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Music and Aspects of Identity in People with Alzheimer's Disease

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Music and Aspects of Identity in **People with Alzheimer's Disease**

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Music and Aspects of Identity in **People with Alzheimer's Disease**

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Abstract

Music has been used as a healing tool for centuries, now commonly in the form of music therapy. Music therapy has been beneficial for people with Alzheimer's disease by brightening moods, increasing social interaction, and reducing the difficulty of finding words (Brotons, Koger, & Pickett-Cooper, 1997). In the current study, the effect of music on aspects of identity in individuals with Alzheimer's was investigated. Twenty-three participants (nine with Alzheimer's, fourteen non-Alzheimer's controls) responded to the Autobiographical Memory Interview (AMI) and the Ten-Item Personality Inventory (TIPI) with and without music played immediately beforehand. It was hypothesized that music would increase autobiographical memory recall and accuracy in judgment of personality for those with Alzheimer's, but would have no effect on participants without Alzheimer's. Results showed that for people with Alzheimer's disease, music increased recall of specific events but not simple factual information, and music had no effect on the recall of those without Alzheimer's. When the data was split into high and low levels of cognitive functioning (based on scores from the Mini-Mental State Examination), the low cognitive functioning group recalled significantly more information on both the Personal Semantic and Autobiographical Incident portions of the AMI. The results suggest that music can aid autobiographical recall in individuals with low cognitive functioning, including those with Alzheimer's disease. The results also provide additional support for the use of music as therapy.

Music and Aspects of Identity in People with Alzheimer's Disease

"One does not need to have any formal knowledge of music – nor, indeed, to be particularly "musical" – to enjoy music and to respond to it at the deepest levels. Music is part of being human, and there is no human culture in which it is not highly developed and esteemed. Its very ubiquity may cause it to be trivialized in daily life: we switch on a radio, switch it off, hum a tune, tap our feet, find the words of an old song going through our minds, and think nothing of it. But to those who are lost in dementia, the situation is different. Music is no luxury to them, but a necessity, and can have a power beyond anything else to restore them to themselves, and to others, at least for a while" (Sacks, 2007, p. 347).

Music plays a role in the lives of everyone. We listen to it in our cars, hear it in the grocery store, dance to it at parties, and hear it within nature. Whether we are conscious of all of the music we hear or not, our auditory system picks up on it. Music affects us even before we are born; it has been found that a fetus' heart rate changes when different songs are played during the last trimester of pregnancy, when auditory functioning begins (Tan, Pfordresher, & Harré, 2010). As infants, we become sensitive to pitch and prefer consonant intervals over dissonant intervals by the age of two months. By the time a child is six months old, he or she is able to grasp the idea that a transposed melody is not a new melody, but the original melody presented with new pitches (Tan et al., 2010). Metrically speaking, North American infants are sensitive to both simple and complex meters, but this changes as they age. Because Western music is primarily made up of simple meters, adults throughout the Western world are familiar with simple meters but not complex meters. This indicates that our sense of meter is innate, but lack of exposure to different meters weakens our ability to distinguish them later in life (Hannon & Trehub, 2005).

The way we process and store musical information involves a large majority of the brain. Musical information is not found in one specific part of the brain, but is located in many different areas including the auditory cortex, cerebellum, hippocampus, amygdala, and prefrontal cortex (Levitin, 2006). Each area of the brain is responsible for decoding a different aspect of the music. For example, the auditory cortex processes the initial sounds and the cerebellum helps process rhythm and meter. The mesolimbic system is also activated with music, and produces dopamine. Increased dopamine levels are associated with positive moods, indicating that music may be a means for improving mood (Levitin, 2006). Music can induce several physiological symptoms, including heart rate, blood pressure, skin conductivity, and "chills" (Hallam et al., 2008). Different elements of music can bring about different physiological changes and emotional reactions (Sloboda, 1991).

Music has a close relationship with emotion. As Diana Raffman writes, "The tie between music and feelings is considerably tighter than the tie between a sentence and its meaning" (Sloboda, 2005, p. 158). This connection has been discussed as far back as the 4th Century B.C., when Plato claimed that melodies in different modes provoked different emotions (Patel, 2008). Music is not simply sound; it contains many different elements that contribute to the overall meaning that music holds. Humans are semiotic beings; we are always looking for meaning, and we find much meaning in music (Kühl, 2007). In one case, a man who lost his memory for music could not recognize the tune "Happy Birthday," but he knew it was a happy tune (Tan et al., 2010). While music may trigger certain emotions because of evoked memories or the story the music tells, there are also specific musical characteristics that are tied to emotion. For example, feelings of sadness arise with slow low-pitched music in a minor mode with high dissonance, whereas feelings of happiness occur with fast-paced, high-pitched music in a major mode with

low dissonance (Sloboda, 2005). With emotions, music shows both its universality and its uniqueness; these musical characteristics generally evoke the same emotions in people, but the individual connections one may have with the music are unique with each person.

There have been many cases where music has a seemingly miraculous effect on someone, with no definite reason as to why. An unresponsive elderly woman with dementia who hasn't spoken in months suddenly awakens when a radio is turned on, and begins speaking and singing clearly (Wong & Viagas, 2012). A young boy with Williams Syndrome, who has very poor hand-eye coordination as a symptom of his disease, is able to play his clarinet flawlessly, yet is unable to put it back in its case (Levitin, 2006). Clive Wearing, a musicologist who suffers from amnesia, is able to perform and conduct music with ease, despite having no memory of receiving an education in music (Sacks, 2007). Around the world, people are in awe of the "power" of music, as it affects countless people in varying situations. Many people understanding the benefits of music have turned it into a form of therapy for others. Music therapy is a field on the rise, and is used with people of all ages with varying issues. In this paper, the effects of music on individuals with Alzheimer's disease will be examined more closely.

I will begin by discussing Alzheimer's disease and the changes associated with the disease. I will then discuss the connection between Alzheimer's disease and identity, focusing on autobiographical memory and personality. Then, I will discuss music therapy and how it has benefited individuals with Alzheimer's disease. Finally, I will review previous research on music, Alzheimer's disease, and identity, before outlining the hypotheses for the current study.

Alzheimer's Disease

Alzheimer's disease is a growing issue in the world today. Currently, 5.4 million Americans suffer from the disease, and another develops the disease every 68 seconds. Alzheimer's disease

is degenerative and is the sixth leading cause of death in the United States (Alzheimer's Association). In "Alzheimer's in America," Dr. Maria Carrillo describes Alzheimer's Disease as a "progressive, incurable and fatal disease in which cells in certain parts of the brain are destroyed, eventually leaving patients unaware of the world around them and unable to care for themselves" (Shriver et al., 2011, p.63). While memory loss is the most recognizable symptom of Alzheimer's disease, there are several other symptoms. A person suffering from Alzheimer's disease may experience changes in personality and several different cognitive impairments, including difficulty speaking and understanding others and difficulty making decisions. (Shriver et al., 2011).

Alzheimer's disease degrades the brain by destroying neurons. The first neurons affected are located in the hippocampus (the memory center) and cause memory loss. The neuron loss eventually spreads to the frontal, parietal, and temporal lobes, causing other symptoms to occur, including the inability to communicate or recognize faces. Alzheimer's disease also destroys the nerve cells at the basal nucleus of Meynert, where a large amount of the neurotransmitter acetylcholine is produced. The damaged nerve cells cause less production of acetylcholine, which is the key neurotransmitter for the formation and retrieval of memories. With the deterioration of the neurons and nerve cells, the brain begins to shrink (Petersen, 2002).

The symptoms of Alzheimer's disease worsen as an individual progresses through the stages of the disease. In the mild stage of Alzheimer's disease, individuals may have difficulties finding the right word, may feel disoriented or get lost in familiar places, and may misplace items in odd places. As the individual becomes aware of memory loss, he or she begins to feel frustration and helplessness, which can also lead to depression (Petersen, 2002). In the moderate stage of Alzheimer's disease, the symptoms are more severe, and the diagnosis is often made during this

time. Individuals at this stage of Alzheimer's disease struggle with communication, tasks involving calculation or planning, and are often more aggressive and agitated. When an individual reaches the severe stage of Alzheimer's disease, they are no longer able to reason, and require assistance in simple tasks such as eating and dressing. They have little memory, have difficulty speaking, and struggle with recognizing others or even themselves. In the final stages, the individual is often bedridden, as the disease weakens the body systems and increases susceptibility to infections and other health problems. In most cases, death occurs between eight and ten years after diagnosis (Petersen, 2002).

In the early stages of Alzheimer's disease, it can be difficult to tell if the individual has Alzheimer's disease or mild cognitive impairment. The mental and functional abilities of those with mild cognitive impairment do decrease faster than those without it, but individuals with Alzheimer's disease experience a much more rapid and severe loss of mental and functional abilities (Petersen, 2002).

Alzheimer's Disease and Identity

Many family members and caregivers of those with Alzheimer's disease have noted that the person they once knew is "gone," and is no longer recognizable as being the same person (Orona, 1990). To some, it seems as though parts of the person's identity have been lost or jumbled. It has been suggested that the sense that an individual with Alzheimer's disease is no longer the person they once were does reflect changes in the individual's identity (Addis & Tippet, 2004). In a study by Naylor and Clare (2008), participants with Alzheimer's had a weaker and more negative sense of identity as compared to those without Alzheimer's. This weaker sense of identity may be related to the separation from self, described by Cohen (1991), which is experienced by individuals with late-stage Alzheimer's disease.

Identity can be defined as a component of self-concept, consisting of knowledge of one's traits, life, and experiences (Addis & Tippet, 2004). Autobiographical memory and personality are two concepts which have been found to be strongly connected to a sense of identity.

Several studies show a close relationship between autobiographical memory and identity. Simply put, autobiographical memory deals with the ability of people to recall information about their lives (Baddeley, 1992). Relating specifically to identity, autobiographical memory "contribute[s] to trait self-knowledge and to self-narratives, enabling the integration of past and present selves and contributing to the sense of continuity of identity" (Addis & Tippet, 2004, p. 56). Autobiographical memories are often categorized as episodic or semantic (Foster and Valentine, 2001). As a whole, autobiographical memories are a "resource of the self" (Conway, 1997, p. 25). Several studies have shown that autobiographical memories are not only related to identity, but are actually an integral part of a person's identity (Irish et al., 2006; Naylor & Clare, 2008; Conway & Pleydell-Pearce, 2000). Furthermore, Conway and Tacchi (1996) have suggested that one of the purposes of autobiographical knowledge is to "ground" the self, keeping one aware of who they are at the core. The way that a person conceptualizes their self throughout their life is linked with their autobiographical memories (Conway, Singer, & Tagini, 2004). In other words, the experiences a person has throughout his or her life affects how he or she conceptualizes his or her self, therefore connecting autobiographical memories and identity.

It is acknowledged that many areas of memory – including episodic, semantic, and working memory – are impaired at different stages of Alzheimer's disease (Greene, Hodges & Baddeley, 1995). Researchers have proposed the possibility that the sense of self of an individual with Alzheimer's disease disintegrates because of the memory loss (Downs, 1997; Massimi et al., 2008). Addis and Tippett (2004) found that, "Autobiographical memory has a clear role in

the constitution of identity, enabling connections between discrete moments in consciousness, and if lost, it would follow that one's identity would also be lost or significantly changed" (p. 58). Therefore, it can be understood that those with Alzheimer's lose their sense of identity as the disease slowly cuts off the connections they have to their memories. In Addis and Tippett (2004)'s experiment on the topic, participants with Alzheimer's disease were found to have poorer autobiographical memory recall and weaker identity when compared to participants without dementia.

Personality is also closely related to a person's identity and sense of self. Lounsbury, Levy, Leong, and Gibson (2007) studied personality and identity, finding a significant correlation between the two as each of the Big Five traits (as listed by Costa and McCrae, 1992) correlated with a sense of identity. According to Lounsbury et al. (2007), "Personality traits are important contributors to identity formation and may serve as expressions of identity as well as determinants of other factors that contribute to identity achievement" (p. 52). Additionally, personality has been found to be stable and consistent by the age of 30 (Costa & McCrae, 1994).

Despite the typical stability of personality, a change in personality has been found to be a consistent characteristic of Alzheimer's disease (Pocnet, Rossier, Antonietti, & von Gunten, 2011; Talassi, Cipriani, Bianchetti, & Trabucchi, 2007). When families and caregivers note that a person with Alzheimer's is no longer him- or herself, they often describe changes in the individual's personality, many of which are negative (Addis & Tippett, 2004). According to Jacomb (1996), as cognitive impairment increases, most positive aspects of personality decrease. Specifically, it has been found that individuals with Alzheimer's disease tend to feel less enthusiasm and happiness, and more irritability and dependence on others (Talassi, Cipriani, Bianchetti, & Trabucchi, 2007). It has also been found that with the onset of Alzheimer's

disease, people become increasingly less accurate in their judgment of their own personality (Ruby et al., 2009). Many studies looking at personality in people with Alzheimer's disease have thus relied on family members, often a child or spouse, to provide the base data for the patient's personality (Talassi, Cipriani, Bianchetti, & Trabucchi, 2007).

On the whole, individuals with Alzheimer's disease tend to experience a loss of identity, which can relate to both autobiographical memories and personality. These two aspects of identity will be used in the current study.

Music Therapy

The idea that music can heal is nothing new; this notion has been around for centuries. In ancient times, dancing and chanting were key elements in healing ceremonies. According to records, music was used in Chinese medicine over five millennia ago along with herbs and salves (Hanser 2009). Hippocrates, the "Father of Western Medicine," also noted the importance of music in medicine in the fourth century. In Ibn Sina's famous *The Book of Healing*, written in the 11th century, music is said to be able to positively affect both the mental and physical health of a person (Wong & Viagas, 2012).

Around the time of the Industrial Revolution, scientists began to research music as a form of therapy. The first article on music therapy, titled "Music Physically Considered," was published in 1789 (Wong & Viagas, 2012). At the end of the 19th century, Dr. James Coming discovered that many areas of the cerebrum were affected when music was played, and that the effects appeared whether the patient was conscious or not (Wong & Viagas, 2012). In the following years, other researchers discovered music's ability to change physiological aspects of a person, including blood pressure, breathing rate, and heart rate. The first known use of music during surgery was in 1914, when Dr. Evan O'Neill Kane played music to calm and distract patients

(Wong & Viagas, 2012). Modern music therapy began during World War II to help war veterans suffering from what we now call Post-Traumatic Stress Disorder. Even patients who were extremely withdrawn and traumatized showed signs of improvement when music was played (Wong & Viagas, 2012). With the success visible in this technique, the practice of music therapy began to spread. Today, music therapy is successfully used with people of all ages for a variety of reasons. The American Music Therapy Association defines music therapy as, "the clinical and evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program" (American Music Therapy Association, 2013). Music therapy is used to promote wellness, alleviate pain, manage stress, enhance memory, express feelings, improve communication, and promote physical rehabilitation. An individual does not need to be particularly musical to benefit from music therapy (American Music Therapy Association, 2013).

Music Therapy and Alzheimer's Disease

Research has shown that music therapy has several benefits for people with Alzheimer's disease. Music has been found to decrease levels of agitation and anxiety, encourage social interaction, and brighten moods (Brotons, Koger, & Pickett-Cooper, 1997). Music also has the "power to provide the Alzheimer's patient with a sense of accomplishment, to energize and stimulate, to trigger words, and to soothe and comfort both the patient and caregiver" (Brotons, Koger, & Pickett-Cooper, 1997, p. 211). It is believed that music may be helpful for people with Alzheimer's disease partly because of how music is registered in the brain. Music involves both hemispheres, and so the function of music is often retained even as parts of the brain, such as the language center, decay. (Aldridge & Aldridge, 1992). In fact, the medial prefrontal cortex, which

is associated with music, is one of the last parts of the brain to decay with Alzheimer's disease (Beck, 2009). Thus, music may also be used as a form of communication for individuals with Alzheimer's who have lost the ability to communicate in a typical manner.

Music, Alzheimer's Disease, and Identity

In several case studies, music has had a miraculous effect on individuals with Alzheimer's disease and their identity; the music appears to awaken them to themselves, and for a short time, they are whole once again (Simmons-Stern, Budson, & Ally, 2010). According to Sacks (1991), a person with Alzheimer's has not actually lost memories, but simply lost access to the memories. He suggests that music can help an individual with Alzheimer's to "recall and reaccess not only his powers of speech, perceptual and thinking skills, but his entire emotional and intellectual configuration, life history, his identity – at least for a while" (Sacks, 1991, p. 12). Sacks is clear, however, that it must be the "right" music: music that holds special significance to the individual. Without a connection to the song, the music may not have as large of an impact on the person.

Music therapist Dr. Steven Hale suggests that music helps people with Alzheimer's disease because of the connection it has with emotion. He states, "While individuals with Alzheimer's disease might have lost much of their cognitive functioning, they still retain the ability to respond to emotion, a right brain function. Creativity is the last to go" (Humphrey, 2000, p.52). Oftentimes, music can trigger an emotional response, especially if the person listening associates the song with a person or event from their past. Janata (2009) studied the connection between music and memories within the brain, and found that both music and memories are associated with the medial prefrontal cortex. This connection explains why memories are so easily called to mind when a song is played. The medial prefrontal cortex deteriorates at a slower rate compared to

other portions of the brain, indicating that the connection between music and memories may remain even as other brain functions are lost (El Haj et al., 2012).

Knowing that music can sometimes cause a person to recall specific memories, it has been questioned whether music can help a person with Alzheimer's with their overall autobiographical recollection. A number of studies have shown that music does in fact play a role in the recall of individuals with Alzheimer's disease. A 2001 study by Foster and Valentine showed that participants with dementia recalled more autobiographical information with music playing in the background, rather than silence. El Haj, Postel, and Allain (2012) built off of Foster and Valentine (2001)'s study, but rather than playing the music in the background, music was played before interviewing the participants. The autobiographical memory recall of individuals with Alzheimer's disease was tested following either silence, an excerpt from Vivaldi's *Four Seasons,* or music selected by the participant. The researchers found that recall was significantly higher in the music conditions, and was greatest in the condition where the music was chosen by the participants themselves. It is believed that music selected by the participants evokes more emotional memories, which are often easier to recall. A study by El Haj, Fasotti, and Allain (2012) showed that compared to memories recalled in the silence condition, memories recalled in the music condition were more specific with greater emotional content, and were also retrieved faster.

Generally speaking, music seems to play a larger role in memory for people with Alzheimer's than for elderly individuals without dementia. In an experiment where participants studied song lyrics either with a sung recording or a spoken recording, the participants with Alzheimer's disease recalled the lyrics significantly better in the sung recording condition versus the spoken recording condition. The healthy elderly individuals, on the other hand, showed an

insignificant difference between the two conditions (Simmons-Stern, Budson, & Ally, 2010). Specific to autobiographical memory, Irish et al. (2006) compared autobiographical memory recall between people with Alzheimer's disease and healthy elderly individuals with and without music. While the healthy elderly individuals generally recalled more memories, there was no significant change in their recall between the music and no music conditions. Among the individuals with Alzheimer's, however, there was significantly more information recalled in the music condition versus the no music condition. This finding means that music has a greater effect on memory recall when there has first been memory loss.

No research was found related to the effects of music on personality in individuals with Alzheimer's disease. However, based on previous research showing the effects of music on other aspects of identity, namely autobiographical memory, it is believed that music may also affect personality in individuals with Alzheimer's disease.

Current Study

In this study, I looked at how music may affect aspects of identity in people with Alzheimer's disease, looking specifically at autobiographical memory and personality. Combining what was done in previous studies, I analyzed the differences in autobiographical recall with and without the playing of participant-selected music for both individuals with Alzheimer's and individuals without Alzheimer's. I also looked at how music affects personality, something on which there does not appear to be any previous research. By assessing autobiographical memory recall and the participants' sense of personality, I was able to see if music has an effect on awakening these aspects of identity in people with Alzheimer's disease.

I hypothesized that music would have an effect on aspects of identity in the participants with Alzheimer's disease. More specifically, I hypothesized that the autobiographical recall would be

greater when music was played than when it was not played, and likewise that the personality self-assessment would be more accurate when music was played compared to when it was not played. Furthermore, I hypothesized that there would be no significant differences for the participants without Alzheimer's disease; I hypothesized that music would not have an effect on their autobiographical memory recall or their judgment of their own personality.

Method

Participants

Participants were 23 residents (20 women and 3 men, ranging in age from 60 to 98) from Arlington Place, Good Shepherd Community, and St. Benedict's Senior Community, all senior communities in Central Minnesota. Nine of the participants had Alzheimer's disease, and the remaining 14 had no diagnosed dementia. The participants were selected by employees at each of the senior communities, who informed the experimenter whether or not the participant had Alzheimer's disease.

Materials

Each participant completed the Mini-Mental State Examination (Kurlowicz & Wallace, 1999) to measure their level of cognitive functioning. The MMSE has been used in several studies as a valid measure of cognitive functioning in elderly individuals. The MMSE is broken into five sections: Orientation, Registration, Attention and Calculation, Recall, and Language. The specific questions asked can be seen in Appendix A. The MMSE was scored out of 30 points; any participant scoring 10 or below would not be included in the study, as their cognitive functioning would not be high enough to complete the remaining measures. As a part of the MMSE, a pencil and a watch were used as objects to be named.

Participants also verbally described their interest and background in music with the questionnaire (see Appendix B). The intent of this questionnaire was threefold: to see if the participant enjoys music, if the participant has a background in music, and to learn the name of one of the participant's favorite songs. The information about the favorite song was used later in the experiment.

The Ten-Item Personality Inventory (Gosling, Rentfrow, & Swann, 2003) was used as a self-reported measure of the participant's personality (See Appendix C). The TIPI is a short and quick measure of personality based on the Big Five personality factors, and is valid and reliable (Gosling et al., 2003). It is best used in situations where time doesn't allow for an extensive measure of personality, making it ideal for this study. The TIPI asked participants to rate how strongly they believed each pair of adjectives described them. The test used a Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree").

Participants also completed the Autobiographical Memory Interview (Kopelman, Wilson & Baddeley, 1989). The AMI is commonly used to assess memory recall, particularly with elderly individuals. It is shown to be a valid measure of autobiographical memory (Irish et al., 2006; El Haj, Postel & Allain, 2012; Addis & Tippett, 2004). The AMI measures autobiographical memory through Personal Semantic questions and Autobiographical Incident questions. Personal Semantic questions asked the participant to recall names, dates, and other facts, while the Autobiographical Incident questions asked the participant to recall information about a specific event. The interview questions ranged from early childhood to recent past. For this experiment, the interview was broken into two halves which the participants completed on two separate occasions. The first set of questions (Set A) related to the following areas: Before School, High School, Wedding, and Recent Holidays and Journeys. The second set of questions

(Set B) related to the following areas: Elementary School, College/Career, Children and Meeting

Someone New, and Current Institution. In both sets, each section contained multiple Personal

Semantic questions and one Autobiographical Incident question (Set A can be seen in Appendix

D, and Set B can be seen in Appendix E). The participants' responses were scored according to

the instructions provided in the AMI manual. The questions were divided into the two sets as

evenly as possible: Set A was worth 39 points, and Set B was worth 40 points. Participants

received 3 scores: total score for Personal Semantic questions, total score for Autobiographical

Incident questions, and total overall score.

A laptop computer was used throughout the sessions. The sound recorder program on the

laptop was used to record the responses in the second and third sessions for later coding. The

laptop was also used in the music condition to play a song for the participant. A small portable

speaker was used to increase the volume of the music, making it easier for the participant to hear.

Questionnaires were also sent out to family members of the participants. The family

members received edited versions of the Music Questionnaire (see Appendix F) and the Ten-

Item Personality Inventory (see Appendices G and H) to be completed describing the

participants' musical background and personality.

Procedure

An employee at each senior community contacted a close family member or power of

attorney of each participant. The experimenter provided the employees with the necessary forms

for the family members. Through a letter, the family member was informed of the purpose of the

study. The family member then had the opportunity to provide his or her consent to assist in the

study. The powers of attorney of the participants with Alzheimer's disease also provided consent

for the participants. The family member was asked to fill out two additional forms. One form

asked about the participant's musical interest and background, nearly identical to the form used with the participants themselves (see Appendix F). The family member was also asked to describe the participant's personality using an edited version of the TIPI. If the participant had Alzheimer's disease, the family member was asked to describe the participant's personality before onset, and currently (see Appendix G). If the participant did not have Alzheimer's, the family member was asked to describe the participant's personality before moving into the senior community, and currently (see Appendix H).

All participants were seen on three separate occasions. The initial session was the same for all participants. For the remaining two sessions, participants were randomly assigned into the two conditions: music and no music. This part of the experiment was a between-subjects design, with the groups counterbalanced. The groups were further counterbalanced by which set of the AMI they received in each of the conditions. Each session with the participant typically took place around a week apart at the senior community where he or she resided. The sessions were all conducted between the hours of 10:00 a.m. and 4:30 p.m., but the exact time varied with each session.

At the first session, the participant listened to the explanation of the study given by the experimenter, and then gave his or her consent or assent. If the participant gave assent due to Alzheimer's, a witness was present and also signed the form. After the consent or assent form was signed, the participant completed the MMSE. Then, the participant answered the questions on the music questionnaire. Because of varying levels of cognitive and physical decline, all participants answered the questions verbally.

In the following two sessions, the participant completed the TIPI and half of the AMI. In the music condition, the participant first listened to a song. This song was selected by the

participant in the first meeting. If the participant did not name a specific song, the experimenter

referred to the data provided by the family. If still no specific song was chosen, the experimenter

chose a popular song by the artist or of the genre that the participant or their family was able to

provide. Following the playing of the song, the participant described his or her own personality

using the TIPI. The participant answered each of the 10 items using the Likert scale ranging from

1 ("Strongly disagree") to 7 ("Strongly agree"). Once this inventory was completed, the song

was played again. Then the participant answered the questions on one half of the AMI. Half the

participants in the music condition received Set A, and the other half received Set B.

In the no music condition, no music was played and instead the session began with the

participant describing his or her own personality using the TIPI. Then, the participant responded

to the questions on the AMI immediately following the TIPI; no song was played in between the

two measures. Again, half of the participants received Set A in this condition, while the other

half received Set B. All participants completed both sets, and so had opposite sets in the two

conditions, preventing a testing effect.

Analysis

The data from the TIPI was scored according to the instructions provided by Gosling,

Rentfrow, and Swann (2003). The participant's responses between the music and no music

conditions were compared for differences. The responses were also compared with the family

member's responses. Both sets of the family member's responses were used: the description of

the participant's current personality, as well as the description of the participant's personality

before the onset of Alzheimer's or moving into the senior community.

The answers given in the AMI were scored according to the instructions provided in the

AMI manual. The Personal Semantic questions were scored based on accuracy of remembering

specific dates, names, and facts. The more accurate and specific the answer, the more points the participant received. The Autobiographical Incident questions, relating to a memory of a specific event, were scored on a scale of 0-3. A 0 indicated that the participant was unable to come up with a response, a 1 meant that the answer was extremely vague, a 2 indicated that the answer was a personal event but not specific with time and place, and a 3 meant that the answer was specific, with time and place. As Set A and Set B had different possible totals, participants' scores for were converted into percentages before being compared. Family members were contacted to verify answers given in this portion of the study.

Once all of the data was compiled, the experimenter analyzed the data for differences between groups and conditions. The data was analyzed for differences between the music and no music condition, and further, to see if there was a difference between the participants with Alzheimer's disease and the participants without Alzheimer's disease.

Results

Participants with Alzheimer's disease scored significantly lower on the MMSE, $M = 16.33$ (2.64) compared to participants without Alzheimer's, $M = 25.71$ (4.70). Scores can be seen in Figure 1. Three of the participants without Alzheimer's scored as low as the participants with Alzheimer's. As a result, the data was also split by the median score on the MMSE (19), creating two groups: High Cognitive Functioning (score of 20 and above) and Low Cognitive Functioning (score of 19 and below). Data was analyzed twice: first by looking at the Alzheimer's/No Alzheimer's groups, and then by looking at the High Cognitive Functioning/Low Cognitive Functioning groups.

The Effect of Alzheimer's Disease

It was hypothesized that the participants with Alzheimer's disease would score significantly higher on the Autobiographical Memory Interview (AMI) in the music condition compared to the no music condition, and that there would be no significant difference between the two conditions for the participants without Alzheimer's disease. A 2 (Music) x 2 (Memory Type) x 2 (Alzheimer's) Mixed (Music and Memory Type within subjects, Alzheimer's between subjects) ANOVA was completed to analyze scores on the AMI. The two sections of the AMI, Personal Semantic questions and Autobiographical Incident questions, were scored and analyzed as two separate tests. The test showed a main effect for Memory Type, $F(1, 21) = 58.37$, $p < .001$ (one-tailed), indicating that participants scored higher on the Personal Semantic portion of the AMI compared to the Autobiographical Incident portion. There was also a main effect for Alzheimer's, $F(1, 21) = 28.71$, $p < .001$, as participants with Alzheimer's disease overall scored lower than participants without Alzheimer's. There was no main effect for Music, $F(1, 21) = 0.30$, $p = .297$. There was a significant interaction between Memory Type and Alzheimer's, $F(1, 21) = 4.410$, $p = .024$, but no interaction between Music and Memory Type, $F(1,21) = .044$, $p = .418$ or Music and Alzheimer's, $F(1, 21) = 1.642$, $p = .107$. There was a significant three way interaction between Music, Memory Type, and Alzheimer's, $F(1, 21) = 3.44$, $p = .039$.

Because there was a significant interaction between Music, Memory Type, and Alzheimer's, and because it was hypothesized that there would be a difference between participants with and without Alzheimer's disease, a 2 (Music) x 2 (Memory Type) ANOVA was completed. The test was split by Alzheimer's to look at differences between the scores of the two groups in each condition. For the participants without Alzheimer's, there was a main effect for Memory Type, $F(1,13) = 46.45$, $p < .001$, but no main effect for Music, $F(1, 13) = .27$, $p = .308$. There was no

interaction between Music and Memory Type, $F(1, 13) = 1.89$, $p = .096$. For participants with Alzheimer's disease, there was a main effect for Memory Type, $F(1, 8) = 24.997$, $p < .001$, but no main effect for Music, $F(1,8) = 2.76$, $p = .068$. There was a significant interaction between Music and Memory Type, $F(1,8) = 3.92$, $p = .042$.

Since there was a significant interaction between Music and Memory Type for participants with Alzheimer's disease but not for those without Alzheimer's, a paired samples *t*-test split by Memory Type was conducted to compare both the Personal Semantic and Autobiographical Incident scores in the music and no music conditions. With the participants without Alzheimer's, there was no significant difference between the Personal Semantic scores in the no music condition, $M = 0.64$ (0.20) and the music condition, $M = 0.66$ (0.19), $t(13) = -0.46$, $p = .326$, $d = .083$ (one-tailed). There was also no significant difference between the Autobiographical Incident scores in the no music condition, $M = 0.38$ (0.25) and the music condition, $M = 0.33$ (0.20), $t(13) = 1.03$, $p = 0.162$, $d = .235$. With the participants with Alzheimer's disease, there was not a significant difference between the Personal Semantic scores in the no music condition, $M = 0.23$ (0.15) and the music condition, $M = 0.25$ (0.12), $t(8) = -0.82$, $p = .218$, $d = .137$. However, there was a significant difference between the Autobiographical Incident scores, with participants scoring higher in the music condition, $M = 0.11$ (0.08) than in the no music condition, $M = 0.04$ (0.08), $t(8) = -1.96$, $p = .043$, $d = .883$. A graph comparing the results between the two groups can be seen in Figure 2.

The Effect of Cognitive Functioning

All of the tests were rerun, splitting the data by Cognitive Functioning (based on MMSE score) rather than by Alzheimer's. A 2 (Music) x 2 (Memory Type) x 2 (Cognitive Functioning) mixed (Music and Memory Type within subjects, Cognitive Functioning between subjects)

ANOVA was first conducted to analyze the scores on the AMI between the High and Low Cognitive Functioning groups. The test showed a main effect for Memory Type, $F(1,21) = 64.35$, $p < .001$, again indicating that participants scored higher in the Personal Semantic portion of the AMI compared to the Autobiographical Incident portion. There was also a main effect for Cognitive Functioning, $F(1,21) = 43.83$, $p < .001$, showing that the High Cognitive Functioning group scored higher than the Low Cognitive Functioning group overall. There was no main effect for Music, $F(1,21) = 0.039$, $p = .423$. There was a significant interaction between Music and Cognitive Functioning, $F(1,21) = 4.07$, $p = .029$. There was no interaction between Memory Type and Cognitive Functioning, $F(1, 21) = 2.41$, $p = .068$, or between Music and Memory Type, $F(1, 21) = 0.43$, $p = .259$. There was no three-way interaction between Music, Memory Type, and Cognitive Functioning, $F(1,21) = 1.58$, $p = .111$.

Since there was an interaction between Music and Cognitive Functioning, a 2 (Music) x 2 (Memory Type) ANOVA was conducted, split by Cognitive Functioning. For the High Cognitive Functioning group, there was a main effect for Memory Type, $F(1,10) = 29.02$, $p < .001$, but not for Music, $F(1,10) = 1.02$, $p = .169$. There was no interaction between Music and Memory Type, $F(1,10) = 1.07$, $p = .163$. For the Low Cognitive Functioning group, there was a main effect for both Memory Type, $F(1,11) = 41.02$, $p < .001$, and Music, $F(1,11) = 5.22$, $p = .022$. There was no interaction between Music and Memory Type, $F(1,11) = .46$, $p = .257$.

To further explore the results in line with the Alzheimer's-based analysis, paired samples t-tests split by Memory Type were conducted to compare both the Personal Semantic and Autobiographical Incident scores in the music and no music conditions. With the High Cognitive Functioning group, there was no significant difference between the Personal Semantic scores in the no music condition, $M = 0.71$ (0.15) and the music condition, $M = 0.70$ (0.17), $t(10) = 0.25$, p

= .405, *d* = .064. There was also no significant difference between the Autobiographical Incident

scores in the no music condition, *M* = 0.45 (0.24) and the music condition, *M* = 0.35 (0.19), t(10)

= 1.20, p = .129, *d* = .445. With the Low Cognitive Functioning group, there was a significant

difference between the Personal Semantic scores, as participants scored higher in the music

condition (*M* = 0.31, *SD* = 0.18) than in the no music condition, *M* = 0.27 (0.17), *t*(11) = -1.99, *p*

= .036, *d* = .246. There was also a significant difference between the Autobiographical Incident

scores, as participants scored higher in the music condition, *M* = 0.13 (0.03) than in the no music

condition, *M* = 0.06 (0.11), *t*(11) = -1.92, *p* = .041, *d* = .758. A graph comparing the results

between the two groups can be seen in Figure 3.

The Effect of Music on Personality

It was hypothesized that when in the music condition, participants with Alzheimer's

disease would provide a more accurate description of their personality compared to when in the

no music condition. Furthermore, it was hypothesized that there would be no significant

differences between the conditions for the participants without Alzheimer's disease. A 2 (Music)

x 2 (Alzheimer's) x 5 (Personality) ANOVA was conducted to analyze the data collected with

the Ten-Item Personality Inventory (TIPI). There were no significant differences in the responses

from the TIPI between the music and no music conditions, when split by Alzheimer's or when

split by Cognitive Functioning, all *p* > .246 (two-tailed). Insufficient data was received from

family members, and as a result the participant and family data was unable to be compared.

However, individual personality scores differed so minimally that this analysis would be highly

unlikely to be significant no matter what the families reported. See Table 1 for data from the

paired samples *t*-test conducted for the participant's responses.

Discussion

It was hypothesized that participants with Alzheimer's disease would score higher on the Autobiographical Memory Interview (AMI) in the music condition than in the no music condition, and that there would be no significant differences between the two conditions for participants without Alzheimer's disease. This hypothesis was not fully supported, but there were significant results when the AMI was separated into its two parts, the Personal Semantic portion and the Autobiographical Incident portion. Additionally, it was hypothesized that the participants with Alzheimer's disease would be more accurate in the description of their personality on the Ten-Item Personality Inventory (TIPI) in the music condition than in the no music condition, and that there would be no significant difference between the two conditions for participants without Alzheimer's disease. The results of this study failed to support this hypothesis.

Music and Autobiographical Memory Interview

The data from the AMI was analyzed twice, first by dividing the groups into participants with Alzheimer's and participants without Alzheimer's, as hypothesized. Due to low MMSE scores from three of the non-Alzheimer's participants, data was also analyzed by dividing the groups into high and low Cognitive Functioning (as determined by the median MMSE score).

Alzheimer's. When comparing the data from the AMI between the Alzheimer's and no Alzheimer's groups, it was found that whether or not music was played before responding to the questions on the AMI made no difference for the participants without Alzheimer's. The results were insignificant for both the Personal Semantic and Autobiographical Incident portions of the test. This is consistent with what was hypothesized. When looking at the participants with Alzheimer's disease, there was no main effect for Music, thus failing to support the hypothesis. However, there was an interaction between Music and Memory Type, indicating that the playing

of music before the AMI did not have the same effect on the Personal Semantic and

Autobiographical Incident scores. As a result, *t*-tests were run to compare the differences

between conditions for the Personal Semantic and Autobiographical Incident scores separately.

Results were insignificant for the Personal Semantic portion, indicating that the music had no

effect on participant recall for those types of memories. However, there was a significant

difference between the music and no music conditions with the Autobiographical Incident

scores. This indicates that music is able to help individuals with Alzheimer's disease recall more

details about a particular event from their lifetime.

Cognitive functioning. When comparing the AMI data between the High and Low

Cognitive Functioning groups, similar results were found. The High Cognitive Functioning

group showed no significant difference between the music and no music conditions for either the

Personal Semantic or Autobiographical Incident portions of the AMI, as was the case for the

participants without Alzheimer's disease. For the Low Cognitive Functioning group, there were

significant results, but they differed from the results found with the participants with

Alzheimer's. In this case, there was a main effect for Music, and no interaction between Music

and Memory Type; participants scored significantly higher on both the Personal Semantic and

Autobiographical Incident portions in the music condition. By splitting the data into High and

Low Cognitive Functioning groups rather than Alzheimer's and No Alzheimer's groups, the

playing of music was shown to have a more widespread effect, with significant results in both

the Personal Semantic and Autobiographical Incident portions of the AMI.

Music and Ten-Item Personality Inventory

The results did not support the hypothesis regarding personality. Whether the data was

split by Alzheimer's or by Cognitive Functioning, there were no significant differences between

the music and no music conditions for either group. It can be inferred that the playing of music does not affect how a person describes their own personality.

Explanations

While the results regarding memory do not perfectly match the hypothesized results, there are still interesting significant results. As predicted, music does not seem to affect participants without Alzheimer's disease, or those who have high cognitive functioning. As these participants' memories are still fairly intact, these results are unsurprising. What is more interesting are the results regarding the participants with Alzheimer's disease and the participants who have low cognitive functioning. Music has an effect on memory recall of people with Alzheimer's disease when thinking of a specific event, but does not significantly affect their ability to recall semantic data such as names, addresses, and dates. However, when the data is divided by cognitive functioning instead, the participants with low cognitive functioning were significantly affected by music overall. When music was played, these participants scored significantly higher on both recalling semantic memories and specific events. However, the effect size for the Personal Semantic scores was significantly smaller than the effect size for the Autobiographical Incident scores, indicating that the relationship between Music and Personal Semantic scores is weaker than the relationship between Music and Autobiographical Incident scores.

Music and Personal Semantic scores. There is a possible explanation as to why the Low Cognitive Functioning group scored significantly higher on the Personal Semantic questions with music, while the Alzheimer's group alone did not. When the participants were split by Alzheimer's, the non-Alzheimer's group consisted of eleven participants who had high cognitive functioning and three participants who had low cognitive functioning. Music did not

have any effect on the participants with high cognitive functioning, but there was a small increase in recall in the music condition for the three individuals with low cognitive functioning in the non-Alzheimer's group. Therefore, among the non-Alzheimer's group there were two different response patterns. Within the Alzheimer's group, which consisted solely of low cognitive functioning individuals, there was also a non-significant increase in recall in the music condition. When the data was split by Cognitive Functioning and the scores of the three low cognitive functioning individuals without Alzheimer's disease were combined with scores of the low cognitive functioning individuals with Alzheimer's, the patterns were the same and the effect of music was strengthened. The effect of music on Alzheimer's participants alone was not strong enough to be significant, but with the addition of three more low cognitive functioning individuals, the effect of music became significant. As a result, the Low Cognitive Functioning group showed a significant increase in recall for Personal Semantic data with the playing of music.

Music and Autobiographical Incident scores. Music very clearly helps individuals with Alzheimer's disease recall more details about specific events from their lifetime. There are many possible reasons why this increase in recollection occurs. As Janata (2009) discussed, there is a connection in the brain between music and emotion. It is possible that the music played in the study affected the participants on an emotional level, and those emotions helped them to recall more about a specific event. Music has also been thought to connect with specific memories (Levitin, 2006). It may be possible that the song played during the study brought back a specific memory from the participant's past, if the song was associated with a specific event or time in their life.

With the emotional connection in mind, it is reasonable that participants with Alzheimer's disease have improved recall of specific events with the playing of music. Generally speaking, there are emotions associated with different events in a person's life. If emotion does help memory recall, it would help a person to recall details about a specific event rather than a simple fact, such as a date of birth. It is also possible that semantic data is stored differently in the brain than memory for events. Music may be able to more easily reactivate the memory network and pull together memories for specific events than semantic data, especially if the events have more emotions associated with them. Overall, it is very possible that the autobiographical incidents hold more meaning for the individuals than the factual data does, making it easier to recall those incidents with the playing of music.

Music and Personality. Though it was hypothesized that music would affect how the participants with Alzheimer's disease judge their own personality, the results showed otherwise. There was no significant difference in how either the participants with Alzheimer's disease or the participants without Alzheimer's disease judged their own personality between the two different conditions. This clearly implies that there is no connection between music and personality. The fact that music did not have a significant effect on personality also implies that personality and autobiographical memory are not closely linked as aspects of identity, and that music may not affect overall identity in the broad sense of the term.

Though changes in personality are a clear characteristic of Alzheimer's disease, it may be possible that the individual does not fully lose sight of the personality that suited them for the majority of their life. Perhaps the individual is aware that they have become more withdrawn, for example, but still think of themselves as the outgoing and extroverted person they once were. Therefore, when responding to the Ten-Item Personality Inventory in the no music condition, it

may be possible that the individuals responded by describing their personality before

Alzheimer's set in. In the music condition, it is possible that the music did reawaken aspects of

their identity, and it simply further reinforced their responses that described their personality pre-

Alzheimer's. Another, perhaps more realistic, explanation is that the individuals with

Alzheimer's disease described their current personality in the no music condition, and again in

the music condition; the music did not awaken the personality aspect of identity at all. If more

data had been able to be collected from the family members, it may have been possible to

compare that data with the participants' data to determine whether participants' responses were

more closely related to their current personality or their personality before the onset of

Alzheimer's disease.

Future Research and Applications

This study opens up many possibilities for more research. If the budget allowed it, it

would be very helpful to run the study again, using brain imaging tools to determine the

difference in brain activity between the music and no music conditions. Future studies could also

look deeper into the differences between people with Alzheimer's disease and people with

general low cognitive functioning to help determine why the results in this study were different

between the two groups. Future studies could also focus on the Autobiographical Incident

questions, to further understand why music increases recall for specific events with people with

Alzheimer's. It would also be interesting to incorporate song choice into the results. Many

participants were unable to name a favorite song, and if the family did not name a song either, I

had to choose. Since Sacks (1991) points out that the song must mean something to the person to

be most effective, and El Haj et al. (2012) found that recall was higher when participants chose

their own music, it could be worthwhile to compare the scores of those who chose a specific

song and those who did not. Future studies could also examine the connection between music and personality; though I was unable to find significant results, it may be possible that another approach would find something different. To conduct additional research on the topic of music, identity, and Alzheimer's disease, researchers could examine aspects of identity other than memory and personality. On a broader level, future studies could look into other ways music may affect people with Alzheimer's disease or other diagnoses.

This study helps to support music therapy, as it shows an increase in memory recall for people with Alzheimer's disease simply by playing a song. These results could be applied in senior communities and nursing homes, as they show the positive value of music. The results indicate that playing music in the senior communities and nursing homes could be beneficial for residents.

Limitations

While the study did have some significant results, there were still limitations in the study that may have affected the results. Gathering participants with Alzheimer' disease proved to be difficult. Due to confidentiality reasons, I could not contact families directly and needed to go through the employees at the senior communities. Many of the forms sent out to families of potential participants never made it back to me or the senior communities. As a result, I had fewer participants than originally planned. Furthermore, the majority of the family forms describing the participant's personality were not returned, and as a result that aspect of the study could not be analyzed. Additionally, since I was not able to receive phone numbers for all of the powers of attorney for the participants with Alzheimer's disease, I could not verify the answers on the AMI for all of the participants.

With more time, it would have been possible to reach out to other senior communities in hopes of gathering more participants. Time also may have affected the results of the study, as I did not meet with participants at the same time of day for each session. Since some people may function better in the morning versus the afternoon (or vice versa), it would have been better to be more consistent with the times of the interviews. Having more time to conduct the interviews would have made this possible. The Ten-Item Personality Inventory was chosen as the personality assessment for this study because of the short amount of time required to administer the test; however, it may have been beneficial to use a longer, more valid measure of personality.

There are a few other factors that may have played into the results. People with Alzheimer's disease tend to have good days and bad days, and their level of self-awareness can vary. It is possible that I met with the participants on different types of days for the interviews, and that the differences in responses were not necessarily due to the music. Additionally, it was difficult to control for exposure to music. While no music was played in the no music condition, it was hard to know if the participant was affected by any music heard shortly before the study, whether on TV, the radio, or from another resident playing piano. While it may be unlikely that the results were affected by external sources of music, the possibility remains. Furthermore, the gender split in the study was highly unbalanced, with 20 women and three men. Therefore, it is difficult to say with confidence that music has the same effect on men and women with Alzheimer's disease.

The labeling of participants as either having Alzheimer's disease or not having Alzheimer's disease may have been an issue, as there are varying degrees of dementia and Alzheimer's cannot be definitively diagnosed without an autopsy. Administering the MMSE was helpful in determining the level of cognitive functioning for each participant, and later dividing

the participants into high and low cognitive functioning groups may have helped to alleviate this issue.

Finally, it is unknown how long the effect of music lasts. Perhaps its effect wore off by the end of the session, or perhaps it lasted for a couple of hours afterward. It is also possible that the length of the effect varies person to person. While I was able to find a significant effect for music in this study, the effect is likely only temporary.

Conclusion

Music does have an effect on the autobiographical memory aspect of identity in people with low cognitive functioning, including those with Alzheimer's disease. Music helps people with Alzheimer's disease to recall more details about specific events, but does not help them to recall semantic data, such as names and dates, at a level that is significant. Individuals with low cognitive functioning show a significant increase in recollection of both specific events and semantic data with the playing of music. However, music does not have a significant effect on the autobiographical memory recall of people with high cognitive functioning. Regardless of whether people have high or low cognitive functioning, music does not have a significant effect on how people describe their own personality. While both autobiographical memory and personality are aspects of identity, it appears they may not be closely tied together, as music did not affect both aspects equally. The results overall suggest that music can be beneficial with memory recall in people with low cognitive functioning, including people with Alzheimer's disease.

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Table 1

Means and Standard Deviations of TIPI Responses

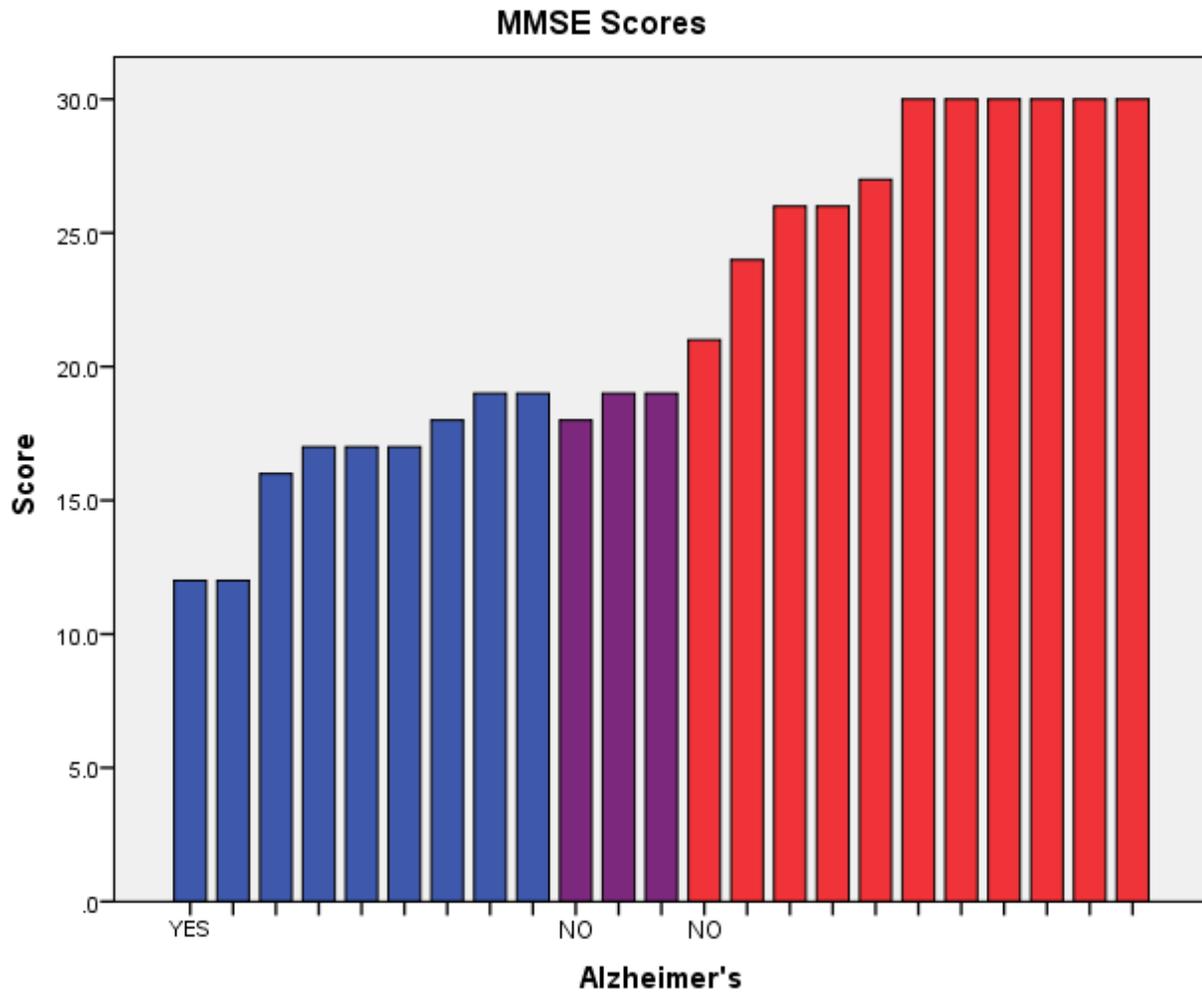|	Alzheimer's		No Alzheimer's	
Personality Factor	No Music	Music	No Music	Music
Extraversion	3.33 (1.85)	3.56 (1.47)	4.64 (1.73)	5.00 (1.61)
Agreeableness	5.83 (0.94)	5.67 (0.90)	5.57 (0.90)	5.57 (1.19)
Conscientiousness	5.78 (0.94)	5.83 (1.00)	5.75 (0.83)	5.89 (0.76)
Emotional Stability	5.11 (0.89)	5.06 (0.58)	5.00 (1.18)	4.96 (1.01)
Openness	3.83 (1.15)	4.06 (0.58)	5.46 (0.95)	4.93 (1.30)

Figure 1. MMSE scores of all participants. The three lowest scores of the non-Alzheimer's participants, marked with purple, gave reason to split the data into high and low Cognitive Functioning. The blue and purple bars mark the Low Cognitive Functioning participants, and the red bars mark the High Cognitive Functioning participants.
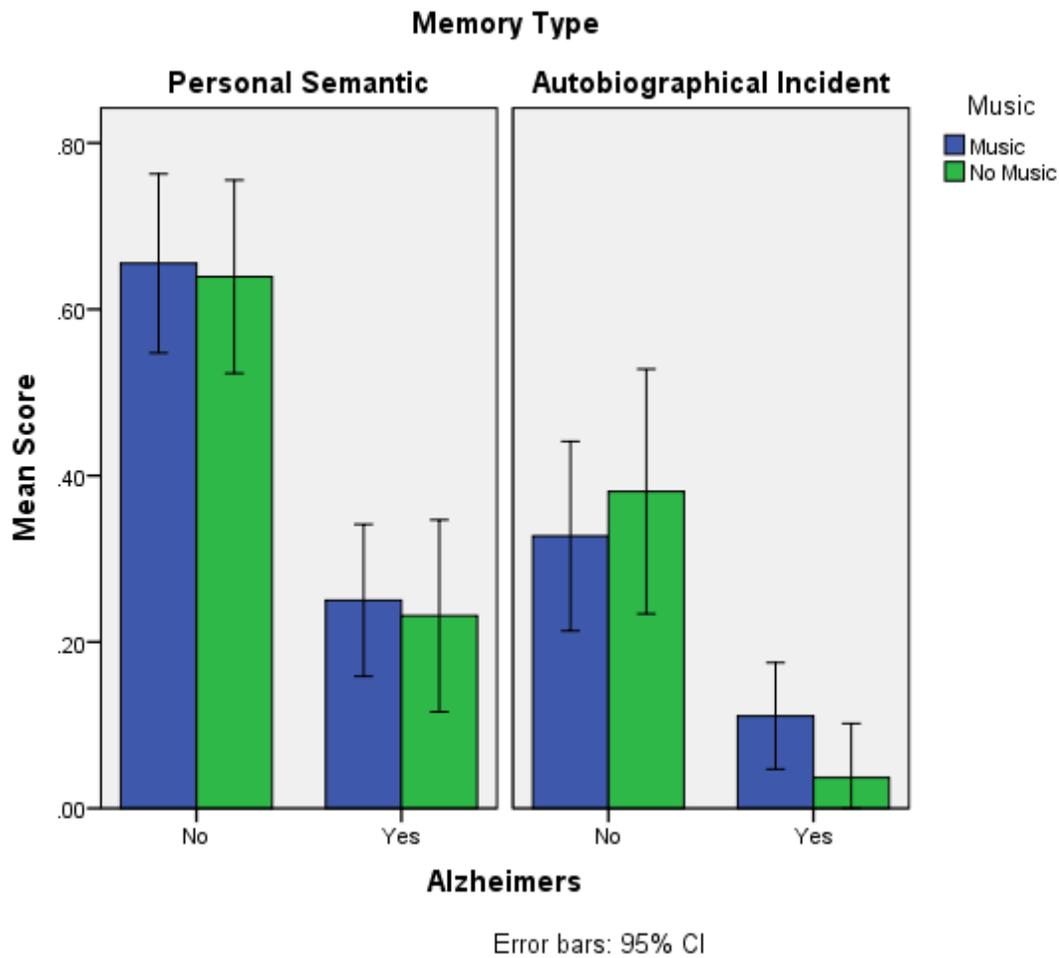
Figure 2. The type of memory interacts with music for participants with Alzheimer's. Participants with Alzheimer's disease scored significantly higher on the Autobiographical Incident portion of the test when music was played, compared to when no music was played. There were no significant differences between the Personal Semantic scores with and without music. Individuals without Alzheimer's disease showed no significant differences in scores on either the Autobiographical Incident or Personal Semantic portions of the AMI. N = 23 (9 with Alzheimer's).
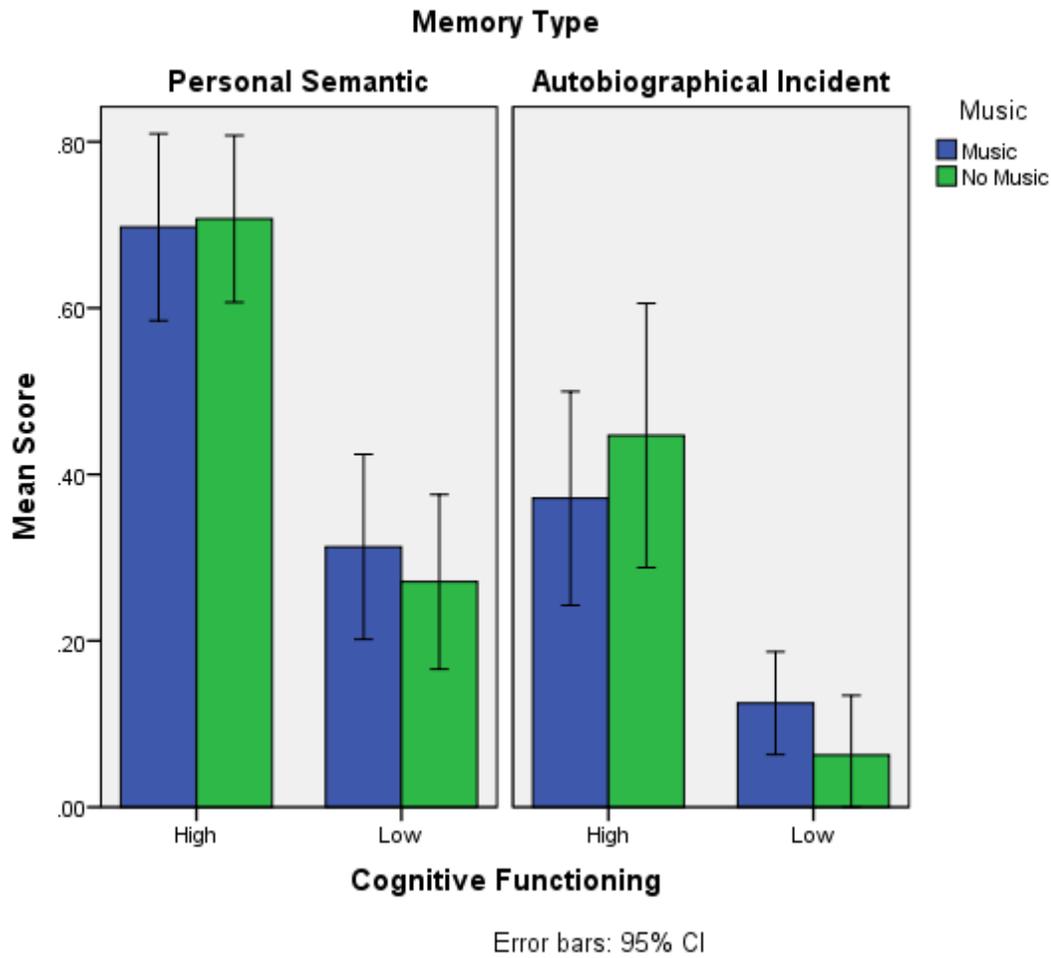
Figure 3. Participants with High Cognitive Functioning did not score significantly differently between the music and no music conditions on either the Personal Semantic or Autobiographical Incident portions of the AMI. The Low Cognitive Functioning participants scored significantly higher on both the Personal Semantic and Autobiographical Incident portions of the AMI in the music conditions versus the no music condition. N = 23 (9 with Alzheimer's).
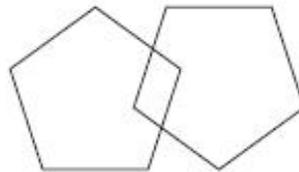
Appendix A

The Mini-Mental State Exam

Patient_____ Examiner _____ Date _____

Maximum	Score	
		Orientation
5	( )	What is the (year) (season) (date) (day) (month)?
5	( )	Where are we (state) (country) (town) (hospital) (floor)?
		Registration
3	( )	Name 3 objects: 1 second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer. Then repeat them until he/she learns all 3. Count trials and record. Trials _____
		Attention and Calculation
5	( )	Serial 7's. 1 point for each correct answer. Stop after 5 answers. Alternatively spell "world" backward.
		Recall
3	( )	Ask for the 3 objects repeated above. Give 1 point for each correct answer.
		Language
2	( )	Name a pencil and watch.
1	( )	Repeat the following "No ifs, ands, or buts"
3	( )	Follow a 3-stage command: "Take a paper in your hand, fold it in half, and put it on the floor."
1	( )	Read and obey the following: CLOSE YOUR EYES
1	( )	Write a sentence.
1	( )	Copy the design shown.

_____ Total Score

ASSESS level of consciousness along a continuum _____

Alert   Drowsy   Stupor   Coma

Appendix B

Music Questionnaire

Do you enjoy listening to music?

Did you play any instruments or sing at any point in your life?

What is one of your favorite songs? (*If unable to answer, then:* Who is one of your favorite artists? *Last resort:* What is your favorite kind of music?)

Appendix C

Ten-Item Personality Inventory-(TIPI)

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which *you agree or disagree with that statement.* You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

I see myself as:
1. _____ Extraverted, enthusiastic.
2. _____ Critical, quarrelsome.
3. _____ Dependable, self-disciplined.
4. _____ Anxious, easily upset.
5. _____ Open to new experiences, complex.
6. _____ Reserved, quiet.
7. _____ Sympathetic, warm.
8. _____ Disorganized, careless.
9. _____ Calm, emotionally stable.
10. _____ Conventional, uncreative.

TIPI scale scoring ("R" denotes reverse-scored items): Extraversion: 1, 6R; Agreeableness: 2R, 7; Conscientiousness; 3, 8R; Emotional Stability: 4R, 9; Openness to Experiences: 5, 10R.

Appendix D

Autobiographical Memory Interview

The following is an outline of the Autobiographical Memory Interview (AMI), divided into two separate sets: one for each session. The AMI is meant to be a fairly flexible measurement, and the individual nature of memories may require follow up questions to be asked. The AMI will be scored according to the instructions in the AMI manual (see attached).

AMI Set A

Total points possible: 39

Period Before School
Personal Semantic Questions (5 points)
1) What is the address you were living at before going to school?
2) Can you name three friends or neighbors from the period before you went to school?

Autobiographical Incident Question (3 points)
1) Can you recall an incident from the period before you went to school? (Prompt: Your first memory? Involving a brother or sister?)

High School (ages 11-18)
Personal Semantic Questions (8 points)
1) What is the name of the high school you attended?
2) Where was your high school located?
3) Did you graduate? If so, what year? If not, what year did you leave school?
4) What is the address you were living at while attending high school?
5) Can you name three teachers or friends from high school?

Autobiographical Incident Question (3 points)
1) Can you recall an incident that occurred while you were in high school? (Prompts: Involving a teacher? Involving a friend?)

Wedding
Personal Semantic Questions (9 points)
1) Were/Are you married? If so, what date were you married? (if not married, or if married at age 40 or later, ask: Can you name someone whose wedding you attended during your twenties? Where did this wedding take place?)
2) What is the address you were living at before this wedding?
3) What is the address you were living at immediately after this wedding?
4) What was the name of the best man from the wedding? (If no best man, name one of the guests)
5) What was the name of one of the bridesmaids from the wedding? (If no bridesmaids, name one of the guests)
6) What was your maiden name/the maiden name of the bride?

Autobiographical Incident Question (3 points)
1) Can you recall an incident from this wedding? (Prompts: An incident involving a guest at the wedding? An incident at the reception?)

Holidays and Journeys
Personal Semantic Questions (5 points)
1) Where did you spend last Christmas (or Thanksgiving)?
2) Can you name a person who you spent Christmas (or Thanksgiving) with?
3) Can you name a place you have visited in the last year? (if necessary, within the last five years)
4) When did this trip take place?
5) Who went with you on this trip?

Autobiographical Incident Question (3 points)
1) Can you recall an incident that took place while on this trip? (Prompts: At the place you visited? Involving someone you met?)

Appendix E

AMI Set B

Total points possible: 40

First School
Personal Semantic Questions (8 points)
1) What is the name of the first school you attended?
2) Where was your school located?
3) How old were you when you started at this school?
4) What is the address you were living at when you started this school?
5) Can you name three teachers or friends from this school?

Autobiographical Incident Question (3 points)
1) Can you recall an incident which occurred while you were at school (ages 5-11)? (Prompts: Involving a teacher? Involving a friend?)

Career
Personal Semantic Questions (8 points)
1) Did you obtain any qualifications after leaving school? (College, vocational school, etc.) If so, what qualifications did you obtain?
2) (If they did obtain qualifications) What institution did you attend? Can you name one of the courses?
(If they did not obtain qualifications) What was your first job? What was the name of the firm or organization?
3) What is the address you were living at while obtaining the qualifications (or starting your first job)?
4) Can you name three friends or colleagues from this period?

Autobiographical Incident Question (3 points)
1) Can you recall an incident from college (or your first job)? (Prompts: your first day at work or college? An incident with a friend?)

Children and Meeting Someone New
Personal Semantic Questions (4 points)
1) What is the name of your first child? (If no child: a niece, nephew, or child of a close friend)
2) What is the child's date of birth? (If not own child: age of child is acceptable)
3) Where was the child born?
4) What is the name of your second child? (If no child: a niece, nephew, or child of a close friend)
5) What is the child's date of birth? (If not own child: age of child is acceptable)
6) Where was the child born?

Autobiographical Incident Question (3 points)
1) Can you recall a first encounter with someone while in your twenties? (Prompts: meeting someone in an interview? Meeting someone on a trip or at work? If applicable for time frame – when you met your spouse?)

Present Hospital or Institution
Personal Semantic Questions (8 points)
1) What is the name of the place we are currently in?
2) Where is this place located?
3) When did you first arrive here?
4) What is the address for where you are currently living?
5) Can you name three staff members or fellow residents here?

Autobiographical Incident Question (3 points)
1) Can you recall an incident that occurred here? (Prompts: involving other residents? To do with the nurses or other staff members?)

Appendix F

Music Questionnaire

Resident's Name_____

Does your family member enjoy listening to music?

Did your family member play any instruments or sing at any point in his or her life?

What is one of your family member's favorite songs? (If no specific song comes to mind, who is your family member's favorite artist?)

Appendix G

Personality Description of Family Member

Appendix A. Ten-Item Personality Inventory-(TIPI)

Here are a number of personality traits that may or may not apply to your family member. Please write a number next to each statement to indicate the extent to which *you agree or disagree with that statement.* You should rate the extent to which the pair of traits applies to the person, even if one characteristic applies more strongly than the other.

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

CURRENTLY
I see my family member as:

BEFORE ALZHEIMER'S
I saw my family member as:

CURRENTLY		BEFORE ALZHEIMER'S
1. _____	Extraverted, enthusiastic.	1. _____
2. _____	Critical, quarrelsome.	2. _____
3. _____	Dependable, self-disciplined.	3. _____
4. _____	Anxious, easily upset.	4. _____
5. _____	Open to new experiences, complex.	5. _____
6. _____	Reserved, quiet.	6. _____
7. _____	Sympathetic, warm.	7. _____
8. _____	Disorganized, careless.	8. _____
9. _____	Calm, emotionally stable.	9. _____
10. _____	Conventional, uncreative.	10. _____

Appendix H

Personality Description of Family Member

Appendix A. Ten-Item Personality Inventory-(TIPI)

Here are a number of personality traits that may or may not apply to your family member. Please write a number next to each statement to indicate the extent to which *you agree or disagree with that statement.* You should rate the extent to which the pair of traits applies to the person, even if one characteristic applies more strongly than the other.

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

CURRENTLY I see my family member as:		*BEFORE HE/SHE MOVED TO THE SENIOR COMMUNITY* I saw my family member as:
1. _____	Extraverted, enthusiastic.	1. _____
2. _____	Critical, quarrelsome.	2. _____
3. _____	Dependable, self-disciplined.	3. _____
4. _____	Anxious, easily upset.	4. _____
5. _____	Open to new experiences, complex.	5. _____
6. _____	Reserved, quiet.	6. _____
7. _____	Sympathetic, warm.	7. _____
8. _____	Disorganized, careless.	8. _____
9. _____	Calm, emotionally stable.	9. _____
10. _____	Conventional, uncreative.	10. _____