

Music and Dementia: An Overview

Music appears to be a unique and powerful stimulus for reaffirming personal identity and social connectedness in individuals with dementia.

By Ronald Devere, MD

Among the most significant artistic expressions, music is embedded in the fabric of human culture and identity. We have all been exposed to music in some way, whether by listening to recordings, playing an instrument, attending concerts, or dancing. It provides a unique emotional experience that takes on personal and social meaning in endless respects. As a neurologist specializing in dementia, I have long wondered about the connections of music and memory and the relationship of music to cognition. Do individuals with dementia, for example, get any benefit from exposure to music? If so, what are those benefits, and how do they work?

Over the last 25 years, many published reports and studies have examined and attempted to shed light on the relationship of music to cognitive impairment. Ahead, I will offer a broad overview of several notable studies.

Understanding Procedural Memory

Despite the level of brain impairment and severity in dementia, certain activities remain preserved in most

instances and are very resistant to decline. These include activities such as pedaling an indoor bicycle, enjoying music, dancing, and throwing a baseball. The person doing these activities may not know who you are or who they are, but these activities were learned and engrained in their younger years and remain. The memory for these activities is called Procedural Memory (PM). Memory for events, knowledge, and reasoning, known as Explicit Memory (EM), gradually disappears as dementia worsens.

What does the literature say about the value of music in people with dementia and other categories of cognitive impairment? Let's first look at individuals with predominantly moderate to severe memory impairment. In his famous book *Musicology*, published in 2007, the late Oliver Sacks discussed a few patients with severe memory impairment only.¹ In particular, he discussed the English musician Clive Wearing, who developed Herpes Encephalitis in his 40s. It predominantly damaged his medial temporal lobes responsible for normal memory function. His memory span was less than 15 seconds. He could not preserve new memo-

ries and had loss of almost his entire past. His wife Deborah stated that it was as if every waking moment was the first waking moment. “He always feels he just emerged from unconsciousness and arising from the dead,” she said.

Dr. Sacks interviewed Clive in his home and noted some Bach music sitting on top of the piano and asked him to play it. Clive said he had never played it or seen it before. He then started playing “Prelude 9 in E major” and remembered playing it before. His memory for that particular piece only occurred while he played it. With this music he was able to improvise, joke, and play with any piece of music. His general knowledge or semantic memory was greatly affected along with his episodic and day-to-day memories. Clive was safe enough in his home but would get immediately lost if he went out alone. His musical powers, however, were totally intact. He was able to automatically read music, sing the notes, play the keyboard, and sing with his wife and create his own world. Clive did not lose any skills he acquired in the past before his encephalitis and he was able to learn new skills with training and practice, even if he would retain no memory for the practice sessions. Without any intact explicit memory, Clive could not remember from day to day which piece he chose to work on previously, or that he ever worked on it before. Without close direction from someone else, he was incapable of undertaking the process of learning any new piece irrespective of his considerable technical skills. Twenty years after his encephalitis, Clive had dropped out of space and time, but when seen at the keyboard alone or with his wife, he was himself again and wholly alive. His life revolved around filling the present—the now—and that only occurred when he was totally immersed in his music.

Interestingly, the response to music is preserved even when the dementia is advanced, such as when patients have impairment of executive function (judgment, planning, reasoning and insight), speech, and language.

Music and Dementia: Looking at the Data

Musical perception, musical emotion, and musical memory can survive long after other forms of memory and cognitive function have disappeared. In non-demented Parkinson’s disease, music therapy can lead to fluent motor flow, such as dancing. But once the music stops, so does the improvement in motor function. In dementia it can improve mood, behavior, and in some cases cognitive function, which can persist for hours and days after the music stops. Music also does not need to be familiar to exert these improvements and one does not need to have any formal knowledge of music or be musically inclined to enjoy music and respond to it at the deepest level.

Listening to familiar music can elicit pleasurable responses such as smiling or moving/dancing even when communication is lost.² Singing has also been shown to improve behav-

Music and Agitation

Agitation is one of the most common behavioral concerns in dementia and present in more than 50 percent of cases. There are at least three subtypes of agitation that occur in Dementia: 1. Physically nonaggressive behavior such as wandering. 2. Physically aggressive behavior such as hitting and kicking. 3. Verbal vocal agitation such as shouting, repeating words and demanding attention. This agitation, regardless of type, leads to caregiver distress and predicts nursing home placement and greater use of restraints and psychotropic drugs, causing increased cognitive decline, stroke and death. This has triggered the important need for non-pharmacologic therapies, such as music, to manage agitation. It is important to know that music therapy can help agitation but it is not necessarily better than other recreational activities, such as playing with puzzles, robotic animals, and squeezing a ball. Dementia patients respond better with individualized activities including personally preferred music.

ior, mood, and cognitive function in some dementia cases.³ From a physiological standpoint, music can also increase the heart rate and hormone levels in cognitively impaired patients.⁴ Moreover, playing a musical instrument can delay the onset of future cognitive decline and reduce the risk of dementia.⁵ Thus, music appears to be a necessity for dementia patients.

Of note, most of the studies discussing music and dementia come from patients with AD. Much less is known about its impact on other causes of dementia, however, studies have shown that singing, playing a musical instrument, and composing music are often well preserved in severe AD as well as frontotemporal dementia (FTD).⁶⁻⁷ Some studies have shown that musicians with AD can learn to play new tunes.⁸ People with AD showed preserved recognition of familiar tunes similar to normal healthy individuals, but learning and recognition after 24-hour delay was impaired in familiar and unfamiliar melodies. In a 2009 study, AD patients exposed repeatedly to new melodies were able to recognize these songs for up to eight weeks.⁹ This did not occur with music repeated less frequently.

Familiar tunes and lyrics can be recognized across all stages of AD.¹⁰ Due to bonds formed early in life between highly familiar tunes and lyrics, the ability to recognize such information is very functional in individuals with AD. The ability to detect pitch distortion or recall songs from spoken lyrics is usually impaired. Also noted is that the sense of familiarity in AD is preserved, whereas recollection that involves retrieval of information is impaired. In a study of two musicians, one with AD and one with FTD (behavioral variant),

investigators found that the FTD case showed preserved recognition of musical composition, but the AD case showed deficits in this area compared to healthy musicians.¹¹

Behavior and Cognition. A large number of studies claim that music intervention has positive effects on behavior, agitation, mood, and cognition in dementia. For example, short-term music therapy has been found to reduce mood symptoms, such as depression and anxiety,¹² while longer music therapy (over three months) has also been shown to be very effective.¹³ Another study found that the beneficial effects of individual music therapy on anxiety and depression lasted up to eight weeks.¹⁴

In a study comparing standard care to regular singing or music listening sessions over 10 weeks in 89 people with dementia (type not specified), music sessions improved general cognition (MMSE score), attention, and executive function compared to standard care.¹⁵ Singing appeared to evoke personal remote memories by increasing recall of names of children, friends, and immediate short story recall.

Music in the form of a song has been shown to be an effective verbal memory aid in mild AD. Verbal information presented as lyrics in an unfamiliar song rather than the spoken word is better recognized in forced choice testing. Several studies have reported that music listening facilitates recall of personal memories (involuntary autobiographical memory) in people with AD. It's worth noting, however, that cafeteria noise can yield the same result, suggesting any type of auditory stimulation could produce this effect. In AD, personally selected music (music rated high on familiarity and emotion) has led to more specific memories, is recalled more quickly, and is rated higher in emotional content. The memories recalled were more positive than negative in feelings compared to younger and older healthy adults.

It is worth noting that the experimental rigor of many of these trials is lacking, and biases have interfered with results. Some of the limitations of these studies include small sample sizes, lack of randomization, group dissimilarity, and no control groups. The results of many of these studies, therefore, need to be interpreted with some caution. Nevertheless, music appears to be a unique and powerful stimulus for reaffirming personal identity and social connectedness in persons with dementia, which is crucial for optimal well being, despite severe memory impairment as in AD.

Music Expertise, Aging Cognition, and Dementia Risk

Music can have a significant impact on memory and cognition beyond merely listening to it. In fact, musicians have been shown to have greater volume of the auditory cortex (surface), premotor regions, cerebellum, and anterior corpus callosum compared to non-musicians. Musicians are likely

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to recruit both halves of the brain when performing music tasks (such as detection of pitch) and use multiple rather than single strategies to perform music cognition tasks. Studies have shown that elderly musicians outperform non-musicians on tasks assessing auditory processing, cognitive control, and comprehension of speech in noisy environments.¹⁶⁻¹⁷ This has also been shown to occur in elderly persons with minimal early music training and even after a short period of music training in those with no previous music training. In addition, music training early in life was associated with faster neural responses to speech in elderly individuals.

In one study, musically naive participants (ages 30-85) who received six months of piano lessons compared with no treatment control group showed improved performance on specific cognitive tasks that represent executive function, such as speed of processing information, verbal fluency, and enhanced mood.¹⁸ These studies suggest that music training may have a protective effect in the face of age-related mild cognitive changes and can occur even after short periods of training in the elderly. This raises the question of whether music expertise gives rise to greater cognitive reserve and access to different strategies in the musician brain and may potentially reduce the risks of dementia.^{19,5} Lending further weight to this notion is a study in which researchers interviewed 23 elderly former orchestra members (mean age 77 years old) and found that no participant was aware of current or former members of the orchestra with dementia.²⁰ Findings from a five-year prospective study evaluating frequency of engagement of leisure activities in 469 people over 75 years of age who did not have dementia revealed that playing a musical instrument was one of several leisure activities associated with reduced risk of dementia.⁵ While these results are encouraging, the potential protective effect of musical expertise in the face of neuropathology requires more investigation.

Musical composing in the presence of cognitive impairment has been studied in the famous French composer Maurice Ravel, who is especially known for his musical piece “Bolero,” amongst others. In October 1932, Ravel

was involved in a car accident and suffered facial and chest injuries. He also developed progressive cognitive decline,²¹ having difficulty writing and even signing his name. In addition to trouble writing music, he could no longer conduct an orchestra (even his own music). Partially intact were his perceptual auditory abilities, and he was able to recognize his own composed works. He could also recognize slight mistakes when someone was playing his music.

When Ravel died, no autopsy was performed. In reviewing his case, neurologists have suggested that he had a progressive neurodegenerative disease, such as the primary progressive aphasia variant of frontal temporal dementia, which causes inability to carry out speech and the normal use of the left upper extremity (he was right-handed). Ravel underwent brain surgery on the right side and the neurosurgeon noted a very shrunken brain size and dilated ventricles in the brain. Other neurologists considered Alzheimer's disease, stroke, etc., but the exact cause was not proven. Most neurologists believe his car accident was not the cause of his disorder but was perhaps the proverbial straw that broke the camel's back, allowing a neurodegenerative disorder to start showing itself.

Whether Ravel's brain disorder influenced his musical writings is difficult to say, but there is strong evidence that the composer had a brain disorder that predominantly affected the left side of his brain. The speech and language centers are predominantly on the left side of the brain, which explains his impaired speech, writing and reading difficulties, and the use and control of the right hand. Moreover, his ability to recognize his music and errors played by other musicians suggest the right side of his brain was still functional. Studies by musicians and neurologists have suggested that Ravel was impaired with his illness in the late 1920s and early 1930s when he was composing "Bolero" and "Concerto for the Left Hand." "Bolero" turned out to be a very different composition than his other works, suggesting a possible imbalance of both sides of the brain. "Concerto for the Left Hand" consists of one movement and greater use of wind instruments, while themes and phrases are much shorter and less elaborate. Music experts stated that this composition avoids the difficulty of elaborating a complex structured theme, which was not the usual standard of his previous music. They believe when this was written his disease was already very active and the piece was based predominantly on the right side of the brain. This information and other studies in normal individuals strongly suggest that music-related functions are not lateralized to one side of the brain as language, speech, and following commands in a normal limb.

Benefits of Music Therapy

The aim of music therapy in people with dementia is to



Music and Dementia: Key Considerations

Recent randomized controlled studies have shown the efficacy of music intervention in improving the well-being of individuals with dementia and their caregivers.

- Music abilities are not completely spared in dementia.
- Different dementias likely respond differently to music intervention (Alzheimer's disease versus frontotemporal dementia), and more studies are needed in other dementias, including vascular, Parkinson's disease dementia, and Lewy Body dementia.
- Musical training appears to delay cognitive decline and promote brain plasticity in the elderly brain, but more studies with pathology are needed.
- The development and use of the MiDAS assessment scale has provided insight into who is likely to show improved quality of life or reduction in psychiatric symptoms in response to music therapy.

address emotions, cognitive powers, thoughts, and memories—to stimulate them and bring them to the fore. It aims to enrich and give freedom, stability, organization, and focus. Evaluation of music therapy and its impact is a complex task. Clinically significant changes are often highly individual and standardized outcome measures may not always portray what matters most. No studies before 2014 used dementia-specific validated music therapy outcome measures. In an article entitled "The Development of Music in Dementia Assessment Scales (MiDAS)," investigators sought to obtain a deeper understanding on the meaning and value of music for people with Dementia.²² They elected to engage three focus groups—family caregivers, care home staff, and music therapists—in addition to dementia patients, who play an important role in giving an opinion on how music

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plays a role in dementia. The focus groups and interviews aimed to investigate the meaning and experience of music for people with dementia and observed the effects of music. The key questions asked in these groups were:

To people with dementia: What does music mean to you? What do you think of your music therapy/music activities? In what way is music important to you?

To families, staff, and therapists: What changes and responses do you observe in your families/clients following music therapy or music activities? How do you know if music is meaningful to the person?

One dementia patient observes: “Medications have horrible side effects such as sleepiness, and music focuses me different from reading a newspaper. I get carried away singing you don’t want to stop.”

A staff member noted about a dementia patient: “Before music therapy he was often withdrawn, wander around the corridor, or stuck in a wheelchair. During a music session, there is a real sense of group interaction and humor.”

After evaluation of these focus groups and getting detailed input, the authors decided that five important areas had to be included in any music scale: Interest, Response, Initiation, Involvement, and Enjoyment. Importantly, MiDAS was not developed for a specific music therapy and has been used in active music making, singing, and dancing with music. This scale system is based on individual optimal levels (the best score the individual can achieve), rather than a uniform pre-determined set of scores. The optimum score will be different in each individual and may change as the dementia progresses. When the MiDAS system is used, it can also be compared with cognitive tests or quality of life.

Further analysis of the qualitative data revealed that the effects of music for people with dementia goes beyond reduction of behavioral and psychological symptoms. They also noted that individual preference of music is closely linked to personal identity and personal history. Moreover, sustaining “here and now” musical and interpersonal connectedness helps value the uniqueness of an individual and help maintain the quality of his/her life.

CONCLUSION

How and why music is beneficial to cognitive impaired individuals and the extent to which efficacy of music surpasses that of other pleasant activities remains to be further clarified.²³ Nevertheless, it’s clear from the available data that music plays a role in cognition and that music therapy can be potentially beneficial for some dementia patients. ■

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PRACTICAL POINTER

Music can elicit emotions and memories and help provide a link to a person’s past and promote interconnection with caregivers and others with dementia. Recent findings suggest that that musical training delays cognitive decline and promotes brain plasticity in the elderly brain. More studies are needed to confirm the specific benefits of music therapy.