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The Effects of Incorporating Music into Daily Life on Cognitive Decline  
An Annotated Bibliography

by Devlin Deveney

Dementia currently affects over 35 million people worldwide – a number that is expected to triple by the year 2050 according to the report, “Dementia: a public health priority” by World Health Organization and Alzheimer’s Disease International. Despite the high population of people with dementia, there are currently no cures for the diseases within this category. The aim of this article is to explore the cognitive effects of incorporating music into daily life prior to the onset of dementia and determining whether or not these effects have an impact on age-related cognitive decline. It is hoped that this paper will raise awareness and interest in the possibility of slowing or preventing the onset of dementia through musical training.

Amer, Tarek et al. “Do Older Professional Musicians Have Cognitive Advantages?”

*PLoS ONE* 8, no. 8 (August 2013): 1-8.

In this study, several psychologists from the University of Toronto Department of Psychology looked at the effects of music training on cognitive abilities in adults between 50 and 77 years old. The experiment involved each of the 42 participants performing various tasks that tested cognitive control and processing. The “Discussion” section states that professional musicians were matched with non-musicians based on age, education, vocabulary, and general health. The conclusion that the authors came to after comparing the results was that musicians generally outperformed non-musicians on “near-transfer tasks” (tasks that assess auditory processing and conflict resolution). According to the

study, musicians also excelled in several aspects of cognitive control. Overall, this work supports the claim that music heightens cognitive abilities.

Balbag, M. "Music Across the Lifespan." PhD Diss., University of Southern California, 2016. ProQuest Dissertations and Theses.

This dissertation investigates the benefits of music participation on cognitive health. It looks specifically at the preventative effects music can have on cognitive decline. Balbag uses three main studies to support her claim that music can be a "protective health behavior." One unique study that could be extremely useful when researching the impact of music on cognitive decline is the twin study because it lessens potential variables.

Bentivoglio, Marina. "Musical Skills and Neural Functions: The Legacy of the Brains of Musicians." *Annals of the New York Academy of Sciences* 999, no. 1 (January 2006): 234–43. <https://doi-org.du.idm.oclc.org/10.1196/annals.1284.034>.

Bentivoglio provides the history of several prominent musicians and addresses the possible impact that music had on their cognitive functions or vice versa. Some of the notable musicians that are accounted for include Mozart, Mussorgsky, and Ravel.

Bentivoglio also includes a brief history of music research in phrenology and cortical structure. This article provides useful information regarding the relationship between music and cognitive abilities by giving the reader a basic understanding of what parts of the brain are affected by music and how neurologists have come to know this.

Devere, Ronald. "Music and Dementia: An Overview." *Practical Neurology* (June 2017): 31-35. [http://practicalneurology.com/pdfs/pn0617\\_CF\\_Music.pdf](http://practicalneurology.com/pdfs/pn0617_CF_Music.pdf).

Devere's article assesses several past studies that have aimed to determine the correlation between music and cognitive abilities. He covers music's impact on memory, auditory processing, and age-related cognitive decline. He also discusses the many benefits that music can have on those already diagnosed with dementia. This article would be a helpful starting point when researching music's impact on cognitive abilities due to the discussion of several reputable studies and reports.

Hanna-Pladdy, Brenda, and MacKay, Alicia. "The Relation Between Instrumental Musical Activity and Cognitive Aging." *Neuropsychology* 25, no. 3 (2011): 378-386. <http://dx.doi.org/10.1037/a0021895>.

This study assessed whether or not there is a correlation between the amount of music instrumental experience and cognitive aging. The test group included 70 healthy adults between the ages of 60 and 83. The adults were matched based on age, education, frequency of physical exercise throughout life, and, if applicable, years of musical training. The musicians were grouped into either the high activity (10 years or more) or low activity (less than 10 years) group. While this study found a lot of the cognitive differences between the high activity and low activity musicians to be insignificant, the results show that there was a substantial difference between the high activity musicians' abilities and the non-musicians'. Thus, this study provides evidence that musical experience does enhance cognitive abilities, and continues to have a positive effect later in life.

Kenny, Dianna T., Time Driscoll, and Bronwen J. Ackermann. "Effects of Aging on Musical Performance in Professional Orchestral Musicians." *Medical Problems of Performing Artists* 33, no. 1 (March 2018): 39-46.

The aim of this study was to determine how age might affect both the physical and psychological abilities of professional musicians. 377 professional orchestra musicians between the ages 18 and 68 years old were evaluated based on their responses to several physical and psychological measures. The results of this study did not end up supporting authors' hypothesis that the older musicians would have significant decline in both abilities. The older musicians, in fact, did not show significant decline in either areas. Comparing these results to the results of the same tests taken by non-musicians of similar age could be used to determine if music might be the cause of the musicians' cognitive abilities. This study is careful to include that there are other factors that could have caused for these results such as having fewer numbers of responses from those over 55, and further studies would help clarify this.

*Radiolab*. "Unraveling Bolero." Produced by WNYC Studios. May 22, 2018.

<https://www.wnycstudios.org/story/unraveling-bolero>.

"Unraveling Bolero" is a podcast episode that tells the story of Anne Adams, a biologist who one day decides to drop her career and take up painting. One of her paintings, titled "Unraveling Bolero," was painted as a sort of visual interpretation of Ravel's "Bolero." Six years after this painting, Adams began showing significant signs of dementia. What is remarkable about this is that 60 years earlier, six years after Ravel completed "Bolero,"

he also began showing similar symptoms such as extreme forgetfulness and lack of vocabulary. Both Adams' and Ravel's artistic works use seemingly obsessive repetition, which neurologist Bruce Miller hypothesizes might be a symptom of early dementia. He suggests that because the language circuit in the brain is inhibited, the basal ganglia (the part of the brain responsible for motor functions) can get overwhelmed, thus causing the person to feel the need to perform the same action over and over again. In the early stages of dementia, the person may try to make sense of the overstimulation and express it through various means, e.g., the melody that repeats throughout the entirety of Ravel's "Bolero" and never really develops. Aside from just telling the parallel timelines of two artists who showed substantial cognitive decline, this podcast gives the listener a deeper understanding of what happens to the brain throughout different stages of dementia. This understanding can be useful to a researcher who is interested in learning the causes and early signs of cognitive decline.

Schlaug, Gottfried. "Music, Musicians, and Brain Plasticity." In *Oxford Handbook of Music Psychology*, edited by Susan Hallam, Ian Cross, and Michael Thaut, 197-207. Oxford: Oxford University Press, 2008.

The effect that music can have on the frontal cortices is the primary topic of this article. Schlaug's hypothesis for why musicians have different brain structures from non-musicians is that the musical activities engage the brain in "cross-modal plasticity," thus resulting in anatomical differences after a long period of time. Schlaug compares the brain structures of musicians and non-musicians from past studies to show the reader that significant differences can be seen. She continues the conversation by offering plausible

reasons for these differences and by discussing other works that support her hypothesis. This in-depth look at how music engages various parts of the brain and can permanently affect the structure is a valuable addition to the research regarding music's effect on preventing cognitive decline.

Schneider, Catherine. "Music Training as a Neuro-Cognitive Protector for Brain Aging: Cognitive and Neuropsychological Profiles in Professional Musicians." PhD Diss., University of Kentucky, 2018. ProQuest Dissertations and Theses.

Schneider introduces her topic by describing the significance that dementia has on today's population. She addresses the heightened mortality rate of those with cognitive impairments, the extreme medical costs of dementia patients, and the often lessened quality of life. She goes on to explore musical training as a cognitively stimulating activity that could possibly have a positive impact on cognitive functions in later life.

Schneider's study results, along with her many relevant sources, would further the claim that music has a positive effect on cognitive health; however, we are still lacking a fundamental understanding as to what exactly causes this positive impact.

White-Schwoch, Travis et al. "Older Adults Benefit from Music Training Early in Life: Biological Evidence for Long-Term Training-Driven Plasticity." *Journal of Neuroscience* 33, no. 45 (November 2013): 17667-17674.

<https://doi.org/10.1523/JNEUROSCI.2560-13.2013>.

The focus of this study was specifically on the neural response timing of musicians who had a fair amount of musical training (anywhere from 4-14 years), but had not played an

instrument for multiple decades. The study found that musical training had a significant correlation with improved neural response times to speech. The information provided from this study could be used to help support the hypothesis that musical experience supports cognitive health, thus delaying or preventing decline in abilities related to cognitive function.

World Health Organization and Alzheimer's Disease International. *Dementia: A Public Health Priority*. Geneva: WHO Press, 2012.

For this work, the World Health Organization and Alzheimer's Disease International teamed up to create a report in hopes of raising public awareness for the increasing population of people with dementia. The report draws attention to the sheer number of people who have been diagnosed with a type of dementia: about 35.6 million people currently (as of 2012) and an expected 70 million by the year 2030. The report continues to address numerous aspects of dementia such as the epidemiology, understanding what it is and what all it can affect, how to care for those with dementia, and potential prevention. The importance of stimulating the brain and its positive effect on staving off neurodegeneration is stressed when discussing potential ways to prevent the onset of dementia. This resource provides the researcher with a good fundamental understanding of what dementia is and the importance of supporting cognitive health.

Zendel, Benjamin R., and Claude Alain. "Musicians Experience Less Age-Related Decline in Central Auditory Processing." *Psychology and Aging* 27, no. 2 (2012): 410-7. <http://dx.doi.org/10.1037/a0024816>.

In a test group of 74 musicians and 89 non-musicians, this study aimed to test whether or not extensive musical training diminishes age-related decline, specifically in auditory perception. In an attempt to ensure that there was a clear distinction between the two groups, the musicians were required to have started musical training by the age of 16 and still be participating in music-related activities at the time of the study while the non-musicians could not have more than two years of musical experience. The discussion section of this study suggests several reasons that musical practice and training could have yielded the positive results that were found. Not only does this study provide useful results from comparing musician vs. non-musician auditory abilities, but it is also a great resource if looking to further the conversation regarding if/why music has an impact on cognitive decline.