

Vitamin M(usic) is good for our aging brains

Music learning is the gift that keeps on giving. I have seen this headline a few times. Generally, the articles relate to research that has been undertaken with participants over the age of 60 and has compared brain health between those that undertook music learning during childhood and those who didn't. The typical finding has been that participants who engaged in formal music learning in childhood have maintained higher levels of brain health, speech in noise perception and language skills than those who have not engaged in music learning in childhood.

These are very encouraging findings, but they are only the tip of the iceberg. This 2021 study titled "Music Training and Brain Volume in Older Adults" takes this specific field of research several steps further. Let's start with the big findings.

Big Findings

Here are the big bang findings that the researchers outline in the abstract.

"We demonstrated that musical training, defined as the extent of musical training, musical practice, and musicianship, was positively and significantly associated with the volume of the inferior frontal cortex and parahippocampus. In addition, musical training was positively associated with volume of the posterior cingulate cortex, insula, and medial orbitofrontal cortex."

These a lot of very big neuroscience words but there are several things we can take from this statement.

Music training has been defined in this study in a much broader way. Rather than only being about learning music through an instrument, the extensive participant survey took into account musical listening, appreciation learning and technical musical knowledge, alongside formal music learning on an instrument and/or voice.

The brain volume measurements were gathered on very specific areas of the brain. This helps hone our understanding of the areas of the brain that music training may maintain good brain health in as we age.

Together, the present study suggests that musical behaviours relate to a circuit of brain regions involved in executive function, memory, language, and emotion.

This is a great distillation of the main functions of all those specific brain regions. The human brain is not simple, and it does not have one area in control of one type of cognitive function. Rather, multiple brain regions connect and share information in order to complete complex cognitive tasks. Here are some useful findings we can take away from this statement in the abstract.

Executive Functions are the higher form of cognitive processing that are unique to humans. They are the skills we need to function as adults; ability to plan, make decisions, manage our emotions and understand others. The longer we maintain these functions, the longer we can engage meaningfully in society and with our loved ones.

Memory, as we age, can be impacted by Dementia, Alzheimer's and general cognitive decline. It is possible that the fitter our memory systems are the less likely we are to experience these memory affecting conditions. Research is ongoing in this area, and music training is supporting this research.

Language is a vital aspect of being human. We thrive on conversation, reading and even hearing expressions of love and affection. The degradation of our language ability can negatively impact our wellbeing, social isolation, and depression. These factors can then have a detrimental effect on our physical and mental wellbeing. Preserving our language faculties is incredibly important as we age.

Emotions are fundamental to our humanity. Managing our emotional health and understanding other emotions is a marker of good physical and mental health. Preserving these faculties, which are connected to and influence executive functions, memory and language, is vital for healthy aging.

The takeaway message from these big findings is that music training, including high levels of musical sophistication from learning an instrument, appreciating and listening to music, and understanding the more technical aspects of music, can contribute to significantly higher levels of brain health as we age. Vitamin M(usic) is good for our aging brains.

Following our brains as they age

This study also uses an interesting method for recruiting participants, and it reflects the enormous benefit of following participants as they age. This study recruited participants from a group who had previously been involved in a study that looked at the impact of exercise on the aging brain.

Most of us will be aware of research that points to how beneficial remaining physically active in life can be for our bodies and our brains. However, by using participants from this previous study, the researchers explored the combination of physical activity and musical activity on overall brain health.

"Musicians who maintained at least 10 years of engagement at any time in their life span had better cognitive capacity in advanced age even when controlling for age, intelligence, and education"

Hanna-Pladdy, B., & Gajewski, B. (2012). Recent and past musical activity predicts cognitive aging variability: Direct comparison with general lifestyle activities. *Frontiers in Human Neuroscience*.



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It is very tempting to just do one thing that ensures we remain healthy in later life, but research is showing that it is the combination of activities that ensure a healthy aging brain. By designing this study using this participant group, they could both compare brain changes over time as well as the impact of physical activity and musical sophistication on brain health as measured by brain volume.

Music & Language - nearer than we think

Numerous studies have shown that music and language share an overlapping neural network. In plain language, this means that when our brain processes music as well as language, it is using a series of networks that share a lot of common connections. This is one of the fundamental mechanisms that lead to children having higher language skills if they have also experienced ongoing music learning. Another way to say this would be, music learning is a complementary learning experience to language learning.

This research paper puts forward a fascinating idea about how we could look at these relationships when it comes to near and far transfer effects in the brain. A near transfer is a transfer of knowledge between similar contexts, such as improving fine motor skills specific to putting fingers in the right place on a violin fingerboard. Far transfer is the transfer of knowledge between dissimilar contexts, for example, taking those fine motor skills and using them for painting or handwriting.

Previously researchers have seen the transfer between music and language to be a far transfer – transferring knowledge to a dissimilar context. However, due to staggering similarities in how the brain processes music and language, they suggest that music and language processing are actually a near transfer.

“Due to the overlap in processing demands between music and language, the effects of musical training on language abilities may be considered a form of near transfer because of the relatively similar contexts surrounding music and language.”

If this is so, how could or should this research inform language development programs in schools? Could this research further support the idea that music learning is a complementary learning experience to language learning?

Music learning preserves our humanity

In older adults, many areas of the brain that the research found music training enhanced were connected to the brain’s default mode network. This is a fascinating part of the brain as it is active when a person is not focused on the outside world and the brain is at wakeful rest, such as during daydreaming and mind-wandering. It is the mode that we default to when we are not actively trying to do something new. It has also been described as our deepest selves or the seat of our beliefs that we base our behaviour on. It is our individual humanity.

This study points to the preservation of many areas of the brain that contribute to the default mode network. Therefore, it could be said that music training maintains our

humanity and our deepest and truest selves. Preservation of this part of ourselves as we age is vital for ourselves, our loved ones, and our society’s broader health.

The Future

There is a lot more work to be done in the field of music learning and the healthy aging brain. Still, this study has brought us one step closer to understanding both how music learning may have a long-term positive impact on brain health, as well as how music could be used to maintain brain health in our later years. I’ll leave you with this gem from the paper.



Future researchers may explore the interactions among musical training, exercise training, and cognitive training to understand the role of each activity in the aging brain, as well as the best approaches to boosting brain and cognitive health in the elderly.



Read More

Chaddock-Heyman, L., Loui, P., Weng, T. B., Weisshappel, R., McAuley, E., & Kramer, A. F. (2021). Musical training and brain volume in older adults. *Brain Sciences*, 11(1), 50.

Researcher to Follow

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Professional Reflection • Part 1

Personal Brain Buzz

What do you think about measuring broader skills in music learning over just learning a musical instrument? Here is what the research instrument includes in a measure of musical sophistication. Discuss your understandings about musical sophistication based on this description.

Musical Sophistication (Page 4 of the research paper)

High levels of musical sophistication are said to be characterized by

- a. higher frequencies of exerting musical skills or behaviors,
- b. greater ease, accuracy, or effect of musical behaviors when executed, and
- c. a greater and more varied repertoire of musical behavior patterns.

This means that highly musically sophisticated individuals are able to respond to a greater range of musical situations, are more flexible in their responses, and possess more effective means of achieving their goals when engaging with music.

Experiment Time

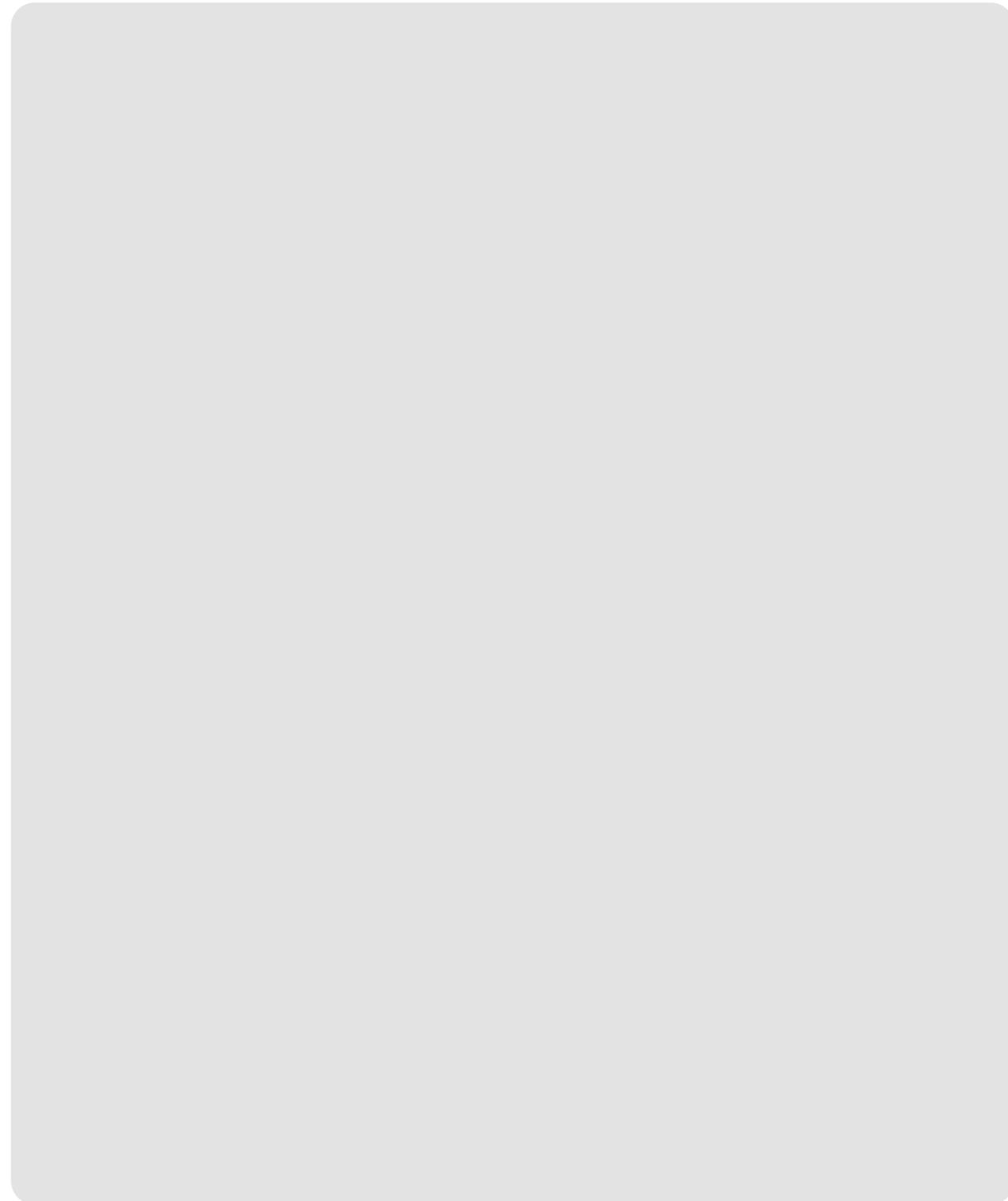
Compare your thoughts with a colleague about musical sophistication. Try to listen openly and think deeply about the nuances, similarities and differences between your thoughts and your colleagues.

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Professional Reflection • Part 2

Teaching Brain Buzz

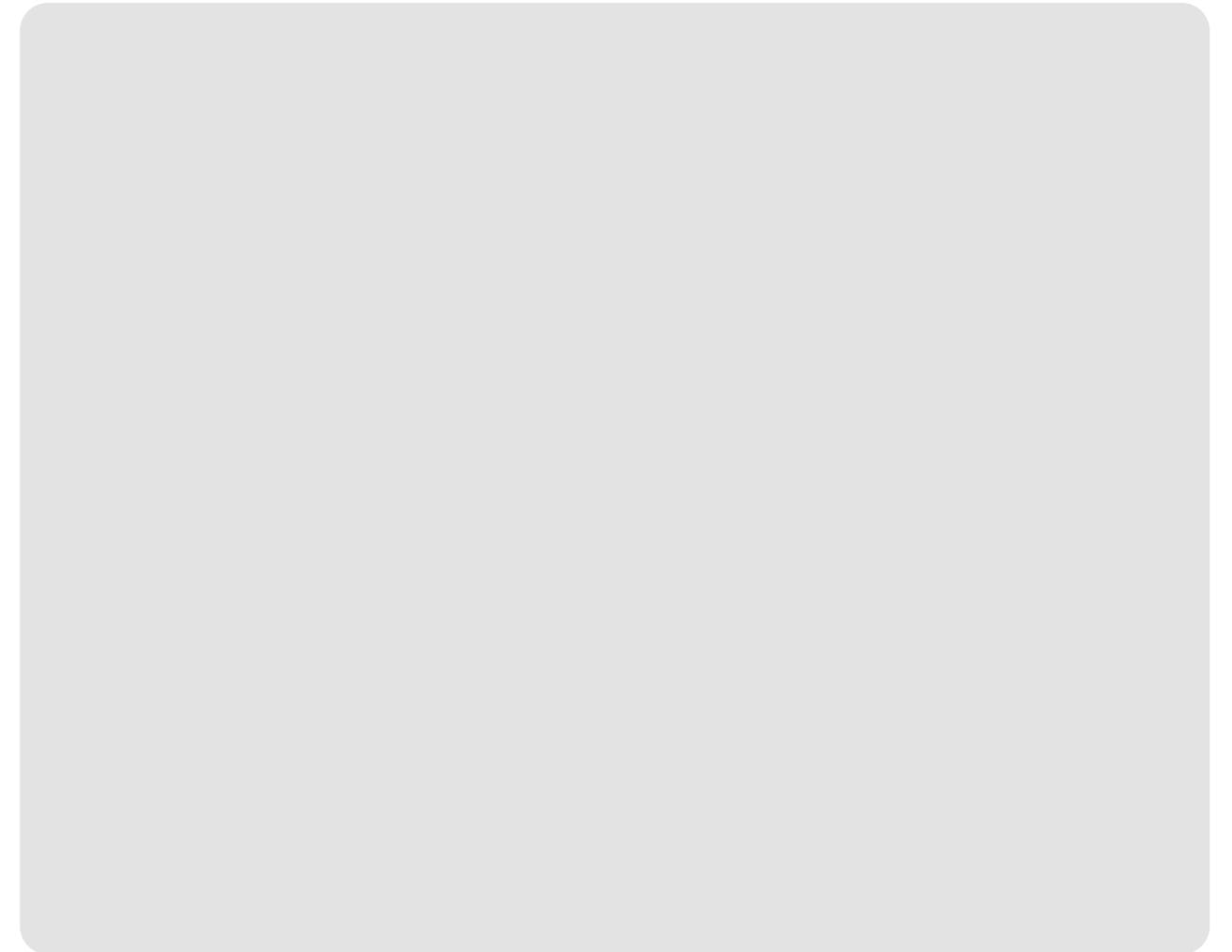
Where, when and how do your students experience the different aspects of musical sophistication? Do you favour one aspect of sophistication over another, and if so, why?



Experiment Time

Select one student or one cohort of students and track when you believe they reached new levels of the three musical sophistication types.

Then outline the musical and non-musical behaviours the student(s) exhibited as evidence of improving their musical sophistication.



Questioning Brain Buzz

After completing this professional reflection, write at least two questions you have about this topic.

