACTED] and the rest of the research team.

Sincerely,

[REDACTED]  
[REDACTED]

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Master of Music in Music Therapy  
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