The impact of music on cognition of Alzheimer’s disease patients

A Review

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Alzheimer’s disease is the 6th leading cause of death in the U.S. According to “Alzheimer’s Facts & Figures” (2013), “it [Alzheimer’s disease] is the only cause of death among the top ten in America without a way to prevent it, cure it, or even slow its progression”. Alzheimer’s disease affects 1 in 3 seniors and is developed in an American every 68 seconds. By 2050, every 33 seconds Alzheimer’s disease will develop in one American as the population of Americans over 65 years old increases. This progressive and devastating disease has a widespread impact, affecting not only the individual with the disease, but family members and caregivers. $9.1 billion were spent in additional healthcare costs in 2012 because of the emotional and physical impact on Alzheimer’s patients’ caregivers. According to “Alzheimer’s Facts & Figures,” (2013) unless Alzheimer’s disease is cured or treated in a better way, Alzheimer’s will cost an estimated $1.2 trillion (in today’s dollars) in 2050 and costs to Medicare and Medicaid will increase over 500 percent. Therefore, Alzheimer’s disease does not only have an emotional and physical consequence, but will have an economic consequence. Exploration of alternative promising future treatments is the key in the battle against Alzheimer’s disease. Music therapy and other musical activities like listening to music and playing a musical instrument offer promise in the search for a treatment to help Alzheimer’s patients regain their identity. However, only about 5,000 certified music therapists exist in the U.S. and less than 20% work with the elderly ("Alzheimer's Facts & Figures," 2013).

In Alzheimer’s patients, music seems to be the most complex part of memory that is spared by the disease (Spiro, 2010). Verghese et al. followed elderly adults 75 years or older for five years (Verghese, Lipton, Katz, Hall, Derby, Kuslanisky & Buschke, 2003). The scientists discovered that those who frequently played a musical instrument were less likely to develop dementia. Also, those with participation scores in the top 1/3 of all participants, judged by the
amount of time spent on the activity, had a 63% lower risk of dementia. Therefore, music seems to have the strongest “protective effect” against the degeneration of the brain out of cognitive activities like reading, writing, or doing crossword puzzles (as interpreted by Wan & Schlaug, 2010, p.5). However, in musicians who have developed dementia, the procedural memory (motor skills needed for playing the instrument) and declarative semantic memory (memory of the vocabulary associated with playing the instrument) are still intact (Spiro, 2010). In a study completed by Sluming et al. (2002), the scientists discovered that there was increased gray matter density in the left inferior frontal gyrus of professional musicians that was not observed in non-musicians (Sluming, Barrick, Howard, Cezayirili, Mayes, Roberts, 2002). In addition, the scientists found that there were “significant age-related volume reductions in cerebral hemispheres, dorsolateral prefrontal cortex subfields bilaterally, and gray matter density in the left inferior frontal gyrus in controls but not musicians”. Sluming et al. (2002) believe that the differences in brain matter are a result of musicians’ daily musical activities because their years of playing correlate with their brain matter volume. This data supports the protective impact of music and supports the role of music in possible prevention of Alzheimer’s.

Catherine Wan and Gottfreid Schlaug believe that music may counteract some of the negative impacts of the aging brain (2010). Wan and Schlaug (2010) supported their hypothesis with the results of a study about piano lessons for elderly individuals completed by Bugos, Perlstein, McCrae, Brophy and Bedenbaugh (as cited in Wan & Schlaug, 2010, p.5) In the Bugos and et al. study, 60-85 year old individuals participated in a half-hour piano lesson each week for six months and practiced each week for three hours. After the piano lessons, the elderly had improved test scores on working memory, perceptual speed, and motor skills (as cited in Wan & Schlaug, 2010, p.5). However, the control group, which did not have the piano lessons, did not
experience any of these improvements. Further support for the protective impact of music on the aging brain is found in a study by Verghese et al. (2003). This study investigated the impacts of the frequency of cognitive and physical leisure activities on chance of developing Alzheimer’s (Verghese et al., 2003). The cognitive activities could be reading, writing, completing crossword puzzles, playing cards or board games, playing musical instruments and participating in organized group discussions. The physical activities were playing golf or tennis, bicycling, swimming, participating in group exercises, dancing, playing team games like bowling, climbing more than two flights of stairs, walking for exercise, babysitting, and doing housework. The 469 subjects did not have dementia at the beginning of the research, but 124 developed dementia during the approximately five years of follow-up. Of the 124 that developed dementia, 61 subjects developed Alzheimer’s disease, 30 subjects developed vascular dementia, 25 developed mixed dementia, and 8 subjects developed other dementia types. The frequency of activity was recorded based on a point system with seven points for everyday participation; four points for performing the activity several days per week; one point for performing the activity once a week; and zero points for performing the activity occasionally, monthly, or never. Those who were the most involved in their activity, in the top 1/3 on the cognitive activity scale, had a 63% lower risk of dementia than those who participated in their activity less. Risk of dementia was reduced by only 7% in participants who participated in their activity 1 day per week. Overall, Verghese et al. found that “among cognitive activities, reading, playing board games, and playing musical instruments were associated with a lower risk of dementia. Dancing was the only physical activity associated with a lower risk of dementia” (Verghese et al., 2003, p.2511-2512).

Music seems to be the most complex part of an Alzheimer’s patient’s memory that is still intact (Spiro, 2010). When musicians have developed dementia, they have a well-preserved
procedural memory (motor skill memory) for musical performance and a well-preserved declarative semantic memory (the language associated with music). In a study completed by Prickett and Moore (1991) scientists found that dementia patients remembered the lyrics sung during their music therapy session better than spoken material (as cited in Spiro, 2010, p.893). However, Prickett and Moore (1991) found that the memory of lyrics was not limited to the memory of old songs; new song lyrics were remembered as well (as cited in Spiro, 2010, p.893).

Brotons and Koger (2000) also found that “following music therapy, performance on speech content and fluency of spontaneous speech was better than following therapeutic conversation sessions,” (as cited in Spiro, 2010, p. 893-894). Fluency of spontaneous speech is an important impact because it allows the Alzheimer’s patients to communicate their feelings, which Alzheimer’s patients cannot do once the disease progresses. Cooke, Moylea, Shumb, Harrisone, and Murfield (2010) conducted a study about the impacts of attendance of live music sessions, music therapy, and conversational therapy sessions on cognition and behavior of Alzheimer’s patients (as cited in Spiro, 2010, p.895). Cooke et al. found that Alzheimer’s patients who attended more than 50% of live music sessions experienced an increase in spontaneous speech, even though there was no difference in agitation and anxiety from that of the Alzheimer’s patients who merely read a book (as cited in Spiro, 2010, p.895).

Listening to music can also trigger memories, causing an awakening. Awakenings occur when an autobiographically salient song, a song that may have a special or emotional connection to a person, is played (Rossato-Bennett, director, 2012). At Keswick, a facility which contains a 24 hour Memory Care Unit, Seluzicki played the flute (Seluzicki, narrator, 2013). When Seluzicki first began to play, the memory impaired patients were very agitated and not aware of their surroundings. The agitation, delusion, and apathy witnessed by Seluzicki were expected
because the memory care patients were at an advanced stage of their disease. About 4-5 minutes after Seluzicki began playing classical music arrangements, the memory impaired patients (including Alzheimer’s and other forms of dementia), were not agitated and were relaxed. A woman who will be referred to as “X,” was shouting during the first two songs that Seluzicki played, but she stopped screaming, began smiling and acted more appropriately; “X” began to make comments like, “she plays nice” and “wasn’t that song pretty”. There was also another woman, who will be referred to as “Y,” who was the most agitated in the room. When Seluzicki began playing, her aggressive behaviors and comments, such as “shut your mouth” and “shut up,” were reduced to “be quiet” and “listen to her play”. Overall, the reactions to the music and performance became much more appropriate because they began to comment on the music and clap after each song, which they had not been doing during the first 2-3 pieces that Seluzicki played. However, in addition to behavioral changes, some cognitive changes were observed. “X” reacted to the performance of “Trumpet Voluntary,” a song commonly played at weddings, with excitement and exclaimed “that’s my wedding! That’s my wedding”. A few minutes later, “X’s” daughter entered the room, and X recognized her daughter by saying “that’s my daughter! Rochelle”. “Y,” upon hearing the tune, “Edelweiss,” began to repeat the phrase, “that’s right-don’t ever forget. Always remember. Don’t ever forget”. Edelweiss is a tune from the “Sound of Music,” that is sung to remember how Austria was before the German occupation. Therefore, “Y” seemed to make an appropriate connection between the song and its meaning. Also another woman, who is referred to as “Z,” began to sing along to Greensleeves as Seluzicki began to play the tune. Seluzicki realized, while she was playing, that the woman recognized the song and was very moved by hearing the tune. After the tune was finished, “Z” waved to get the attention of Seluzicki’s mother and, while putting her hand across her heart, “Z” mouthed ‘thank you’ to
Seluzicki’s mother. While Seluzicki could not say for sure that her observations are awakenings, she can say that she observed cognitive changes.

“The range of music-based activities in care homes is increasing” (Spiro, 2010). Music has been shown to have profound impacts on cognition. At Keswick, iPods are being used to calm memory care residents and to bring back old memories (Walker, 2013). iPods are also being used at Cobble Hill, a healthcare facility in Brooklyn, New York, to help patients with Alzheimer’s disease (Rossato-Bennett, director, 2012). In the documentary Alive Inside, Henry Dryer, a 10 year resident at Cobble Hill has an iPod with music that fits his likes. Dryer’s disease has progressed to the point that he does not keep his head raised, but keeps it laid down on the tray of his wheelchair during day. Dryer does not communicate with anyone and can barely answer simple ‘yes’ or ‘no’ questions. However, when Dryer is given his iPod, he begins to move his upper body and sing to the music. When the iPod is taken away, he is able to communicate with people, to answer ‘yes’ or ‘no’ questions with ease, and even to elaborate on his answers. Dryer was able to remember his younger days when his favorite artist was Cab Calloway and when he used to go to dances frequently. Dryer proclaimed that he loved music.

Dr. Oliver Sachs described the effect of music on Dryer as the “quickening effect”. Dr. Sachs explained that Dryer was being “quickened” by the music on his iPod and was being given his identity back. Dryer began to remember who he was as a young adult and was able to communicate in a coherent and audible way in which he had not been able to communicate before listening to the music. This cognitive impact, though transitory, reflects the beneficial impact of music on cognition in Alzheimer’s patients. Alive Inside demonstrates well the results found in various studies about the impact of music on cognition in Alzheimer’s patients [Prickett and Moore (1991) (as cited in Spiro, 2010, p.893), Brotons and Koger (2000) (as cited in Spiro,
2010, p.893-894), Sluming et al. (2002), Bugos et al. (2007) (as cited in Wan & Schlaug, 2010, p.5), and Cooke et al. (2010) (as cited in Spiro, 2010, p.895)]. The results of these studies and others like them (Verghese et al., 2003) may lead to recommendations that the elderly engage in cognitive activity to decrease the risk of development of dementia, similar to those that people engage in physical activity to decrease the risk of development of cardiovascular diseases (Verghese et al., 2003, p.2516).
References


