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The Melody of Memory: Exploring the Effect of Music Therapy on Language and Memory Recall in Adults with Alzheimer's Disease

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THE MELODY OF MEMORY: EXPLORING THE EFFECT OF MUSIC THERAPY ON LANGUAGE AND MEMORY RECALL IN ADULTS WITH ALZHEIMER'S DISEASE

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77 Pages

Background: Music is an important part of life for the lives of many seniors. Prior research has indicated that music is beneficial to adults with Alzheimer's disease.

Purpose: With the intent to advocate for music therapists working in memory care, the purpose of this study was to investigate the effect of music therapy intervention on language and memory in people with Alzheimer's disease. Three research questions were addressed in this study: (1) Of the three conditions (music therapy, recorded music, control), which appear to result the most change in MMSE scores in adults with moderate Alzheimer's disease? What differences are observed after each condition? (2) Does music therapy treatment significantly enhance memory and communication in patients with moderate Alzheimer's disease? (3) What behaviors/responses were observed during each condition? Particularly, facial expressions, body language, communication, episodic memory, singing/humming, physiological responses, and alertness.

Method: Five participants over the age of 65 diagnosed with Alzheimer's disease were recruited for this study, each receiving 3 different conditions once (music therapy, recorded music, and a control [reading a short story]). An adapted Mini Mental-State Examination (MMSE) was administered as a pre-test prior to and a post-test following each condition. Qualitative data was also coded by the researcher after reviewing video recordings.

Results: Music elicited many non-musical responses among participants revealed through qualitative behavioral observations, although no statistical significance was found for quantitative data.

Conclusions: The overarching conclusion of this study is that it is critical for music therapists to remember the individuality of the people in which they support. Music has the potential to be highly effective with adults with Alzheimer's disease, particularly in the areas of communication and memory.

KEYWORDS: music therapy; Alzheimer's disease; dementia; recorded music; reading; memory; recall; language; communication

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CHAPTER I: INTRODUCTION

Alzheimer's disease is an epidemic growing rapidly across the globe, affecting over 50 million adults worldwide (Patterson, 2018). It is the most common form of dementia, affecting an estimated 1 in 9 Americans age 65 and older (Alzheimer's Association, 2022). Additionally, approximately 13.8 million people in the United States will have Alzheimer's disease (Thies & Bleiler, 2013). Prior research has suggested that music and music therapy can elicit communication and responses in patients with Alzheimer's disease.

The purpose of the present study is to investigate the effect of music therapy intervention on language and memory in people with Alzheimer's disease. Music therapy intervention may include therapeutic singing, instrument play, simple song discussion, songwriting, among others. Studying how music therapy affects communication in adults with Alzheimer's disease may be beneficial in further advocating for music therapy services to be provided in nursing homes or hospice care. As the Baby Boomer generation continues to age, more nursing homes and assisted living facilities may have no vacancy. In order to provide the highest quality of care for the aging population, it is important to research beneficial therapies to advocate for the resources needed.

Patel (2008) made significant contributions to research regarding music and the brain, particularly on communication and language. Further research reveals that music therapy significantly improved verbal speech production and fluidity in patients with dementia (Brotons & Koger, 2000). If music enhances speech/language and memory alone, perhaps music could impact both simultaneously through communicating memories. Palisson et al. (2015) found that music can enhance verbal episodic memory for patients with Alzheimer's disease. Their results indicated that the sung texts were better remembered than the spoken text, further supporting the power of music as a mnemonic technique. For many individuals diagnosed with Alzheimer's

disease, delusions can be a difficult symptom for caregivers to see their loved one experience. In one case study, the participant was experiencing a delusion where she thought her husband was an intruder (Baird & Thompson, 2019). The researchers noted that when her husband began to sing a song significant to the couple ("Unchained Melody"), the patient "came back" from her delusion and recognized her spouse.

Music is an important part of life for the lives of many seniors. Interestingly, despite the reported importance of music to seniors, some active music-making services (e.g., community choirs/bands) have decreased (Cohen et al., 2002). The clinical benefits of music are worth investigating in order to advocate in favor of keeping the musical services older adults deserve. Perhaps increasing access to music services applicable to seniors may prevent a degree of cognitive decline associated with aging. In a clinical setting, music therapists are trained to utilize live music chiefly, as they can easily manipulate the tempo, dynamics, lyrics, and other musical qualities in the moment based on their therapeutic judgement and client needs. The musical flexibility of live music has been used in a variety of music therapy interventions, including drum circles. Participating in drum circles appeared to have a significant increase on Mini-Mental State Exam (MMSE) scores in older adults with Alzheimer's disease from pre to post-test (Miyazaki et al., 2020). Music listening is used to "stimulate verbalization, memories, or to encourage relaxation" (Raglio and Oasi, 2015). However, it should be clarified that music listening differs from music therapy when there is the absence of a music therapist. The positive benefits of receptively listening to music should not substitute music therapy. Listening to music does not hold the same intention or expertise as a board-certified music therapist following a therapeutic, evidence-based intervention.

Although there is an abundance of research supporting the effect of music therapy on patients with Alzheimer's disease, much of the literature is becoming dated. More research should continue to be warranted to ensure that these studies are still applicable, utilizing more advanced technology and research. Continued research is needed on subjects that represent all the different stages of dementia, given the varying level of symptoms.

Research Questions

(1) Of the three conditions (music therapy, recorded music, control), which appear to result the most change in MMSE scores in adults with moderate Alzheimer's disease? What differences are observed after each condition?

(2) Does music therapy treatment significantly enhance memory and communication in patients with moderate Alzheimer's disease?

(3) What behaviors/responses were observed during each condition? Particularly, facial expressions, body language, communication, episodic memory, singing/humming, physiological responses, and alertness.

CHAPTER II: LITERATURE REVIEW

Alzheimer's Disease/Dementia Overview

Dementia is a neurocognitive condition that impairs parts of the brain that impact memory loss and other cognitive functioning tasks to a degree that may interfere with a person's daily life (Alzheimer's Association, 2022). Dementia is an umbrella term, as there are several types of dementia: Alzheimer's disease (AD), vascular dementia, Lewy body dementia, Frontotemporal dementia, and mixed dementia. Alzheimer's is the most common cause of dementia, and is a brain disease that causes difficulties with memory, thinking, behavior, as well as functioning in activities of daily living (Alzheimer's Association, 2022). Accounting for 60-80% of dementia diagnoses, Alzheimer's disease is not a normal condition developed by aging, and its symptoms gradually progress over time (Alzheimer's Association, 2022). Research supports that AD is caused by an abnormal buildup of proteins around brain cells, specifically beta-amyloid and tau proteins, and worsens progressively in stages.

There are several stages in which Alzheimer's disease progresses: mild (early-stage), moderate, and severe (late-stage). A person is often diagnosed with Alzheimer's disease in the mild stage; they may visibly appear to be healthy, but may struggle with confusion, poor judgement, repeating questions, misplacing things, among others (National Institute on Aging [NIA], 2017). Symptoms of moderate-stage Alzheimer's disease may include: increased memory loss, difficulty with speech/language/reading/writing, difficulty recognizing family and friends, agitation, and anxiety, among others (NIA, 2017). In the severe stage of AD, it is likely that a patient is bedridden and that their body begins to shut down. People in the severe stage completely depend on caregivers for assistance with activities of daily living. Signs of severe Alzheimer's disease may include: inability to communicate, weight loss, seizures, loss of

bowel/bladder control, and increased sleeping (NIA, 2017). Thus, each stage of AD is typically characterized by the level of impairment of activities of daily living.

People diagnosed with AD require some degree of assistance with activities of daily living (ADL) throughout their lives, as this is a criterion for being diagnosed with AD (Marshall et al., 2012). Each stage of AD (i.e. mild, moderate, severe) is also characterized by ADL impairment. In the mild stage, a person with AD may begin to experience symptoms that slightly interfere with ADLs including, but not limited to: memory loss, taking longer to complete tasks, misplacing things, and poor judgement (NIA, 2017). In the moderate to severe stages of AD, eating, dressing, grooming/bathing, and toileting are impaired and require significant levels of assistance. Along with ADL impairment, there are other symptoms of AD that may be reduced with medication and treatments.

According to the Alzheimer's Association (2022), the most common symptom of Alzheimer's disease is memory loss. The difficulty to remember information may not only disrupt a person's daily life, but may also cause additional symptoms including: anxiety, agitation, confusion, depression, withdrawal, and insomnia, among others (Alzheimer's Association, 2022). Delusions can also be a difficult symptom for caregivers to see their loved one experience. In one case study, the participant was experiencing a delusion where she thought her husband was an intruder (Baird & Thompson, 2019).

There is currently no cure for Alzheimer's disease or other types of dementia, but there are medications and treatments to aid in slowing the speed of which the disease progresses. The U.S. Food and Drug Administration (FDA) recently approved a new drug, Aduhelm, in June 2021. Aduhelm is the first new treatment approved for Alzheimer's disease since 2003 that targets the physiological processes of the disease, specifically, by diminishing beta-amyloid

plaques in the brain (FDA, 2021). Other types of drugs used to treat Alzheimer's disease may include cholinesterase inhibitors, glutamate regulators, or a combination of the two (Alzheimer's Association, 2022).

In addition to prescribed medication, there are other forms of therapies to assist symptoms caused by Alzheimer's disease. Multi-sensory environments (MSE's), also known as "Snoezelen" rooms, are particular environments that may stimulate the visual and auditory senses of a patient with dementia or Alzheimer's disease (Cameron, et al., 2019). These are often private rooms located in nursing homes with colorful lighting, instrumental music, and other sensory activities. Dolls are also used in nursing homes to assist with easing anxiety among residents with dementia, however some critics claim that dolls and stuffed animals may be demeaning to seniors (Gorman, 2016). Additionally, research suggests that animal-assisted activities overall improve dementia symptoms, by decreasing agitation, aggression, and anxiety (Greer et al., 2002). Music has also been shown to have a profound impact on the brain, and may benefit a person diagnosed with dementia or Alzheimer's disease.

Music & The Brain

Music is nearly inescapable in human nature and is an important part of life for many, especially seniors. Over 300 seniors in Canada were surveyed on the significance of music in their lives, and 90% of participants reported they listened to music at least twice a week (Cohen et al., 2002). Interestingly, the researchers found that despite the reported importance of music to seniors, some active music-making services (e.g., community choirs) have decreased. Perhaps increasing access to music services applicable to seniors may prevent a degree of cognitive decline associated with aging.

Prior research has supported different ways in which music affects the brain, particularly memory. Baird & Sampson (2009) studied explicit (semantic) and implicit (procedural) musical memory functions in older adults diagnosed with dementia. While their research for the preservation of explicit musical memory was not significant, they found that implicit musical memory (e.g., the ability to play musical instruments) can be preserved in patients with Alzheimer's disease. This suggests that AD may not affect the regions of the brain associated with implicit musical memory. Musical training, like other kinds of training, is suggested to increase plasticity in the brain (Herholz & Zatorre, 2012). The researchers found that musical training involves several sensory components including: auditory, motor, and visual senses. Thus, since music affects many domains in the brain, musical training and music therapy can be an effective approach for stroke rehabilitation as well, particularly in motor skills recovery (Herholz & Zatorre, 2012).

Although musical memory regions were found to overlap in several places of the brain, the temporal lobes of the brain serve an important role in the preservation of musical memory. Jacobsen and colleagues (2015) studied the brains of both healthy older adults and those with Alzheimer's disease while listening to familiar and unfamiliar songs. Interestingly, the researchers found that the temporal lobes of the brains affected by AD were significantly preserved while listening to music, despite the natural atrophy associated with AD. It is worth nothing that musical long-term memory is preserved in different areas of the brain than long-term memory. The researchers concluded that since the areas of the brain storing musical long-term memories are not typically impaired right away due to Alzheimer's disease, that this is why a person with AD may show evidence of musical long-term memory, such as playing an

instrument. In addition to memory, music overlaps with communication in the brain (Patel, 2008).

Communication/Language

A significant piece of communication is hearing and listening in conversation. Hearing loss and impairment is a natural part of aging, and can impact receptive and expressive communication in older adults. In fact, there are several studies stating that caregivers have noticed impairments in speech perception and communication of their loved one with AD (Burgio et al., 2018; Feast et al., 2016; Savundranayagam et al., 2005). Auditory training may assist in combatting this impairment by enhancing speech processing in older adults (Anderson et al., 2013). The researchers indicated that auditory training, in addition to hearing amplification devices, improved speech clarity. Additionally, Chavin et al. (2021) noted that individuals with mild cognitive impairment and Alzheimer's disease benefit from audiovisual speech cues and supportive sentence context. While these studies were not strictly centered around music, some of the auditory components call for further research on how music may impact one in this regard.

Prior research supports the impact music has on communication, particularly in older adults. In fact, older adults with musical experience have enhanced neural response timing, consistency, and precision (Parbery-Clark et al., 2012). Over time, musicians displayed less decline in speech perception when compared to non-musicians (Merten et al., 2021). These findings imply that musical experience can benefit receptive communication in older adults, specifically hearing precision through background noise. This heightened level of aural awareness may lead to an adult with AD better understanding what is said in a conversation. Research conducted by Dubinsky and colleagues (2019) further supports music's effect on communication on older adults. They found that after 10 weeks of singing in a choir, participants

in the experimental group showed enhancements in the ability to recognize spoken language in background noise, as well as pitch discrimination in older adults with age-related hearing loss.

Anderson and colleagues (2013) found that auditory training changes speech processing in older adults. The researchers indicated that auditory training, in addition to hearing amplification devices, improved speech clarity. Furthermore, individuals with mild cognitive impairment and Alzheimer's disease benefit from audiovisual speech cues (Chauvin et al., 2021). The results support that a patient may display more effective communication through engaging in face-to-face communication with caregivers, loved ones, and healthcare professionals. While this program was not strictly centered around music, some of the auditory components call for further research on how pairing these techniques with music may impact one in this regard.

Patel (2008) discusses the commonalities between music and language: rhythm, melody, syntax, and affect. Music and language have similar rhythm since there are accents on certain words in linguistic speech, and there is a tempo in music. However, rhythm in music has a sustained pulse, whereas rhythm in spoken language is much more fluid when naturally speaking. Patel also references the similarities in syntax, otherwise known as how words/musical notes are arranged. He discusses that music and language have similar syntax since people use words/phrases to form a sentence, and in music notes and phrases are used to compose a piece. Dr. Patel compared the musical circle of fifths and relative keys to the use of combining words into phrases, similar to sentences in language. However, Patel notes that music and language have differences in semantics. This means that music may not be able to explain the "who?" or "why?" that language can.

Memory

There are three main types of memory categories defined by the scientific community: sensory memory, short-term memory, and long-term memory (Camina & Güell, 2017). There are sub-categories within the main types of memory that may be impacted by AD: episodic, semantic, procedural, and working memory (Whitbourne & Whitbourne, 2020). Episodic memory is a type of explicit long-term memory regarding remembering past experiences of significance in a person's life. General knowledge such as grammar, colors, or knowing how to use the phone, is considered semantic memory. Procedural memory is the ability to unconsciously remember how to complete tasks associated with everyday life such as tying shoes or cooking without a recipe. Working memory is remembering information temporarily for only a few seconds. For example, remembering an address or phone number before you write it down is considered working memory (Whitbourne & Whitbourne, 2020).

Just as memory can be evoked by an image or other sense, music can serve as a cue to elicit memories (Belfi et al., 2018). In fact, music that was popular and familiar served as a tool to elicit a wide range of memories from general knowledge to specific events in detail (Janata, 2007). Despite age cohort differences, both young and older adults can demonstrate implicit memory through priming (Halpern & O'Connor, 2000). The researchers played 8 familiar and 8 unfamiliar recorded songs mixed. The participants checked "yes" or "no" when questioned if they have heard the song before. This further supported that tasks involving implicit memory may not be significantly impacted by age (Rybash, 1996).

Jacobsen and colleagues (2015) studied the brains of healthy control subjects versus older adults with Alzheimer's disease. They found that the areas in the brain involving musical memories showed minimal cortical atrophy (loss of brain cells). Researchers studied the effect of

familiar music on memory in contrasting ages, and found that familiar music is associated with remembering details in young adults, and increased positive affect in older adults (Ford et al., 2016; Vanstone, et al., 2012). Even though the younger adults showed higher results in a majority of the categories examined, older adults and adults with AD showed preservation of melody recognition (Vanstone, et al., 2012). Additionally, two patients with probable Alzheimer's disease showed preservation of musical training and memory (Fornazzari et al., 2017). The patients listened to a recording of an unfamiliar musical passage, and were asked to sightread the sheet music on the piano, and learned this over the course of 7 days. Interestingly, both participants were able to play at least the melody line in their right hand, and a simplified bass line in their left hand.

Cognition & Physiological Responses

Bengtsson et al. (2005) studied the impact of long-term piano practicing on white matter development in the brain, and found that a person who has played piano since childhood had a higher white matter plasticity. Furthermore, Herholz & Zatorre (2012) found similar results when studying the effect of music on brain plasticity. Music also has the capability to elicit basic, recognizable emotions (Peretz, 2010). When used in a certain context, music can influence mood, behavior, speech, interaction, and the ability to perform activities of daily living (Chavin, 2002). In older adults, emotions evoked by music are strongly related to memories elicited by music (Salakka et al., 2021). Arroyo-Anlló et al. (2019) studied music and emotion in Alzheimer's disease, specifically, but did not find statistically significant results when studying music and emotion recognition. However, the study showed that "the power of emotional music could enhance the general mental state in a more direct and involuntary neural network, and it could enhance more using music related to the personal experience of the subject" (p. 9).

Music has shown to prompt physiological responses in the body, especially with beat and meter processing (Zhao & Kuhl, 2020). Clair (1996) found that adults with late-stage AD responded more frequently to singing than spoken language and silence. In the study, responses were defined as head turning, eye movement/opening, arm/hand/leg/feet movement, vocalizations, and changes in facial expression. Further research suggests that blood pressure was significantly lower in the treatment group that received music therapy compared to the control group (Takahashi & Matsushita, 2006). Blood pressure increases with aging; however, attending group music therapy weekly may help maintain a healthy blood pressure in older adults. The physiological changes elicited by music is worth noting for the advocacy of music therapy and shows that other healthcare professionals can value the power of music therapy.

Live Versus Recorded Music

Generally, research has supported that listening to music live has a greater impact on people. Swarbrick and colleagues (2019) studied the physiological movements, specifically head movements, of people attending a live music concert in comparison to the recorded album playback from the same artist. They found that the participants that attended the concert live displayed more prominent head movements to the beat of the music. There are several factors that may make live music so desirable: the quality of the music performance/venue, the connection between performer and viewer, and the music appreciation shared between viewers (Thompson, 2007). Researchers have found that there is also a visual component in live performances that may influence mood and elicit emotions (Balteş & Miu, 2014).

Hagerty (2015) studied the use of preferred music as procedural support during assisted bathing for patients with dementia. The participants each received three showers: one with preferred live music, one with preferred recorded music, and one with no music at all. The author

found that preferred live music was generally more effective in reducing behaviors in patients with dementia compared to preferred recorded music and no music at all. The findings highlight the power that live music can have on a person's mood. Additionally, research has supported the notion that live music reduces physiological stress, pain perception, and food intake (Shoda et al., 2016; Cochrane, 2011; Bowden, 2016).

Despite all the positive impacts of music, it is important to clarify that music listening differs from music therapy when there is the absence of a music therapist. Music listening can be used to "stimulate verbalization, memories, or to encourage relaxation" (Raglio & Oasi, 2015, p. 3). However, the positive benefits of receptively listening to music should not substitute music therapy. Listening to music does not hold the same intention or expertise as a board-certified music therapist following a therapeutic, evidence-based intervention. Music therapists are trained to utilize live music chiefly, as they can easily manipulate the tempo, dynamics, lyrics, and other musical qualities in the moment based on their therapeutic judgement and client needs.

Music Therapy

Music therapy is becoming an essential service in many memory care facilities, and has been studied for decades (Brotons et al., 1997). Music therapy is defined as "the clinical and evidence-based use of music intervention to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program" (AMTA, 2005, para. 1). Music therapy utilizes evidence-based treatment strategies to address domains including but not limited to: cognitive, communication, social, emotional, gross motor, and fine motor outcomes. A music therapist may work on cognition through memory, specifically utilizing client-preferred music in interventions to elicit memories. In fact, Ashida

(2000) found that reminiscence-focused music therapy in a small group setting may reduce depressive symptoms in patients with dementia.

Instrument play is a common music therapy treatment strategy worth noting. “Playing a musical instrument has a unique capacity to enable the expression of these preserved forms of memory. In doing so, it can provide access to one’s past and continuing self, and can be considered a form of self-preservation and expression in musicians with dementia” (Baird & Thompson, 2019a, p.138). Although not exclusive to music therapy, participating in drum circles appeared to have a significant increase on Mini-Mental State Exam (MMSE) scores in older adults with AD from pre to post-test (Miyazaki et al., 2020). Additionally, therapeutic singing or singing in a group setting may be a beneficial treatment strategy for older adults with AD. When studying the impact of music on learning and retention, researchers found that singing texts were better remembered by people with AD as opposed to spoken text (Palisson et al., 2015). Similarly, the results from Ratovohery and colleagues (2019) support the positive impact of musical mnemonics on the memory of adults with Alzheimer’s disease. In other words, material is better remembered when it is put to a melodic or rhythmic chant.

Music Therapy & Alzheimer’s disease

Numerous studies have shown the benefits music therapy can provide to patients with Alzheimer’s disease including, but not limited to: increased memory recall/reminiscence, increased communication, decreased anxiety/agitation/depression, and an overall improvement in quality of life (El Haj et al., 2015; Giovagnoli et al., 2018; Ashida, 2000; Solé et al., 2014). Clark (2020) identified the most common intervention categories used by music therapists in dementia care as: facilitated singing, instrument play, receptive music listening, music improvisation, movement to music, music-assisted reminiscing, lyric discussion, music-assisted relaxation,

music & imagery, songwriting, and music combined with other arts. The researcher found that facilitated singing had the highest frequency of utilization among the literature.

Communication

Since communication is salient when caring for a person with dementia, it is important to highlight that music can impact the way in which humans communicate (Jootun & McGee, 2011; Chavin, 2002). Baird & Thompson (2019b) performed a case study on a woman with aphasia and Alzheimer's disease. They found that although there was a deterioration in her expressive language, her music skills (singing and engagement) were preserved. This case study shows how music may be a vital tool in coping with communication symptoms of severe dementia.

Dassa & Amir (2014) further investigated the relationship between music and conversation among residents with mid to late-stage Alzheimer's disease. The researchers found an increase in communication and conversation among people with Alzheimer's disease after singing preferred songs in group music therapy. They highlighted that agitation and aggressive behaviors may arise if a patient cannot effectively communicate their wants and needs to someone. The researchers claim if music can help to increase communication, in theory, this should overall increase a person's quality of life and mood. In addition to increased communication, music therapy may impact the emotional well-being of a person with dementia.

Music therapy interventions and session structure significantly improved verbal speech production and fluidity in patients with dementia (Brotons & Koger, 2000). When working with a client diagnosed with AD, a music therapist may utilize musical conditions to elicit alertness and communication, such as tempo, pitch, dynamics, volume, rhythm, among others (Krøier et al., 2021). They discovered five themes when working with patients with dementia: vitality, disciplined subjectivity, attunement, therapeutic presence, and validation. Music therapists are

completely attuned to a client's nonverbal responses, and are trained to respond as applicable to the situation though music, verbal validation, among others (Krøier et al., 2021).

Memory

There is evidence supporting the positive impact music therapy can have on memory. Prickett & Moor (1991) studied music's effect on memory in patients with probable Alzheimer's disease. They found that the participants recalled the words to songs drastically better than they recalled spoken words or information. The researchers noted that even if the patients did not recall the words of a particular song, most of them sang on syllables, hummed along, or tapped their fingers/toes to the beat. Songs and spoken poems familiar to the participants were chosen for this study. It can be inferred from the results that familiar songs may enhance memory, communication, and engagement for adults diagnosed with AD.

Music was found to be greatly effective at enhancing autobiographical memories in both healthy and neurodivergent older adults (Baird et al., 2020). Although their results showed a decline in music-evoked autobiographical memories, they found that music used as a mnemonic device for memory may vary between people with different types of dementia. Cuddy et al. (2012) found that long-term familiarity for melody and lyrics was preserved across levels of Alzheimer's disease, even in the late-stages of dementia. El Haj et al. (2015) discovered that patients with Alzheimer's disease displayed better memory recall when listening to familiar/preferred music, as opposed to music chosen by the researchers or silence. El Haj et al. (2012) found an increase in positive autobiographical memories, and emotions after being exposed to Vivaldi's "Four Seasons."

Quality of Life

Music can benefit the quality of life for many. In fact, music therapy was ranked the second most commonly reported adjunctive service provided by hospice care companies (Groen, 2007). In addition to communication and memory benefits discussed above, music therapy may increase quality of life, particularly mood. Haneishi (2001) found an increase in the mean mood from pre-test to post-test in adults with Parkinson's disease after music therapy sessions, which may be applicable in other settings as well. There are several domains that may factor into a person's quality of life: physical-motor, cognitive, social, and emotional (Chang, Huang, Lin, & Lin). Group music therapy sessions in particular elicited positive changes on the Emotional Well-being subscale used by researchers (Solé et al., 2014). Specifically, music therapy interventions decreased wandering, crying/shouting, agitation, and other behavioral responses (Wall & Duffy, 2010). While music therapy's effectiveness may be dependent upon the individual, it appears that tactile stimulation paired with instrumental or vocal music may evoke alertness and potentially decrease agitation and anxiety in patients with late-stage Alzheimer's disease (Belgrave, 2009). The results suggest that music therapy intervention paired with other forms of non-verbal communication may make interacting with non-verbal clients feel natural, and assist in building a strong rapport efficiently. Increasing the number of ways in which a music therapist can interact with clients only enhances the individualized and accessible care provided for his or her clients.

Gomez-Romero et al. (2014) performed an article review and found that the results from eleven articles supporting music therapy's positive effect on behaviors, anxiety, and agitation in older adults with dementia. Dahms and colleagues (2021) studied how music therapy and certain music-based interventions affect the behavior of a person diagnosed with dementia. Several

factors were examined through questionnaires taken by the patient's caregiver: disruptive behavior/agitation, depression, and quality of life. The authors found that the results suggest an overall preference during music therapy sessions in combination with technology-based music interventions over the technology-based interventions alone. The results also indicated a significant impact on decreasing agitation of patients over time after participating in music therapy and technology-based music interventions. The researchers' findings highlighted numerous ways that music can be used to contribute to reduction of agitation and depression, as well as increase the overall quality of life for patients with dementia. Thus, music therapy is a powerful service that can be accessible for many.

CHAPTER III: METHOD

Participants

The participants of this study were composed of 5 adults aged 71 to 92 (*M*=81.6; *SD*=8.56) diagnosed with moderate Alzheimer's disease, residing in a local midwestern nursing home. Three of the participants were male and two were female. A sample of convenience was utilized for this study, and the participants were recruited based on referral from the program director of the facility, with consent to volunteer given by each participant and their legal representative. The inclusion criteria to participate in the study involved: adults aged 65 or older, diagnosis of moderate Alzheimer's disease/dementia, and residency at a memory care facility. The Global Deterioration Scale (GDS) was used exclusively as an inclusionary tool to identify and recruit participants for this study. The GDS is a scale used to categorize older adults with dementia by the level of the disease into 3 categories: mild (3-4), moderate (5), and severe (6-7) (Reisburg et al., 1982). The criterion to be eligible for this study was to be categorized as a 5 on the GDS. Moderate dementia as defined by a 5 on the GDS is as follows:

> Patient can no longer survive without some assistance. Patient is unable during interview to recall a major relevant aspect of their current lives, e.g., an address or telephone number of many years, the names of close family members (such as grandchildren), the name of the high school or college from which they graduated. Frequently some disorientation to time (date, day of week, season, etc.) or to place. An educated person may have difficulty counting back from 40 by 4s or from 20 by 2s. Persons at this stage retain knowledge of many major facts regarding themselves and others. They invariably know their own names and generally know their spouses' and children's names. They

> require no assistance with toileting and eating, but may have some difficulty choosing the proper clothing to wear (Reisburg et al., 1982, p. 2).

It should be noted that the activities director of the facility in which research was conducted recruited residents that she thought fit the description of a category 5 on the GDS quoted above.

Instrument

The primary instrument used in this study was the Mini Mental State Examination (MMSE). The MMSE is a tool commonly administered by researchers and healthcare clinicians to test the cognitive functioning among older adults with dementia (Folstein et al., 1975). The full exam takes about fifteen minutes to complete, and is the quickest standardized assessment to measure cognition in older adults. The exam requires no specialized training or equipment and is easy to administer (Lee et al., 2022). The MMSE also measures different domains of cognition, including: orientation, registration, attention, recall, and language. For the purposes of this study, only the recall and language domains were used for the pre-test and post-test assessments. The version of the MMSE adapted by the researcher with the recall and language subsets are shown in Appendix A.

Procedures

The study was conducted by a board-certified music therapist in-person at a local midwestern memory-care facility. The researcher gained approval for this study through the Institutional Review Board (IRB) of the university with which she is affiliated on December 8, 2022. Written consent was obtained from a legal authorized representative of each participant (Appendix B), due to cognitive deficits associated with an Alzheimer's disease diagnosis. Once informed consent was obtained, the researcher utilized the adapted MMSE as a pre-test and post-test, which was distributed prior to and following each condition. All five participants received

each of the 3 treatments in a different order, to rule out the order in which treatments were received as a limitation. The treatments included music therapy, recorded music, and reading. Reading a passage aloud to the participants was chosen as the control, based on prior research supporting positive impacts of reading on cognition in dementia patients (Rentería et al., 2019; Lee et al., 2018).

Music therapy was provided by the researcher, a board-certified music therapist, for approximately 20 minutes. The music therapy session followed the same intervention structure for each of the participants: (1) hello song, (2) movement, (3) song discussion, (4) instrument play, (5) goodbye song, and is outlined in Appendix C. The recorded music treatment included a playlist of songs that were popular during the subjects' youth (Appendix D) played on a Bluetooth speaker, for approximately 20 minutes. While the recorded music was playing, minimal interaction was initiated by the researcher. Questions such as "Have you heard this song before?" or redirectors to outside distractions were the only time that the researcher interjected during the recorded music condition. The control involved the researcher reading 2 short passages for approximately 15-20 minutes, depending upon the attention of the participant. The passages in this study included two short stories applicable for seniors pulled from the book, "100 Uplifting Short Stories for Seniors" (Miller, 2022). One of the stories was about winning the lottery and the other was about endangered species, particularly humpback whales. Like the recorded music condition, minimal interaction was initiated by the researcher during the control. Questions pertaining to the topic of the stories such as "Have you ever played in the lottery before?" or redirectors to outside distractions were the only time that the researcher interjected during the control condition. The five participants received all three different conditions a week apart in a different order, as outlined in Table 1 below.

Table 1

Research Design

Participant:	1	2	3	4	5
Week 1	MT	MT	RM	C	C
Week 2	RM	C	C	MT	RM
Week 3	C	RM	MT	RM	MT

Note. MT = music therapy, RM = recorded music, and C = control (reading)

Materials

Each of the three treatments required different materials. For music therapy, the researcher brought her guitar, a variety of rhythm instruments (including tambourine, maracas, rhythm sticks, and jingle bells), a Bluetooth speaker, and her iPad with the repertoire list and lead sheets in order to facilitate the session. The music therapy session plan for the experiment is shown in Appendix C. For recorded music, the researcher brought a Bluetooth speaker and her phone with a playlist of the songs on the repertoire list, indicated in Appendix D. For reading, the researcher printed two of the short stories included in the book, "100 Uplifting Short Stories for Seniors" (Miller, 2022). The researcher also brought a video recorder and tripod that were used to record participant responses during treatment and reference for accurate data collection.

Data Collection & Analysis

The data collected included the MMSE scores for the recall and language subdomains, in addition to behavioral observations. The researcher received consent to video record the sessions to ensure data collection accuracy by being able to reference client responses and interactions again. The pre-test and post-test MMSE scores were compared to each other, utilizing a paired-samples t-test to test the statistical significance of the data. Additionally, video recordings were reviewed to compile behavioral observations of the participants, as shown in multiple tables in

the results section below. The researcher compiled a handful of behaviors/themes from the literature to consider when reviewing the video footage to code the behaviors (Espinoza, 2020). Conceptual definitions of the behaviors/responses observed are as follows:

Smiling/laughing: Smiling is characterized as a facial expression when the corners of the mouth are moved upward, typically indicating happiness. Laughing is a vocalization often indicating happiness or enjoyment.

Social interaction is a contextual social exchange between two or more people. While verbalizations can be a form of social interaction, non-verbal interactions will be considered as well. Other examples may include eye contact, facial expressions (e.g. smiling, frowning, eye rolling, furrowed brow, grimacing, closed eyes, etc.), body language (e.g. crossed arms, head nodding, fidgeting hands/legs, etc.), and gestures.

Verbal interaction is a specific type of social interaction involving communicating through spoken words.

Singing lyrics will be considered if the participant sings the lyrics along with the song being used during the session for at least one word or short phrase.

Singing without words will be considered if the participant sings along with the song, but the verbalizations are intelligible or on syllables, or if the participant hums the melody along with the song.

Receptive communication is not only hearing and listening to what is being said, but also responding in a way that communicates that one is understanding. For example, the researcher could say “Clap your hands,” and if the participant claps their hands, then they understood what was said. Another example may include if the researcher asks, “What is your

favorite kind of music?" If the participant answers "country music," or another genre of music, then this is evidence that the participant understood what was said.

Reminiscence / episodic memory is a type of "long-term memory that was personally experienced at a particular time or place in the past" (Merriam-Webster, n.d.).

Physical responses entrained to the music is defined as any sort of noticeable response to the music, that can be seen through entraining with the tempo of the music. Examples may include: deep breathing, toe tapping, head nodding, leg patting, or dancing to the beat of the music.

CHAPTER IV: RESULTS

In this chapter, the results of the five participants will be explained in separate sections below as case studies. Pseudonyms will be used in lieu of actual participant names to maintain confidentiality, while still honoring the participants as human beings. Both quantitative (MMSE scores) and qualitative (coded participant responses) will be reported. Once each of the case studies are outlined, a comparison of treatments will be explored. All data were compiled and analyzed by the researcher through review of video recordings of the pre/post tests and the treatment sessions. The current study investigated the effectiveness of music therapy treatment on language and recall in individuals with Alzheimer's disease. A total of five participants were recruited for the study, and received each treatment (MT, RM, or C) in a different order. The results for each case are outlined below under "Participant Case Studies." The research questions for the present study are as follows:

Research Questions

(1) Of the three conditions (music therapy, recorded music, control), which appear to result the most change in MMSE scores in adults with moderate Alzheimer's disease? What differences are observed after each condition?

(2) Does music therapy treatment significantly enhance memory and communication in patients with moderate Alzheimer's disease?

(3) What behaviors/responses were observed during each condition? Particularly, facial expressions, body language, communication, episodic memory, singing/humming, physiological responses, and alertness.

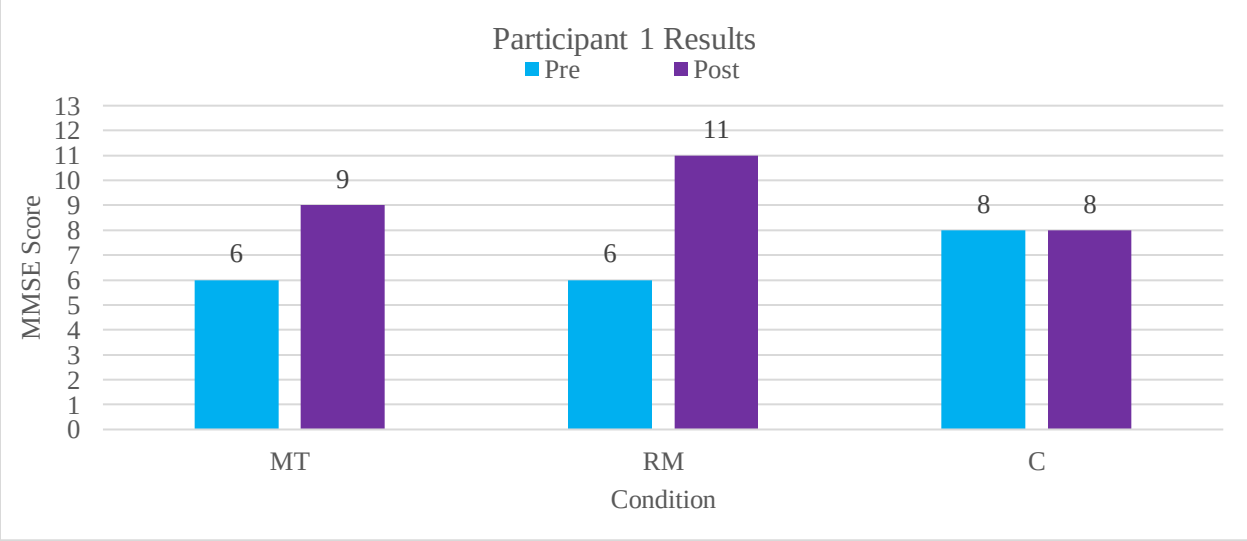
Participant Case Studies

Participant 1: "Bert"

Bert was an 88-year-old white male with Alzheimer's disease that resided at a local midwestern nursing home for approximately three and a half years at the time of the study. He had a musical background and mentioned that he played the French horn in his youth. Additionally, he enjoyed listening to classical music, and his mother was a piano teacher and used to give him lessons. Bert utilized a wheelchair for mobility and wheeled himself around short distances, although staff tended to push him in his wheelchair for longer distances.

Figure 1

Bert's Adapted MMSE Pre-test & Post-test Scores.



Note. The figure includes pre- and post-test MMSE scores for Participant 1, "Bert," for all conditions (MT=music therapy, RM=recorded music, C=control). Pre-test scores are shown in blue, and post-test scores are shown in purple.

Outlined in Figure 1 above are the adapted MMSE pre- and post-test scores for Bert. He received the three treatments one week apart in the following order: music therapy (MT), recorded music (RM), and reading (C) last. For the music therapy treatment, the pre-test adapted MMSE score was six and the post-test was nine out of 13 total. From pre-test to post-test, the

score increased by three points. For recorded music, the pre-test was six and the post-test was 11 out of 13 total, increasing by five points. Finally, for the control, the pre-test and post-test scores were both eight out of 13 possible points. While there is great value in numerical data, it is also critical to consider the qualitative data analyzed during research, as it may provide more detail that can be helpful to further understanding the research. Table 2 below displays an overview of the behavioral observations compiled by the researcher after reviewing video footage.

Table 2

Behavioral Observations for Bert

Behaviors/themes	MT	RM	C
Smiling/laughing	X	X	X
Social interaction	X	X	X
Verbal interaction	X	X	N/O
Singing lyrics	X	X	N/A
Singing without words	X	X	N/A
Receptive communication	X	X	X
Reminiscence / episodic memory	X	N/O	N/O
Physical responses entrained to the music	X	X	N/A

Note. The table shows a list of behaviors/themes observed by the researcher during each of the three treatment conditions (MT = music therapy, RM = recorded music, and C = control). An "X" marks the presence of the theme, while "N/O" means that theme was not observed during the condition. "N/A" means that the behavior was not applicable to the condition.

As shown in Table 2 above, music (either MT or RM) elicited several behaviors and responses. During the music therapy session, it should be noted that Bert attempted to wander toward the door of the activity room about six times. The researcher followed him with her guitar and continued the music therapy session while being mobile. When asked if it was okay if they kept singing together, he responded "yes." He sang along to three of the songs used in the session. After singing the hello song, the therapist asked Bert how he was doing. Interestingly, Bert sang his response "I'm fine" in a melody that he improvised in that moment. During the recorded music session, Bert sang along to the lyrics of six out of the eight total songs on the playlist: "You Are My Sunshine," "Amazing Grace," "Over the Rainbow," "Don't Sit Under the Apple Tree," "Edelweiss," and "Moon River." Additionally, Bert made a clicking sound with his tongue to the rhythm of one of the songs and rocked back and forth in his wheelchair to the beat of the music as well. Table 3 below displays the frequencies of the behavioral observations during each condition.

Table 3

Frequencies of Behavioral Observations for Bert

	MT			RM			C		
Behaviors/themes	I	<50%	>50%	I	<50%	>50%	I	<50%	>50%
Smiling/laughing			X		X		X		
Social interaction			X		X			X	
Verbal interaction			X	X					
Singing lyrics			X			X			
Singing without words	X				X				
Receptive communication									
Reminiscence / episodic memory		X							
Physical responses entrained to the music		X			X				

Note. The table shows a list of behaviors/themes observed by the researcher during each of the three treatment conditions (MT = music therapy, RM = recorded music, and C = control). An "X" marks the presence of the frequency of the behavior, indicated at the top of the column. "I" stands for "intermittent," meaning the behavior was observed a few times. An X under"<50%" indicates that the behavior was observed less than 50% of the time. An X under ">50%" indicates the behavior was observed for 50% or more of the session. The absence of an "X" in the table means that the behavior was not observed or not applicable during the condition.

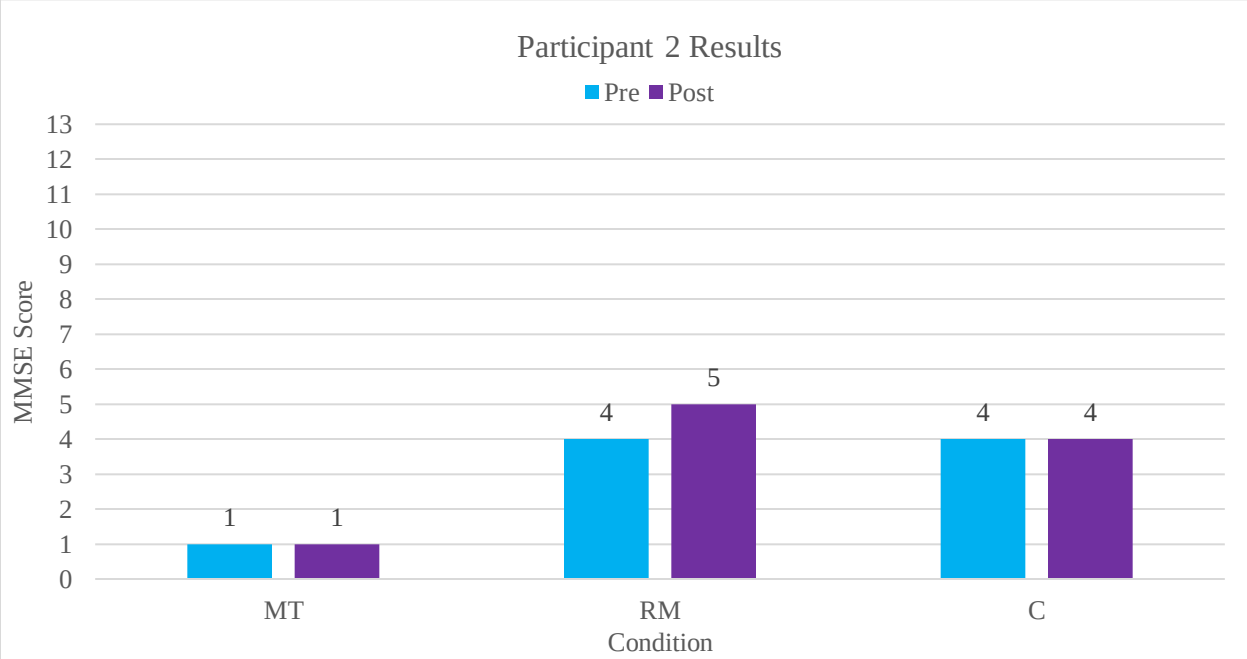
Participant 2: "Susan"

Susan was a 71-year-old white female at the time of the study and resided in the same nursing home for approximately three months. According to the program director of the facility, Susan enjoyed music from the 1950's and 1960's and loved to dance. She was also a realtor for thirty-five years, and her husband was a university professor. Susan ambulated fully on her own and was reported to be very active. However, it should be considered that there could be a co-morbid diagnosis of aphasia. While the researcher did not have access to Susan's medical records and diagnoses, as she communicated using random words or phrases in response.

In Figure 2 below, the adapted MMSE pre- and post-test scores for Susan are presented. She received the three treatments in the following order: music therapy (MT), reading (C), and recorded music (RM) last. For the music therapy treatment, the pre-test score was one and the post-test was one out of 13 total. For the control, the pre-test and the post-test were both four out of 13 total. Finally, for recorded music, the pre-test score was four, and the post-test was five out of 13 possible points. Table 4 below displays an overview of the behavioral observations compiled by the researcher after reviewing video footage from the study.

Figure 2

Susan's Adapted MMSE Pre-test & Post-test Scores.



Note. The figure includes pre- and post-test MMSE scores for Participant 2, "Susan," for all conditions (MT=music therapy, RM=recorded music, C=control). Pre-test scores are shown in blue, and post-test scores are shown in purple.

Table 4

Behavioral Observations for Susan

Behaviors/themes	MT	RM	C
Smiling/laughing	N/O	X	X
Social interaction	X	X	X
Verbal interaction	X	X	X
Singing lyrics	N/O	N/O	N/A
Singing without words	N/O	X	N/A
Receptive communication	X	X	X
Reminiscence / episodic memory	N/O	N/O	N/O
Physical responses entrained to the music	X	X	N/A

Note. The table shows a list of behaviors/themes observed by the researcher during each of the three treatment conditions (MT = music therapy, RM = recorded music, and C = control). An "X" marks the presence of the theme, while "N/O" means that theme was not observed during the condition. "N/A" means that the behavior was not applicable to the condition.

At first glance in Figure 2 and Table 4 above, it appears that recorded music elicited the most behaviors and responses out of Susan. She sang along to "You Are My Sunshine," "Blue Moon," and "Moon River," however, rather than singing the words, she sang the melody on the syllables "doo," and "bum." She also hummed the melody to the song "Edelweiss," and was laughing, dancing, and clapping to "Blue Moon." After reviewing the video footage, Susan appeared to be more alert as well, in comparison to when she fell asleep during the music therapy session. During music therapy, Susan started the session displaying social interaction through eye contact and unintelligible verbalizations. After the researcher began to play the guitar, Susan laid down and physically nested into a comfortable position on the couch in the activity room. Interestingly, the researcher noticed that Susan was still tapping her foot and to the beat of the

music, and her breathing slowly entrained with the music as well. Perhaps Susan was not fully asleep, since it appeared that she was still reacting to the music. When the researcher read the short stories for the control condition, Susan followed along on her copy of the story, and interjected several times, interacting with the researcher through unintelligible verbalizations. Table 5 below displays the frequencies in which the behavioral observations occurred during each condition.

Table 5

Frequencies of Behavioral Observations for Susan

	MT			RM			C		
Behaviors/themes	I	<50%	>50%	I	<50%	>50%	I	<50%	>50%
Smiling/laughing	-	N/O	-			X	X		
Social interaction	X					X		X	
Verbal interaction	X					X		X	
Singing lyrics									
Singing without words				X					
Receptive communication	X				X		X		
Reminiscence / episodic memory									
Physical responses entrained to the music			X			X			

Note. The table shows a list of behaviors/themes observed by the researcher during each of the three treatment conditions (MT = music therapy, RM = recorded music, and C = control). An "X" marks the presence of the frequency of the behavior, indicated at the top of the column. "I" stands for "intermittent," meaning the behavior was observed a few times. An X under"<50%" indicates that the behavior was observed less than 50% of the time. An X under ">50%" indicates the behavior was observed for 50% or more of the session. The absence of an "X" in the table means that the behavior was not observed or not applicable during the condition.

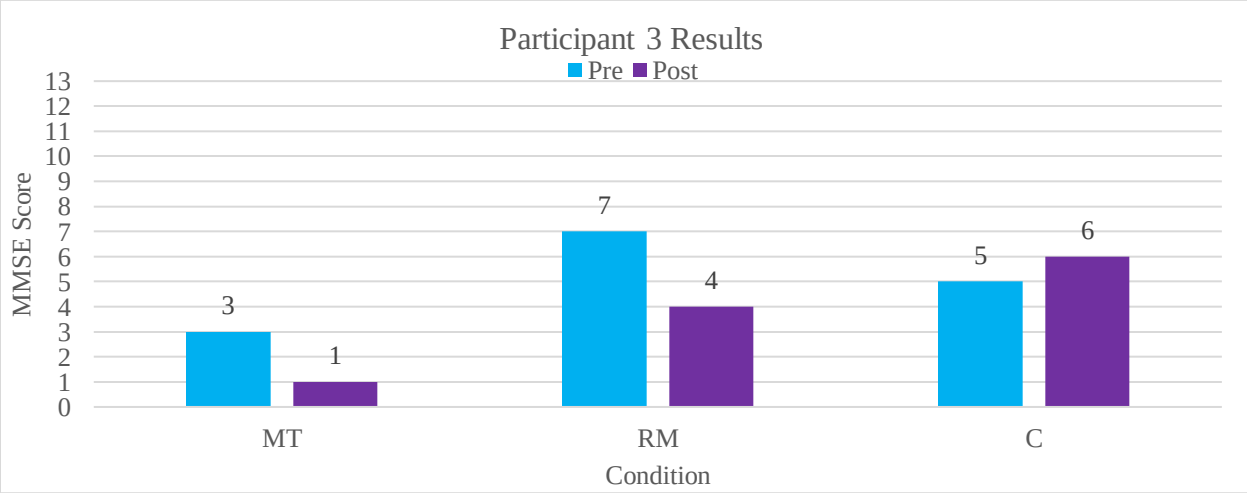
Participant 3: "Jim"

At the time of the study, Jim was an 81-year-old Black male residing at a local nursing home for approximately one year. When asked what kind of music he liked, Jim replied "Oh, anything! [But mostly,] church music and Mississippi bugles!" According to the program director at the facility, Jim loves to talk about the time he lived in Mississippi and all of the good food his mom and his wife used to make for him, like collard greens, sweet potatoes, and pie.

Figure 3 below displays the adapted MMSE pre and post test scores for Jim. He received the three treatments in the following order: recorded music (RM), reading (C), and music therapy (MT) last. For recorded music, the pre-test score was seven and the post-test was four out of 13 total. For the control (reading), the pre-test was five and the post-test was six out of 13 total. Finally, for the music therapy treatment, the pre-test score was three and post-test score was one out of 13 possible points. Additionally, Table 6 below displays the behavioral observations that occurred during each condition as observed by the researcher.

Figure 3

Jim's Adapted MMSE Pre-test & Post-test Scores.



Note. The figure includes pre- and post-test MMSE scores for Participant 3, "Jim," for all conditions (MT=music therapy, RM=recorded music, C=control). Pre-test scores are shown in blue, and post-test scores are shown in purple.

Table 6

Behavioral Observations for Jim

Behaviors/themes	MT	RM	C
Smiling/laughing	X	X	N/O
Social interaction	X	X	X
Verbal interaction	X	X	X
Singing lyrics	N/O	X	N/A
Singing without words	N/O	N/O	N/A
Receptive communication	X	X	N/O
Reminiscence / episodic memory	X	X	N/O
Physical responses entrained to the music	N/O	X	N/A

Note. The table shows a list of behaviors/themes observed by the researcher during each of the three treatment conditions (MT = music therapy, RM = recorded music, and C = control). An "X" marks the presence of the theme, while "N/O" means that theme was not observed during the condition. "N/A" means that the behavior was not applicable to the condition.

During the recorded music condition, Jim mouthed a few lyrics with the song "Amazing Grace," and tapped his toes to the music. Then, he began to talk about how he used to go to church a lot to "worship the Lord back in those days," as he stated. This was the only song on the playlist that elicited a verbal response. During the pre-test before music therapy, Jim began to sing a song that was unrecognizable to the therapist that sounded like a gospel song, after discussing his music preferences. However, during music therapy Jim preferred not to participate in movement, singing, or musical instrument play and said, "I don't do that stuff no more." After the therapist sang "This Land is Your Land," she asked Jim to tell her about his life when he lived in Mississippi. He talked about how he would help his mom and dad on the farm, and reminisced about how much he loved his mother's cooking. For the control, Jim sat and listened

to the researcher read the short stories. He did not appear to be listening to the stories, since he would often interject with a topic unrelated to the stories. Table 7 below displays the frequencies in which the behavioral observations occurred during each condition.

Table 7

Frequencies of Behavioral Observations for Jim

	MT			RM			C		
Behaviors/themes	I	<50%	>50%	I	<50%	>50%	I	<50%	>50%
Smiling/laughing		X			X				
Social interaction			X		X			X	
Verbal interaction			X	X				X	
Singing lyrics				X					
Singing without words									
Receptive communication			X		X				
Reminiscence / episodic memory			X			X			
Physical responses entrained to the music					X				

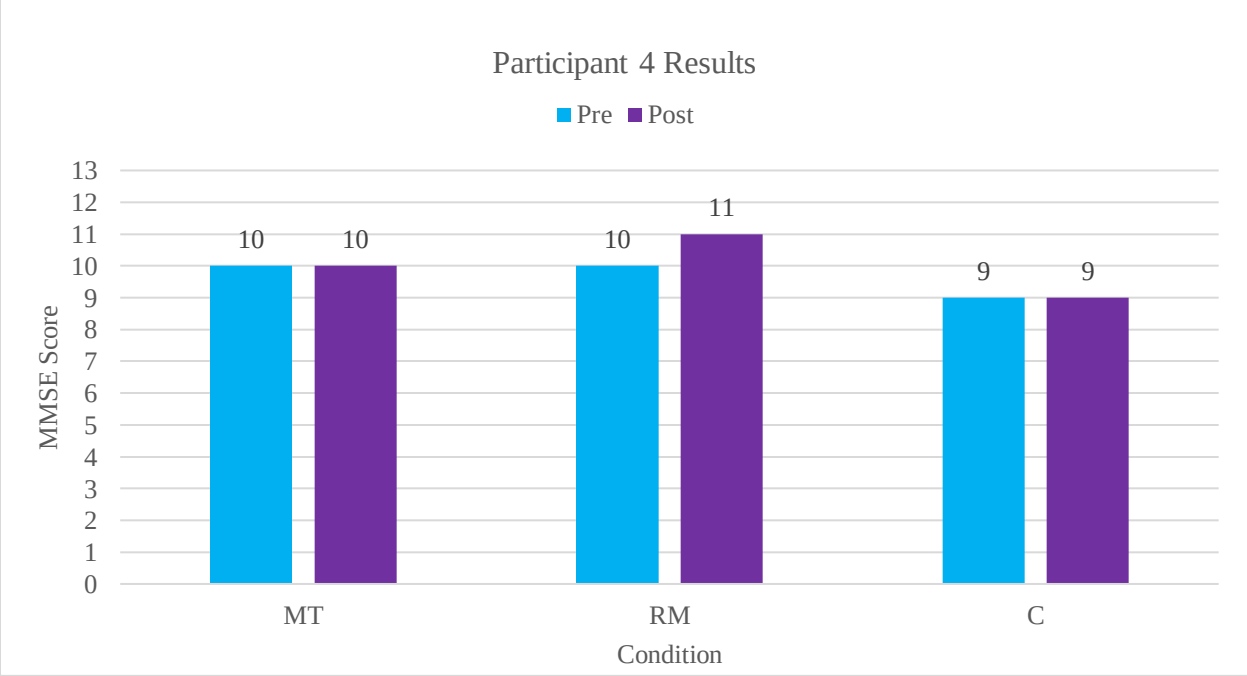
Note. The table shows a list of behaviors/themes observed by the researcher during each of the three treatment conditions (MT = music therapy, RM = recorded music, and C = control). An "X" marks the presence of the frequency of the behavior, indicated at the top of the column. "I" stands for "intermittent," meaning the behavior was observed a few times. An X under"<50%" indicates that the behavior was observed less than 50% of the time. An X under ">50%" indicates the behavior was observed for 50% or more of the session. The absence of an "X" in the table means that the behavior was not observed or not applicable during the condition.

Participant 4: "Betty"

Betty was a 76-year-old white female and had resided in the same nursing home for approximately two and a half years. According to the program director at the facility, Betty enjoyed listening to music from the 1950's and country music. When the researcher asked her what kind of music she liked, she replied "oh, anything!" The researcher prompted Betty to be more specific by naming a few genres. To that, Betty said that she enjoyed church music as her faith was important to her. The program director also mentioned that she enjoyed watching old western movies, and that she enjoyed Johnny Cash music. She also enjoyed a cold Pepsi, puzzles, and watching the Chicago Cubs play baseball.

Figure 4

Betty's Adapted MMSE Pre-test & Post-test Scores.



Note. The figure includes pre- and post-test MMSE scores for Participant 4, "Betty," for all conditions (MT=music therapy, RM=recorded music, C=control). Pre-test scores are shown in blue, and post-test scores are shown in purple.

Outlined in Figure 4 above are the adapted MMSE pre and post test scores for Betty. She received the three treatments in the following order: reading (C), music therapy (MT), and recorded music (RM) last. For the reading control, the pre-test and post-test scores were both nine out of 13 possible points. For the music therapy treatment, both pre- and post-test scores were 10 out of 13 total. Finally, for recorded music, the pre-test score was 10 and the post-test score was 11 out of 13 possible points. Additionally, Table 8 below displays the behavioral observations during each condition, as compiled by the researcher.

Table 8

Behavioral Observations for Betty

Behaviors/themes	MT	RM	C
Smiling/laughing	X	X	N/O
Social interaction	X	X	X
Verbal interaction	X	X	X
Singing lyrics	X	X	N/A
Singing without words	X	X	N/A
Receptive communication	X	X	X
Reminiscence / episodic memory	X	X	N/O
Physical responses entrained to the music	X	X	N/A

Note. The table shows a list of behaviors/themes observed by the researcher during each of the three treatment conditions (MT = music therapy, RM = recorded music, and C = control). An "X" marks the presence of the theme, while "N/O" means that theme was not observed during the condition. "N/A" means that the behavior was not applicable to the condition.

Table 8 above shows the behaviors/themes observed during each condition. During the control condition, Betty quietly followed along on her copy of the short story, and made small verbal remarks like "wow," after she found something interesting. Prior to beginning music therapy, Betty hugged the researcher and said, "I am so happy you are here!" When music therapy started, Betty sang along to every song utilized during the session, even though the "hello song" included lyrics adapted by the researcher. If Betty did not know the words to something, she would hum the melody. After the "hello song," Betty smiled at the researcher and said, "that's nice!" She sang all of the words and played the tambourine to "Take Me Out to the Ballgame," and even sang the lyrics "Cubbies" instead of "home team," unprompted. She indicated that her husband was a huge Chicago Cubs fan, and that she liked them because of him. During "Happy Trails," she sang all of the lyrics and swayed her body side to side to the beat of the music. For recorded music, Betty sang along to all ten of the songs on the playlist. She also sang the lyrics of "You Are My Sunshine" and "Let Me Call You Sweetheart," during the instrumental sections of the song. Even if she did not remember the lyrics to a part of the music, Betty hummed along. Other physiological responses to music observed included: toe taps, leg pats, and swaying side to side. Table 9 below displays the frequencies in which the behavioral observations occurred during each condition.

Table 9

Frequencies of Behavioral Observations for Betty

	MT			RM			C		
Behaviors/themes	I	<50%	>50%	I	<50%	>50%	I	<50%	>50%
Smiling/laughing			X			X			
Social interaction			X			X	X		
Verbal interaction			X		X		X		
Singing lyrics			X			X			
Singing without words			X			X			
Receptive communication			X			X			
Reminiscence / episodic memory			X		X		X		
Physical responses entrained to the music			X			X			

Note. The table shows a list of behaviors/themes observed by the researcher during each of the three treatment conditions (MT = music therapy, RM = recorded music, and C = control). An "X" marks the presence of the frequency of the behavior, indicated at the top of the column. "I" stands for "intermittent," meaning the behavior was observed a few times. An X under"<50%" indicates that the behavior was observed less than 50% of the time. An X under ">50%" indicates the behavior was observed for 50% or more of the session. The absence of an "X" in the table means that the behavior was not observed or not applicable during the condition.

Participant 5: "Hank"

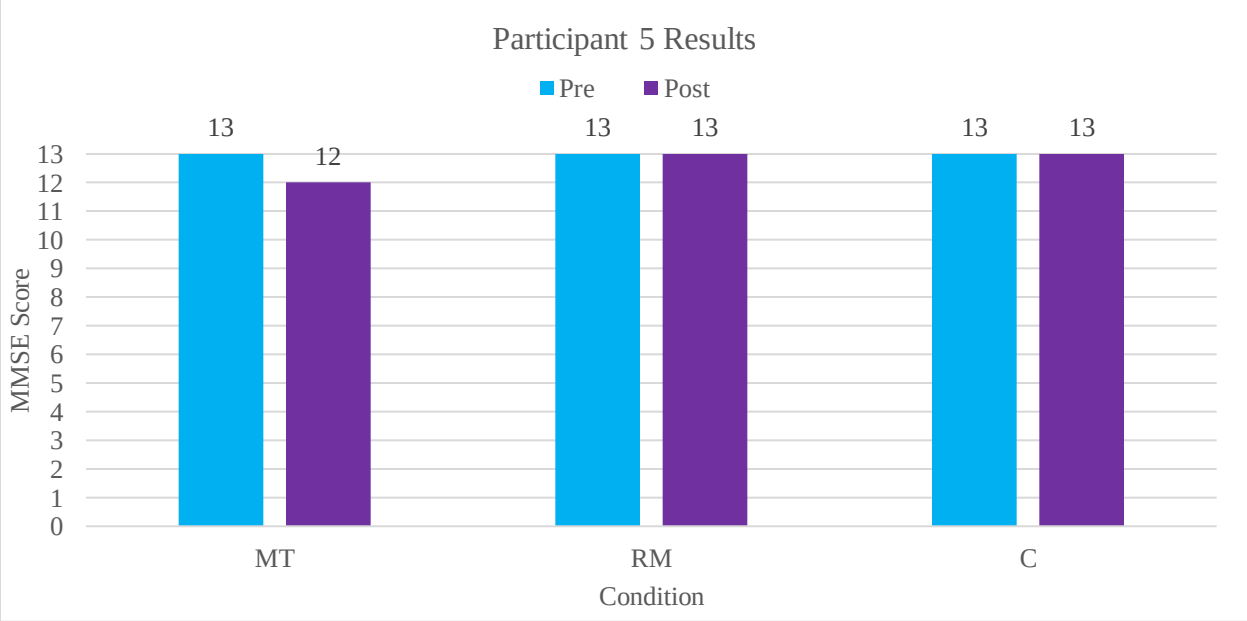
At the time of the study, Hank was a 92-year-old white male residing at the nursing home for approximately three months. Hank had severe hearing loss; in addition to utilizing hearing aids, he had an iPad with a live-transcription app that his staff used to communicate with him. He also utilized a cane and took small steps when walking. Hank loved to read his morning paper undisturbed and knew a little of several languages (Spanish and German were two languages observed by the researcher). He loved animals, especially his tuxedo cat. He was a biology

professor at a university for many years, and taught Entomology, a course about insects. Although he was hard-of-hearing, Hank still enjoyed music and used to play the piano. He mentioned that his mother taught piano lessons and that he learned from her.

Figure 5 below shows the adapted MMSE pre- and post-test results for Hank. He received the treatments in the following order: reading (C), recorded music (RM), and music therapy (MT) last. Hank scored a perfect 13 for the pre- and post-tests of both the recorded music and control sessions. For music therapy, he showed a slight decrease from 13 to 12 from pre- to post-test. Furthermore, behavioral observations during each of the conditions are displayed in Table 10 below.

Figure 5

Hank's Adapted MMSE Pre-test & Post-test Scores.



Note. The figure includes pre- and post-test MMSE scores for Participant 5, "Hank," for all conditions (MT=music therapy, RM=recorded music, C=control). Pre-test scores are shown in blue, and post-test scores are shown in purple.

Table 10

Behavioral Observations for Hank

Behaviors/themes	MT	RM	C
Smiling/laughing	X	N/O	X
Social interaction	X	N/O	X
Verbal interaction	X	N/O	X
Singing lyrics	N/O	N/O	N/A
Singing without words	N/O	N/O	N/A
Receptive communication	X	N/O	X
Reminiscence / episodic memory	X	N/O	N/O
Physical responses entrained to the music	X	X	N/A

Note. The table shows a list of behaviors/themes observed by the researcher during each of the three treatment conditions (MT = music therapy, RM = recorded music, and C = control). An "X" marks the presence of the theme, while "N/O" means that theme was not observed during the condition. "N/A" means that the behavior was not applicable to the condition.

Table 10 above outlines the responses noted for Hank during each condition, compiled by the researcher after reviewing video footage from the study. During the control condition, Hank quietly read the short stories to himself alongside the researcher. Since Hank thoroughly enjoyed reading, this may have impacted the results. Additionally, one of the short stories was about whales, which Hank responded positively to as a former biology professor. Due to his hearing loss, the researcher ensured the volume of the recorded music was loud enough by asking Hank if he could hear it. For the recorded music condition, Hank insistent on reading his morning paper while listening to music simultaneously. Even though his attention was not fully on the music, the researcher noticed he was breathing deeper and entrained with the tempo of the music, particularly during the songs "Moon River" and "Edelweiss." During music therapy, he shared

memories about times that he had traveled to Mexico, England, and West Africa after singing "This Land is Your Land." Hank said that sometimes he needed to travel for his occupation, since he studied insects and their close relatives. After the therapist sang "Take Me Out to the Ballgame," she asked Hank if he liked sports. Then, he talked about how he has been to a few local baseball games before but was not necessarily a sports fan. Finally, when the therapist sang the "goodbye song," Hank smiled and said, "I appreciated your company today." Table 11 below displays the frequencies in which the behavioral observations occurred during each condition.

Table 11

Frequencies of Behavioral Observations for Hank

	MT			RM			C		
Behaviors/themes	I	<50%	>50%	I	<50%	>50%	I	<50%	>50%
Smiling/laughing			X						X
Social interaction			X						X
Verbal interaction			X						X
Singing lyrics									
Singing without words									
Receptive communication			X						X
Reminiscence / episodic memory			X						
Physical responses entrained to the music	X				X				

Note. The table shows a list of behaviors/themes observed by the researcher during each of the three treatment conditions (MT = music therapy, RM = recorded music, and C = control). An "X" marks the presence of the frequency of the behavior, indicated at the top of the column. "I" stands for "intermittent," meaning the behavior was observed a few times. An X under"<50%" indicates that the behavior was observed less than 50% of the time. An X under ">50%" indicates the behavior was observed for 50% or more of the session. The absence of an "X" in the table means that the behavior was not observed or not applicable during the condition.

Comparison of Conditions

This section will outline the results of the pre- and post-tests in comparison to one another. The dependent samples *t*-test for each condition was computed in Microsoft Excel with the alpha value as $p = 0.05$. The results of each condition are outlined in Figures 6, 7, & 8 below, while Figure 9 shows the overall means for each condition. Table 12 below displays the means (*M*) and standard deviations (*SD*) of the pre- and post-tests for each condition (music therapy, recorded music, and the control).

Table 12

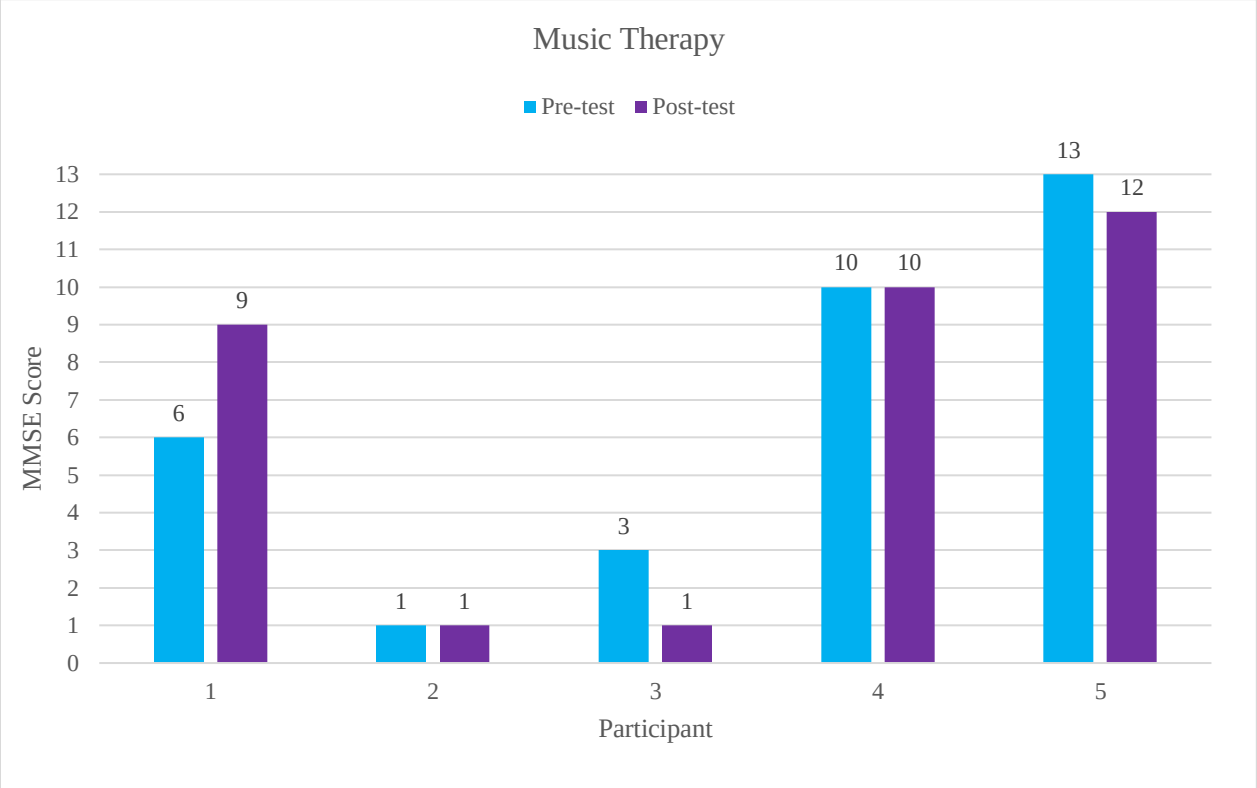
Means & Standard Deviations

Condition	Pre/Post-test	*M*	*SD*
Music Therapy	Pre	6.6	4.9
	Post	6.6	5.2
Recorded Music	Pre	8.0	3.5
	Post	8.8	4.0
Control (Reading)	Pre	7.8	3.6
	Post	8.0	3.4

Note. The table outlines the means (*M*) and standard deviations (*SD*) for the pre- and post-tests of the three conditions (music therapy, recorded music, and the control)

Figure 6

MMSE Scores from Pre- to Post-test for Music Therapy Condition by Subject.

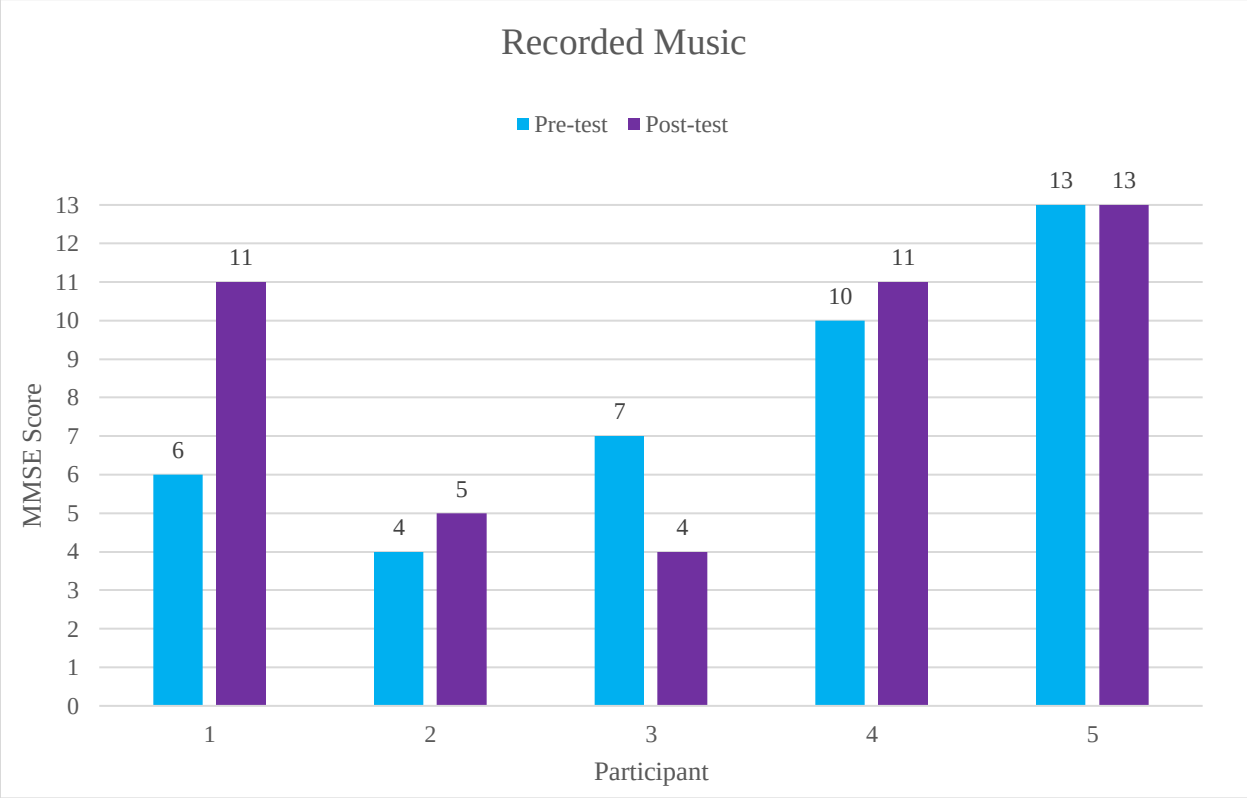


Note. The figure includes MMSE scores for pre- and post-tests of all five participants for the music therapy condition. Pre-test scores are shown in blue, and post-test scores are shown in purple.

Figure 6 above shows the data for all five subjects during the music therapy condition, side by side for comparison. A dependent (paired-samples) *t*-test was used to determine the statistical significance of pre-test to post-test results. The results from the MMSE pre-test (*M*=6.6, *SD*=4.9) and post-test (*M*=6.6, *SD*=5.2) indicated that overall, there was no change in memory recall and language after receiving music therapy. This means that there was no statistical difference for music therapy from pre-test to post-test, $t(4) = 0$, $p = 1$, and that these results have occurred by chance.

Figure 7

MMSE Scores from Pre- to Post-test for Recorded Music Condition by Subject.

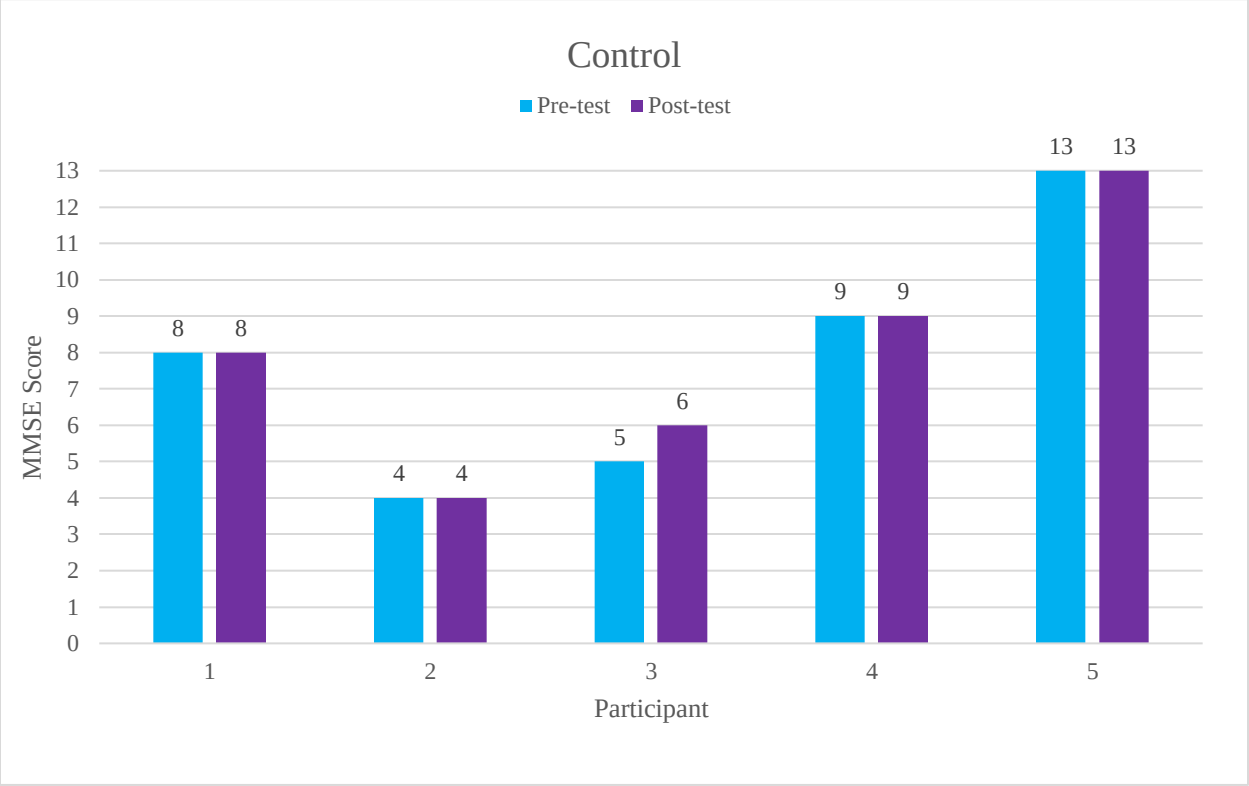


Note. The figure includes MMSE scores for pre- and post-tests of all five participants for the recorded music condition. Pre-test scores are shown in blue, and post-test scores are shown in purple.

Figure 7 above shows the data for all five subjects during the recorded music condition, side by side for comparison. A dependent (paired-samples) *t*-test was used to determine the statistical significance of pre-test to post-test results. The results from the MMSE pre-test (M=8, SD=3.5) and post-test (M=8.8, SD=4.0) indicated that overall, there was a slight increase in memory recall and language after receiving the recorded music condition. There was no statistical difference for recorded music from pre-test to post-test, $t(4) = -0.62$, $p = 0.57$.

Figure 8

MMSE Scores from Pre- to Post-test for Control Condition by Subject.

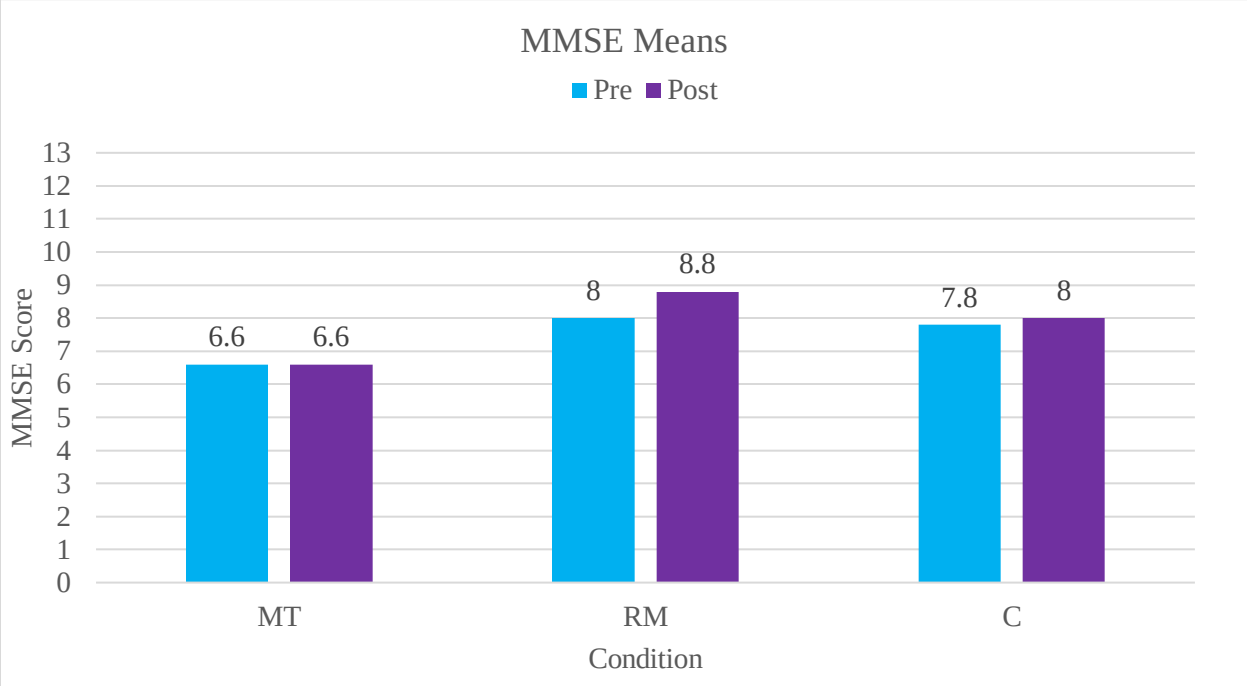


Note. The figure includes MMSE scores for pre- and post-tests of all five participants for the control condition. Pre-test scores are shown in blue, and post-test scores are shown in purple.

Figure 8 above shows the data for all five subjects during the control condition, side by side for comparison. A dependent (paired-samples) *t*-test was used to determine the statistical significance of pre-test to post-test results. The results from the MMSE pre-test (M=7.8, SD=3.6) and post-test (M=8.0, SD=3.4) indicated that overall, there was a slight increase in memory recall and language after receiving the control condition. There was no statistical difference for the control from pre-test to post-test, $t(4) = -1$, $p = 0.37$.

Figure 9

Overall MMSE Means of Participants by Condition



Note. The figure includes mean MMSE scores for pre- and post-tests for all conditions (MT=music therapy, RM=recorded music, C=control). Pre-test scores are shown in blue, and post-test scores are shown in purple.

Figure 9 above visually displays the overall MMSE means of the five participants in each condition (also noted in Table 12 above). Although no statistically significant changes were discovered among any of the conditions, it appears that recorded music elicited to most change from pre-test (*M*=8) to post-test (*M*=8.8). Table 13 below shows the number of participants that exhibited the behavior/theme during music therapy, recorded music, and the control.

Table 13

Behaviors of Participants by Condition

Behaviors/themes	MT	RM	C
Smiling/laughing	4	4	3
Social interaction	5	3	5
Verbal interaction	5	4	4
Singing lyrics	2	3	N/A
Singing without words	2	3	N/A
Receptive communication	5	4	4
Reminiscence / episodic memory	4	2	1
Physical responses entrained to the music	4	5	N/A

Note. The table outlines the number of participants (n=5) that displayed the behavior during the three conditions (MT=music therapy, RM=recorded music, C=control). The numbers in the table indicate the number of participants that displayed that behavior. An "N/A" stands for "not applicable," meaning that behavior was not applicable for the control condition.

Research Questions

(1) Of the three conditions (music therapy, recorded music, control), which appear to result the most change in MMSE scores in adults with moderate Alzheimer's disease? What differences are observed after each condition?

(2) Does music therapy treatment significantly enhance memory and communication in patients with moderate Alzheimer's disease?

(3) What behaviors/responses were observed during each condition? Particularly, facial expressions, body language, communication, episodic memory, singing/humming, physiological responses, and alertness.

CHAPTER V: DISCUSSION

Research Purposes and Questions

The primary purpose of the study was to investigate the effect of music therapy intervention on language and memory in people diagnosed with Alzheimer's disease, in comparison to recorded music and reading. Generally, the participants had a positive attitude and willingness to participate in music therapy sessions, despite the varying numeric data. Furthermore, investigating ways to research an individualized treatment was another intent of the study. Through observing the process administering one-on-one music therapy treatment in research studies, people can learn more about music therapy's effects on individuals with Alzheimer's disease.

The first research question was, "Of the three conditions (music therapy, recorded music, control), which appear to result the most change in MMSE scores in adults with moderate Alzheimer's disease? What differences are observed after each condition?" Since there was no statistical significance observed for any of the conditions from pre-test to post-test, there is not a clear answer for this question. However, the greatest change from pre- to post-test occurred during the recorded music condition, where the post-test mean (M=8.8) was greater than the pre-test mean (M=8). Perhaps the familiarity of the musical instrumentation and voicing in the recorded music playlist may have played a role in why this elicited the greatest change. It is important to note that music therapy did have a positive impact for some, just not all participants. Although, all five participants showed signs of verbal and social interaction during music therapy. Since music therapy is multidimensional, it is worth exploring the potential power of music therapy on social interactions in future research.

The second research question was, “Does music therapy treatment significantly enhance memory and communication in patients with moderate Alzheimer’s disease?” Although no statistical significance was found between MMSE scores, four out of the five participants displayed evidence of memory and reminiscence (indicated in Table 13) during the music therapy condition after qualitative video analysis. Additionally, all five participants showed evidence of verbal/social interaction during music therapy (shown in Table 13). At first glance, the reader may wonder why communication and memory may not have been adequately addressed during the recorded music and the control conditions. Music therapy procedures called for the researcher to explicitly prompt communication and memory through discussion questions because music therapy is multidimensional. The limited use of discussion during the recorded music condition was intentional to mimic the environment of recorded music being played in the background at nursing homes and memory care facilities.

The final research question was, “What behaviors/responses were observed during each condition? Particularly, facial expressions, body language, communication, episodic memory, singing/humming, physiological responses, and alertness.” Although the results were not calculated to be statistically significant, it appears that some qualitative observations are consistent with findings of previous research studies which will be further identified and explored in the Results/Implications section below (Patel, 2008; Brotons & Koger, 2000; Palisson et al., 2015; Clair, 1996; Thompson, 2007; Raglio & Oasi, 2015;).

Results/Implications

It appears that qualitative data has great value in this study due to the complex nature of humans and individualized music therapy treatment. The researcher observed Bert (Participant 1) reply to a question in a singing voice. When asked how he was doing today, Bert sang “I’m fine”

descending from a higher pitch to a lower pitch. This response to the music is consistent with prior research regarding music as a mnemonic technique to help with pragmatic skills (Patel, 2008; Brotons & Koger, 2000; Palisson et al., 2015). Bert was also observed rocking in his wheelchair back and forth to the beat of the music during the recorded music condition. This is inconsistent with literature findings, since previous research has suggested that live music elicits more movements than recorded music (Clair, 1996; Thompson, 2007). However, there are times when a music therapist cannot always accurately replicate the instrumentation and sound of an original song, indicating that there could be instances in which recorded music may be utilized more effectively.

When asked to repeat a phrase after the researcher during the music therapy post-test, Susan (Participant 2) responded with different words, but interestingly spoke in the same rhythm that the researcher did. This is also consistent with prior research regarding music as a mnemonic technique to help with pragmatic skills (Patel, 2008; Brotons & Koger, 2000; Palisson et al., 2015). During the music therapy condition, Susan fell asleep during the session. While this did not show an increase in communication, this could imply an increase in relaxation, which was found in the literature (Raglio & Oasi, 2015). During the recorded music condition, it appeared that Susan was more alert as evidenced by her wide eyes and increased body movement. While this is inconsistent with literature findings suggesting that live music elicits more movements, this could be due to the inconsistencies associated with Alzheimer's disease (Clair, 1996; Thompson, 2007).

During both recorded music and music therapy conditions, Jim (Participant 3) stated several times that he "doesn't sing anymore" and is "too old in age" to do so. However, when discussing church music and reminiscing about his life in Mississippi, Jim started singing a

gospel song that was unknown to the researcher. Since he was adamant on not singing along to the music during music therapy nor recorded music, it was fascinating to see that he sang a song that was meaningful to him unprompted. Perhaps the set repertoire of music planned for this study was not within Jim's preferences, further stressing the importance of individualized treatment. It is possible that the music chosen for music therapy and recorded music conditions may be music that is more known by middle-to-upper class, white/Caucasian people. Since this is strictly a speculation, cultural implications are worth considering when interpreting the results, and exploring in future research.

Betty (Participant 4) sang along to almost all of the songs during music therapy and recorded music conditions. Although MMSE scores maintained from pre-test to post-test, Betty engaged in conversation with the researcher several times during the music therapy condition. When the researcher sang "Take Me Out to the Ballgame," instead of singing the lyrics "home team," Betty sang "Cubbies," unprompted from the researcher. After singing, she continued to discuss how her husband was a huge Chicago Cubs fan, and how she naturally became a fan too because of this. During the recorded music condition, Betty did not engage in conversation with the researcher, however, she displayed movements to the beat of the music through tapping her toes, patting her legs, and swaying side to side in her chair.

Hank (Participant 5) loved to read his newspaper in the morning, so the control that required reading two short stories appeared to be engaging to him. Since Hank had severe hearing loss, the researcher gave him a copy of the short stories to follow along while she read the stories aloud. However, it was possible that Hank did not hear the researcher reading the text. Interestingly, Hank's MMSE score decreased by one from pre-test to post-test, despite his love for reading. For both music therapy and recorded music conditions, it was unclear if Hank heard

the music. Even though his attention may not have been fully on the music, the researcher noticed that Hank's breathing was entrained with the tempo of the music during the recorded music condition, particularly during the songs that were slower in tempo, and less dense in instrumentation. Deeper and controlled breathing may be a sign of relaxation, and if so, this would be consistent with the literature on music and relaxation (Ralgio & Oasi, 2015). During the song "This Land is Your Land" in the music therapy condition, Hank shared memories about different places to which he has traveled as a former professor of biology. It was unclear if the expression of these memories was due to the qualities of the music or since the researcher directly asked Hank about places he has traveled, utilizing his iPad with a live transcription app that his staff used to communicate with him.

Limitations

This study has several limitations that should be considered when interpreting the results. First and foremost, the study had a small sample size of five participants limited to one geographic location. Thus, the findings in this study should be considered with caution and cannot be generalized to all patients diagnosed with Alzheimer's disease. Additionally, research methodology cannot always accommodate the unique backgrounds and experiences of the participants. Knowing this, it is crucial to consider the individuality of human subjects. It is also difficult to predict the mood of a person with Alzheimer's disease. The nature of the cognitive decline as a symptom of Alzheimer's disease could have attributed to the data.

Another limitation was that the instrument used to track numeric data for the study was an adapted version of the Mini Mental-State Examination (MMSE), and only included two out of the five total domains within the full MMSE. The adapted MMSE included questions from the "recall" and "language" domains for the purposes of this study and is shown in Appendix A.

Future studies should consider administering the full MMSE to explore the effects of music therapy on all aspects of cognition. The number of questions in both domains were also unequal, as the "recall" domain only prompted the participants to remember three words short-term, whereas the language domain included six questions requiring a variety of both expressive and receptive communication skills. These skills included naming objects, listening to and repeating a short phrase, listening to and following directions, reading and following directions, writing a sentence, and copying a drawing. Furthermore, this was a short-term study where the participants only received each of the three conditions once.

An additional factor to consider is environmental conditions within the nursing home facility. The first date that data was collected at the facility, the activity room the research was conducted in was rather cool in temperature, causing several of the participants to verbally state "I'm cold," and move closer to the door during treatment. This factor may have caused discomfort for the participants during data collection and may have skewed the results of the data. Furthermore, some sessions were facilitated in different locations like the participants' rooms due to scheduling conflicts with other events happening within the facility. There was one day during data collection that the activity room in the facility was being occupied, and so the program director unlocked a vacant room for the researcher to use. Another participant did not want to leave his room for one day of data collection, so the researcher conducted the study in the resident's room since it was still a quiet and undisturbed space.

Cognitive decline in people with Alzheimer's disease should also be noted as a limitation to the study. While more research is always needed, it is important to remember that Alzheimer's disease is a degenerative neurological disorder and progresses in severity over time. While the study design accounted for this by having the participants receive each treatment condition in a

different order, the reality of inconsistent mood and compliance to treatment due to neurodegeneration cannot be ignored.

Finally, researcher bias should be considered as a limitation, as this study relied solely on the researcher to complete her own collection, coding, and analysis of the data. Although the researcher video recorded all pre-tests, treatments, and post-tests to increase the accuracy of the data, there is still a risk of misinterpretation of the data for desirability of the results. If the researcher had the resources to have outside sources review video footage and analyze the results, this could have increased the accuracy of the data.

Recommendations for Future Research

Should similar studies be conducted in future research, there are several areas that require continued investigation. Future research should consider the limitations mentioned above and replicate the study utilizing a larger sample size over a longer amount of time with more sessions with each condition. Due to time limitations, this study only explored the short-term change from pre-test to post-test after a singular session, therefore making this small-scale research difficult to generalize to the broader population of people with Alzheimer's disease. Studies like this one should also consider hiring a rater to code qualitative data. Since this was a student project with limited resources and funds, the researcher coded and analyzed all data on her own. While measures were taken to ensure that researcher bias is minimal by video recording the data collection, there is still a risk of researcher desirability bias.

It is important to note that the full MMSE was not utilized in this study. Studies like this one should consider administering the full MMSE or try another standard instrument. Furthermore, the "recall" domain in the MMSE should be interpreted as short-term recall, and not long-term recall, as the questions within that domain pertained to remembering three words

over the span of a few minutes. It may be interesting for future research to consider using the full MMSE with all domain areas included or further exploring the effect of music on episodic memory, as opposed to short-term memory recall.

Co-morbid diagnoses should be considered in future research, particularly when developing inclusionary and exclusionary criteria to participate in the study. Although it was not explicitly disclosed to the researcher, one participant appeared to show signs of expressive aphasia, by verbally communicating through combinations of words that did not make sense to the researcher. Another participant had severe hearing loss, which may have impacted the results of the study due to the auditory senses needed to hear, process, and interpret music in the brain. If one cannot hear or understand the music, then it may not be possible for music to elicit memories or increase communication. Future studies may consider including these diagnoses in the exclusionary criteria. Additionally, future research should adhere to a more definitive assessment process/tool. A category five on the Global Deterioration Scale (GDS) was given to the activities director of the facility, therefore, the participants were recruited based on her interpretation of the scale. Future research should consider creating clear inclusionary/exclusionary guidelines when recruiting participants.

It is recommended that cultural implications be explored further in future research. Future studies could include some sort of music preference assessment questionnaire, or interview with the family members of the subjects, to gain further insight on musical preference and cultural background. Culture plays a significant role in one's identity; it shapes beliefs, values, and interests, including the music in which our clients listen to. The design of this study did not utilize much variability in the music repertoire in the music therapy and recorded music conditions. Since the session plan and repertoire list remained consistent no matter the

participant, it is very possible that this participant may not have preferred all the music planned for this study. The failure to consider the individuality of clients, particularly of different racial or cultural backgrounds, can be harmful to the individuals that music therapists support.

There will always be a continued need for more research on the aging population, particularly those with Alzheimer's disease. Since there is no cure for Alzheimer's disease, there is a strong emphasis on quality of life in memory care. Music therapy has the potential to be a strong non-pharmacological treatment to maintain cognition in those with Alzheimer's disease. Furthermore, many studies regarding music therapy and dementia are becoming dated, some being over twenty years old (Brotons & Koger, 2000; Brotons et al., 1997; Ashida, 2000; Prickett & Moor, 1991). More recent research must be done to ensure that these studies are still applicable, utilizing more advanced technology and treatment methods. It is important to consider that some studies may not define what stage of dementia that the subjects are diagnosed (Brotons & Cooper, 1996; Dahms et al., 2021). Continued research is needed on subjects that represent all of the different stages of dementia, given the varying level of symptoms and functioning within each stage.

Conclusion

The overarching conclusion of this study is that it is critical for music therapists to remember the individuality of the people in which they support. Music has the potential to be highly effective with adults with Alzheimer's disease, particularly in the areas of communication and memory. Music can help stimulate memories, further leading to increased communication and connection with their loved ones (El Haj et al., 2015; Giovagnoli et al., 2018; Ashida, 2000; Solé et al., 2014).

The statistical insignificance of the results of this study may actually support the notion that music therapy is needed, as therapists are trained to address non-musical outcomes through client preferences. This only further suggests the need for a certified professional to provide individualized care, since the design of this study did not fully consider music preference, but drew songs and interventions based on a "one-size-fits-many" approach. However, music therapy should not operate in this framework. It is important that music therapy is implemented by a clinically trained & certified professional that operates under an evidence-based framework. The profession depends on this.

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APPENDIX A: ADAPTED MINI MENTAL-STATE EXAMINATION

Adapted Mini Mental-State Examination

Participant:	Date:
Age:	Treatment:
Gender:	Time in facility:
Music Preferences:	
Other background information (hearing loss, assistive devices, experiences):	

Pre/post-test: *I'm going to start by asking questions that require concentration and memory.*

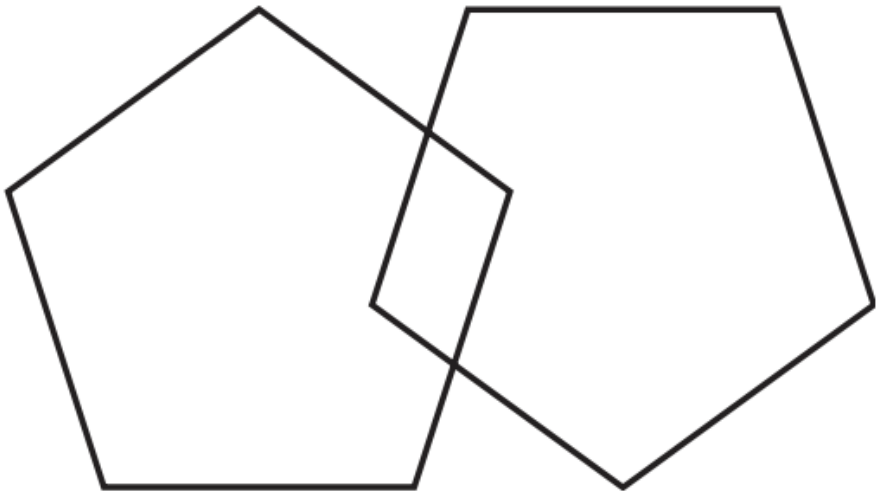
Recall: *I am going to name 3 objects. After I have said them, I want you to repeat them to me. Remember what they are because I will ask you to name them again in a few minutes. Ready?: Apple, Table, Penny*

Okay, now can you spell the word: WORLD?

	Pre-test	**Post-test**
What were the 3 words I asked you to remember?	_____**/3**	_____**/3**
Language:		
What is this called? (Watch, pencil)	_____**/2**	_____**/2**
Please repeat the following: "No ifs, ands, or buts."	_____**/1**	_____**/1**
Okay, now please follow this direction: "Take a paper, fold it in half, and put it on the floor."	_____**/3**	_____**/3**
Please read the following, and do what it says: *Pre-test: "Close your eyes"* *Post-test: "Clap your hands"*	_____**/1**	_____**/1**
Write a sentence.	_____**/1**	_____**/1**
Copy the drawing on the paper.	_____**/2**	_____**/2**
	Total: _____**/13**	_____**/13**

CLOSE YOUR EYES.

CLAP YOUR HANDS.



APPENDIX B: INFORMED CONSENT

ILLINOIS STATE UNIVERSITY
Illinois' first public university

Legally Authorized Representative Permission for Confidential Research

You are being asked to allow the person you represent to participate in a research study conducted by Ariel Furgat under the supervision of Dr. Andrea Crimmins in the music therapy department at Illinois State University. The purpose of this study is to explore the impact of music therapy intervention on patients with Alzheimer's disease, in comparison to listening to music and listening to an audiobook.

Why are we asking for your permission?

We are seeking your permission because you are the legally authorized representative of the person that we would like to include in a study. The researchers would like to include the person you represent in a study because they are an adult age 65 or older, are diagnosed with Alzheimer's disease, are categorized as a 5 on the Global Deterioration Scale (GDS), and reside in a memory care unit.

Their participation in this study is voluntary. Neither you nor the person you represent will be penalized if either of you choose to skip parts of the study, not participate, or withdraw from the study at any time. Additionally, your choice to grant permission or not will have no impact on the person you represent residing in the facility and obtaining services.

What would they do?

If you choose to allow this person to participate in this study, they will be asked to:

- Engage in a music therapy session facilitated by the researcher. The music therapy session may include: listening/singing to familiar songs, moving/dancing to music, engaging in conversation on a topic related to the song, writing a simple song, and/or playing various percussion instruments to music
- Listen to recorded music on a Bluetooth speaker at a comfortable volume.
- Listen to an audio-recording of a short story.
- Answer questions about music preference and memories
- Follow spoken and written directions, such as "raise your hand" or "close your eyes"
- Be video and audio recorded for the sessions

In total, this person's involvement in this study will last approximately 3 weeks. Prior to beginning, the researcher will consult with the activities director to gather any background information regarding music preferences, hobbies, and interests. Each week, the person you represent will receive a different service for approximately 20 minutes (music therapy, listening to recorded music, and listening to a recorded short story) all in a random order. Prior to and following each service, the researcher will complete a portion of the Mini Mental-State Examination (MMSE) and record data on a printed MMSE template. Should you give permission for this person to participate, they will still be asked whether or not they would like to participate in the study.

Are any risks expected?
Possible risks associated with this study are risks of psychological/emotional distress from music that may potentially elicit an undesired memory. For this reason, inquiring a list of preferred music will be a part of assessment. Should the participant show any sign of distress, agitation, or anxiety, the music or the recorded messages will be immediately stopped. The likelihood for this to occur is minimal. Other risks may include breach of confidentiality due to video recordings and identifiable data. Although unlikely, there is a potential risk to the participant's reputation should their identifiable data and videos be accessed by others not authorized to do so. To reduce these risks, utilization of preferred music will be prioritized, and data will be stored on a secure OneDrive file on a password-protected computer and deleted after the thesis research has concluded. Additionally, the printed records of the MMSE will be shredded and destroyed.

Will their information be protected?
We will use all reasonable efforts to keep any provided personal information confidential. As disclosed above, the data will be stored on a password-protected computer, and then destroyed after the study has concluded. Information that may identify them or potentially lead to reidentification will not be released to individuals that are not on the research team. The research may be shared with the faculty committee of this thesis project for educational purposes. However, when required by law or university policy, identifying information (including your signed permission form) may be seen or copied by authorized individuals.
If you choose to have this person participate in this study, they will be video recorded. Video recordings will be stored securely and will only be accessed by the research team. Recordings will be stored only for the duration of the project and then erased.

We need to make you aware that in certain research studies, it is our legal and ethical responsibility to report situations of abuse, neglect, or any other life-threatening situations to appropriate authorities. However, we are not seeking this type of information in our study, nor will you be asked questions about these issues.

Could their responses be used for other research?
We will not use any identifiable information from the person you represent in future research, but their deidentified information could be used for future research.

Who will benefit from this study?
This study will benefit the music therapy field by advocating for the need for services, as well as advocate for individualized care and non-pharmacological treatments for adults diagnosed with dementia or Alzheimer's disease. Participating in this study may emotionally benefit the person you represent by engaging in music therapy, listening to preferred music, or listening to a story.

Whom do you contact if you have any questions?
If you have any questions about the research or wish to withdraw the person you represent from the study, you may contact the researcher, Ariel Furgat, at (630) 336-7742 or email afurgat@ilstu.edu. Additionally, you may contact the faculty advisor of this study, Dr. Andrea Crimmins at amcrimm@ilstu.edu

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If you have any questions about the rights of a participant, or if you feel that the person you represent has been placed at risk, contact the Illinois State University Research Ethics & Compliance Office at (309) 438-5527 or IRB@ilstu.edu.

Documentation of Consent

If you want the person you represent to participate in this study, please type the name of your relative and your initials below.

Person represented _____

Initial _____ Date _____

You will be given a copy of this form for your records.

APPENDIX C:

MUSIC THERAPY TREATMENT SESSION PLAN

1. **Hello Song – K-K-K-Katy (Bill Murray)**
   Adapted Lyrics:
   G C
   [Name], wonderful [Name],
   D G D
   I'm so glad that you are here with me today
   G C
   In music, beautiful music,
   D G
   I would like to ask you how are you today?

2. **Movement – Side By Side (Kay Starr)**
   - Sing through the first two verses, twice. Each verse, the MT will prompt a different movement listed below.
   - Movements to prompt for each verse: toe taps, kicks, patting legs, claps

3. **Song discussion – This Land is Your Land**
   - Sing through the chorus once.
   - Discussion prompt: Tell me about a trip you went on that you enjoyed. Where did you go? With whom? What did you enjoy about that trip?
   - Sing through the chorus twice.

4. **Instrument play/singing – Take Me Out to The Ballgame**
   - Participant will choose an instrument to play.
   - Sing and play through the chorus three times.

5. **Goodbye song – Happy Trails (Roy Rogers)**
   C G7
   Happy trails to you, until we meet again
   C
   Happy trails to you, keep smiling until then
   C7 F
   Who cares about the clouds when we're together?
   A7 D9- G7
   Just sing a song and bring the sunny weather.
   C A7 Dm G7 C
   Happy trails to you, until we meet a-gain

APPENDIX D:

RECORDED MUSIC REPERTOIRE

1. You Are My Sunshine – performed by Jimmie Davis
2. Amazing Grace – performed by Elvis Presley
3. Blue Moon – The Marcels
4. Moon River – Audrey Hepburn
5. Over The Rainbow – Judy Garland
6. Don’t Sit Under the Apple Tree – The Andrew Sisters
7. Edelweiss – from The Sound of Music
8. Let Me Call You Sweetheart – Bing Crosby