

Arwen's Log book

Thinking of questions January 2021

- What is the best use of your time and why?
- How do you get liquid into a ball
- What materials are best for masks?
 - Cotton, natural, polyester, plastic
- What makes squishy toys so satisfying?
- How do people come up with questions?
- Why do parents like their kids to do science fair?
- What are the benefits of science fair?
- Does your hair grow faster after a haircut?
- Who determines the right amount of sleep
- Why do young people not like to sleep?
- Why do adults not like to sleep?
- How do you make artificial snow?
- How do you make artificial snow as good as real snow?
- What impact does the artificial snow have on the environment?
- What other chemicals are in artificial snow?
- How do they find so much water in the snow?
- Can the water be reused?
- Where did skiing begin?
- Do more people ski or snowboard in Canada and other countries?
- What are some common injuries around skiing?
 - Knee
 - Back injuries
 - Skiers thumb
- How do you prevent them?
- Is there an ideal age to ski
- What is the recipe for a good movie
- How about a book?
- Look up the different ratings between movies and why it works
- What foods are inspired by movies?
- Is product placement necessary?
- What are the parts of a plant?
- Is laughter actually positive?
- What about mean laughter - how does it affect the body?
- What are the best materials for making long lasting stuffies?
- Why do people like stuffies?

- Why do I get worse when I practice?
- Is a specific time for practice better?
- What is the perfect music composition?
- What is the preferred type of music?
- How does music affect the brain?
- Is it really helpful if the music isn't challenging?
- What are some brain issues?
 - Epilepsy
 - Anxiety
 - Depression
 - Cerebral palsy
 - Schizophrenia

Problem:

How Does Music Affect the Brain?

Why Did I choose this Question?

When I was trying to choose my Question my mom was helping me think of ideas based on my interests. She suggested something about music and how it helps your brain. My sister has Epilepsy which is a disease that causes you to have seizures. When she was first diagnosed with epilepsy her doctor said that she should do music to help her. I wondered if music is really helping her and I decided to research more on this topic.

Method of collecting data

I mainly used information from interviews of various individuals that had different information to share.

Hypothesis

I think music does help with mental conditions. At senior centers they always want people to play music for the seniors. I think that even if the music is not familiar it will jog the memory of people with Dementia. For many people music causes happy moods and I think it challenges the brain.

Questions Related To My Research

- How does the brain work?
- What type of music calms the brain best? (ex: rock, classical etc.)
- Does your brain change with age?
- How does your brain receive input?
- What is the difference of learning music vs. listening to music?
- What instruments are the best for stimulating the brain?
- Does music help your memory?
- What is the best age to learn music (why)?
- Is it better for your brain to learn more challenging instruments?
- Does different music help with different diseases?
- If you don't like a certain type of music, will it still help your brain?
- How does your brain deal with mental diseases?
- Do other parts of your body get affected by music?
- What is music therapy?

- Does music have an effect in animal brains?
- Does dynamic music affect the brain more or less?
- What are mental conditions?
- What other things help mental conditions?

Research Questions

Different questions that will help me with my research

How does the brain work?

There are many parts of the brain that do different things. These are: the Frontal Lobes, Occipital Lobes, Temporal Lobes, Parietal Lobes, The Thalamus (which is the main spot for sensory connections to go through), and the Brain Stem (this controls the main basic functions). These all come together to help the brain function. In general the brain is a very complex organ that houses many neurons that work together to control you. These neurons are activated by chemical messages called neurotransmitters. These are sent down different paths in our brain and when we learn something new new pathways are made. We know a lot about the brain but there is still a lot to be learned about it, as it is a very complex organ.

What type of music calms the brain best?

According to research lyricless music or white noise calms the brain best. Though this is proven to be the best music to calm the brain it depends on the person. If a person doesn't like classical music they might not feel calm listening to classical music. Because they don't like it this isn't very calming music to them. Some people may like rock or jazz music and this calms them down. It also depends on emotional feelings from the past or different memories that help you feel calm.

Does your brain change with age?

As you age your brain changes too. As you learn new things and have different experiences new neural paths are formed. As you grow older your brain can shrink or atrophy. Your brain can lose cells and it makes it harder for your brain to keep up. This can lead to developing different disorders like dementia.

How does your brain receive input?

Your brain receives input from the nervous system. Like if you touch something hot the signal will go up your spine and go to your brain. These signals come from your five senses: sight, sound, touch, taste, and smell. The somatosensory receives these signals.

What is the difference between learning vs. listening to music?

When we learn music new pathways are formed in our brains. It is like learning a new language. It helps our brains get better. Studies also show that some of the motor functions on our brain do realize the difference between learning and listening to

music. When listening to music new memories might form or some might be remembered. It also has an emotional response to the person listening to the music. In general music is both good to be listened to and played.

What instruments are best for stimulating the brain?

Each instrument created different pathways that help us learn. Different instruments help us with different motor skills as well. It also depends on the instrument that the person like listening to. This recalls memories and might feel different to each person. Thus a specific instrument isn't the best or the worst at stimulating the brain. Though this is all true string instruments and piano are very recommended instruments because they require both hands to do different things at the same time.

Does music help your memory?

Yes it does. Music can help recall memories for people with memory issues. Some people with Alzheimer's disease can forget a lot of things but can still remember how to play a musical instrument. It is easier for people to remember things if they can associate it with something else. Music helps with this because it helps us group words and notes together. Music also triggers memories

What is the best age to learn music?

The best age to learn music is at a young age. Young brains are still developing and can soak up information easier. Ages 5-21 are usually a good age to learn a new instrument.. though it is easier to learn a new instrument when you are young it is also good to learn when you are older. It helps challenge older brains keeping them healthy. In conclusion all ages are good for learning.

Is it better for your brain to learn more challenging instruments?

Musical instruments have different difficulties for different people. The piano might be way easier to learn to one person but might be the hardest thing in the world to another. Some instruments are probably a bit harder than others (like a violin would probably be harder to play than a kazoo) but it is different to every person. It is good for your brain to be challenged though so anything that is challenging to you is good for your brain.

Does music help with different diseases?

Yes music is a very good tool to help with different diseases. It helps calm anxiety, helps recall memories, get Parkinson's patients moving by motivating them, and can help boost moods. Music therapists use music as a helpful tool to help their patients.

If you don't like a type of music will it still help your brain?

Probably not. Even though all music still stimulates the brain it won't help you or your brain. If you have listened to a piece of music during a tragic time it might trigger bad memories. Music therapists like to have their patients listen to familiar music that they like and enjoy.

How does your brain deal with mental diseases?

It is a quite complicated process. Depending on the person and what disease they have reflects on how they deal with it. Different diseases will affect the brain in different ways. The brain will make new connections as it learns, helping deal with the disease.

Do other parts of your body get affected by music?

Music goes through the ear and is sent to the brain to process. The brain controls the music sensor and tells the body what to do like tapping toes or singing along to your favorite song. Music is also great to motivate you.

What is music therapy?

Music therapy is a tool to help improve your mood and well being. It uses music to help recall memories, boost mood, help verbal skills, and social skills.

Does music have an effect on animal brains?

Not much is known about how music affects animals as they can't tell us directly. Though, studies have shown that classical music can help reduce anxiety in dogs. Heavy metal music will cause dogs to bark loudly and shake vigorously. It has also been shown that cows listening to music 100 beats per minute or less produce more milk!

Does dynamic music affect the brain more or less?

Yes it does. Music that had different dynamics (loud, soft, in between) can help us pay attention better. Change will keep our brains alert. If something is the same all the time we will tend to drop out a bit. Happy or more joyful music will create dopamine which will cause you to be happier.

What are mental conditions?

Mental disorders/conditions is a very broad topic. This is because it is hard to define a "normal" brain. Some mental disorders are caused by chemical imbalances in brains though that is only one cause. Some other causes are traumatic experiences, life circumstances, and many others. Mental disorders involve emotional changes, abnormal thoughts, and stops some people from functioning in everyday life.

What other things help mental conditions?

There are many treatments for mental conditions other than music therapy. Medications are a big help. Things like group therapy, social support, and counselling are also good ways to treat mental conditions. Even though these are all good ways to treat mental conditions the best is to have a healthy active lifestyle.

Interviews:

Anita Lai

- How does the brain work?
- control center for nervous system
- very complex organ and not completely understood
- made of of trillions of neurons that work together
- Does your brain change with age?
- can atrophy or shrink with age
- How does your brain receive input?
- from the nervous system - input can be in many different ways. for example - when your hand touches something hot, the sensory nerves in your hand send a signal to your spinal cord and to your brain
- Does music help your memory?
- Does different music help with different diseases?
- If you don't like a certain type of music, will it still help your brain?
- How does your brain deal with mental diseases?
- Do other parts of your body get affected by music?
- What is music therapy?
- Does dynamic music affect the brain more or less?
- What are mental conditions?
- very broad question here
- very medical perspective - true psychiatric conditions can be caused by chemical imbalances in the brain
- tough to answer this one as some conditions are not from chemical imbalances but from trauma, life circumstances, behaviours etc
- What other things help mental conditions?
- medications
- different types of therapy like counselling, behavioural therapy, group therapy
- electroconvulsive therapy
- exercise
- meditation

-What is the best age to learn music (why)? Anytime

This article gives suggested music activities for different age group. I am convinced that music is good for all ages. Studies suggest that those who learn music in their developmental years and even quit in their teenage years still benefit from learning music.

<https://musicimeacademy.com/getting-started/age-guidelines/>

-Does different music help with different diseases? I believe it can help many with anxiety and depression in more therapeutic ways. If an individual enjoys making music it will bring joy and satisfaction to them. It can help individuals relax and process traumatic events. Music therapy is often used in conjunction with medical treatment. Music has helped Stroke patients and Parkinson's patients improve and unhinge their gait when walking. The University of Calgary has been researching this.

Music gets Parkinson's patients moving

Like many of us, Sharon Strachan's exercise companion is an iPod. But Strachan's iPod does a few things yours and mine can't: it helps her manage the symptoms of Parkinson's disease.

Before Strachan goes out for her daily walk, she straps her iPod on her leg, near the knee. During her walk, the music stops if she slows down too much or takes shorter steps. Once she adjusts her stride and her gait, the music begins to play again.

Strachan's iPod uses the Gait Reminder app, developed by Bin Hu in UCalgary's Movement Disorder Clinic in the Hotchkiss Brain Institute. A sensor in the device senses the wearer's steps and causes the iPod to react accordingly.

"The Gait Reminder works on the principle of reward-based motivation," explains Dr. Hu, a UCalgary professor in the Cumming School of Medicine's department of neurosciences. "To activate the brain there is a behavioural paradigm: if you make effort and succeed, you will be rewarded. And in the motivational part of the brain, music is a very strong component."

"In the motivational part of the brain, music is a very strong component."

Parkinson's is a progressive nervous system disease, characterized by tremors, impaired posture and balance, and slowed movement. Many people who have Parkinson's can have difficulty walking, with their steps becoming shorter until they eventually shuffle, or even "freeze" in place. Injuries due to falling increase with time.

Sharon Strachan says in the five years she's used the Gait Reminder app, she's noticed some encouraging signs. "I have no left-hand tremors anymore, can walk up the stairs OK, and can walk down the stairs using the handrail for support. I've had no freezing after walking to music."

She prefers music with movement. ABBA's *Dancing Queen* is one of her favourites: "It's got life and vitality."

Dr. Hu says the 60-song playlist the clinic provides covers the musical spectrum, from country to gospel to contemporary. The favourite? Anything by R&B and funk artist Bruno Mars.

The device that makes the music happen can connect to the clinic with Wi-Fi, sending data to co-ordinators who remotely customize the program settings to

ensure patients can walk safely with optimal outcomes, says Dr. Hu.

-What is music therapy?

This article has a nice video you can watch too to see how music therapy can help.

<https://braceworks.ca/2018/06/23/health-tech/how-music-helps-rehab-patients-learn-to-move-again/>

This article explains how music therapy can help. As well as the one above.

<https://lermagazine.com/article/music-therapy-and-gait-rehab-to-a-different-beat>

-If you don't like a certain type of music, will it still help your brain?

-Do other parts of your body get affected by music?

-Does music have an effect in animal brains?

I imagine that it does, the hard part is that we can't ask them.

7 Scientific Studies About How Animals React to Music

<https://www.mentalfloss.com/article/70539/7-scientific-studies-about-how-animals-react-music>

I find this an interesting read. We can study how animals react to different music (cats, dogs, cows, birds).

-What type of music calms the brain best? (ex: rock, classical etc.) Classical, but also our memoric attachment and emotional attachment to experiences of our past most likely play a part as well.

<https://www.unredu.com/counseling/virtual-relaxation-room/releasing-stress-through-the-power-of-music>

Releasing stress through the power of music

Music can have a profound effect on both the emotions and the body. Faster music can make you feel more alert and concentrate better. Upbeat music can make you

feel more optimistic and positive about life. A slower tempo can quiet your mind and relax your muscles, making you feel soothed while releasing the stress of the day. Music is effective for relaxation and stress management.

[R. Carlos Nakai - Echoes Of Time](#)

[Kevin Kern - The Winding Path](#)

[Angels of Venice - Pachelbel's Canon](#)

[As Twilight Fades ~ Dan Gibson's Solitudes ~ Sleep Deeply](#)

[Spa Relaxing Music Long Time MP3 With Candle Light](#)

[Frédéric Chopin - April Dreams](#)

[Frédéric Chopin - Nocturne in E Flat Major \(Op. 9 No. 2\)](#)

[Kevin Kern - The Enchanted Garden](#)

-What is the difference of learning music vs. listening to music?

Music and Learning

<https://memolition.com/2013/05/22/musics-effect-on-learning/>

Cool Infographic that discusses the benefits of Music Education

[Why Music? The Many Benefits Of Musical Education \[Infographic\] - Visualistan](#)

-What is the best age to learn music (why)?

I believe any time is a good time. Check out these studies below for the most recent research on music and the brain and the benefits it brings. Even if you start when you are young and quit by the time you are 13 years old, your brain was still greatly impacted.

New Research about Music and the Brain

<https://www.inc.com/geoffrey-james/want-smarter-kids-teach-music-not-coding-according-to-mit.html>

<https://www.inverse.com/mind-body/how-music-changes-the-brain-study>

-Does music help your memory? What is the difference of learning music vs. listening to music?

The theories below are what we believe about the way we perceive sound moments when listen.

According to Aaron Copland (1957) composer, we listen to music in three different ways; a sensuous plane for the pleasure of the music itself, an expressive plane where meaning exists that may or may not be expressed in words and a musical plane where the listener can hear melodies, rhythms, harmonies and tone colour.

The current thought concerning the auditory cortex is that there are at least three streams of activity that originate from it and reach different destinations. One is believed to travel anteriorly along the superior temporal gyrus, another travels ventrally within the temporal neocortex and one which follows a dorsal course reaching parietal areas. In particular, the latter may be relevant for tracking time-varied events and spatial processing involved in auditory-motor transformations found in performance situations (Zatorre et al., 2007). Auditory feedback is particularly relevant when playing an instrument because a musician listens and makes timed motor adjustments. A significant study revealed that when auditory feedback was removed, pianists could execute a familiar piece, yet the expressive aspects of their performance were affected (Repp, 1999).

Overlaps or couplings have been observed between auditory and premotor cortices in performing and listening contexts that suggest the two systems closely interact. This has been accomplished by looking at the brain activity of a subject playing a well known piece receiving no auditory feedback and comparing it with the activity of a subject who simply listens to the piece (Bangert et al., 2006; Baumann et al., 2005; Haueisen, & Knösche, 2001). The curious audiovisual conversation that occurs in music performance between a conductor and an ensemble involves a bimodal reflection. The ensemble responds to the conductor's gestures that correspond to their performance sounds, simultaneous to the conductor who responds to the ensemble's performance sounds that coincide with each musician's playing gestures.

-Is it better for your brain to learn more challenging instruments? No, I believe that learning any instrument will allow the brain to operate in the ways described below.

Fusion of Perceptual Theories

Godøy's (2006&2009) model that our perception of salient musical moments is guided by gestural-sonic objects or mental images that fuse auditory input with gestural boundaries. This model combines G.A.Miller's(1956) perceptual chunk theory of deciphering complex sensory information and Schaeffer's(1967)sonic object with Husserl's(1991)phenomenological theory that perception is guided by a

chain of successive now-points. The timescales of the sonic features and music-related actions of emblems can be situated directly within Synder's (2000) short-term memory of melodic and rhythmic grouping or second level of musical experience.

Mirror Neuron Activation and New Teaching and Learning Pedagogies

The evidence supporting a mirror neuron system in humans comes from neuroimaging studies involving electroencephalography, magnetoencephalography and transcranial magnetic stimulation [TMS]. Two primary mirror-like networks were discovered (Rizzolatti & Craighero, 2004). One was located in the parietal lobe, premotor cortex and inferior frontal gyrus, known as the parieto-frontal mirror system, while the other resided in the insula and anterior mesial frontal cortex or limbic mirror system. The former is involved in the recognition of voluntary behaviour, while the latter devotes itself primarily to the recognition of affective behaviour (Cattaneo & Rizzolatti, 2009). Cattaneo and Rizzolatti's mirror neuron findings of two dance performance studies may have parallel implications concerning music performance observations. The first fMRI investigation involving expert dancers found that while the activation of one's mirror neuron system is directly related to the observer's motor experience of a given action, the amount of activation displayed correlates with the degree of skill he possesses for the action (Calvo-Merino et al., 2005). A later study revealed those initially naive to certain dance steps, showed an increase in mirror activation when they underwent a period of motor training where they acquired skill for the steps (Cross, Hamilton & Grafton, 2006). Pedagogical approaches involving the teaching and learning of emblems should encourage increased mirror neuron activation through motor training and gestural skill acquisition. The observational learning implications gathered from these studies and others that posit similar results indicate a probable connection to the realm of experience obtained by an ensemble musician and a conductor. Whether one reviews his own sounds, actions and sonic-objects or those of others, it is believed that the mirror neuron system will continue firing even when his muscles are resting. Once the brain has learned an action it can simulate the action without moving (Helding, 2010)

-What instruments are the best for stimulating the brain?

I think it is more about different sounds influencing our brain than it is the particular instruments and the sound colours they make.

-Does dynamic music affect the brain more or less?

Yes it does. See the slide below from my PhD research that suggests the 7 frequently changing soundscape properties that influence us. The length of the music events is connected to how we perceive it the music and connect with it intellectually.

Gloria Chu

What type of music calms the brain best? (ex: rock, classical etc.)

Great question. There are studies that show different music has different effect on the brain. There's a study that shows relaxing music has better soothing effect as compared to other types of music. Also, the longer that you listen to relaxing music, the effect of feeling relaxed has more of an impact on you. Nawaz, R., Nisar, H., & Voon, Y. V. (2018). The effect of music on human brain; Frequency domain and time series analysis using electroencephalogram. IEEE Access, 6, 45191-45205.

What is the difference of learning music vs. listening to music?

There are several studies that show the same part of the brain is activated regardless whether you are playing the music physically or listening to the music. Certain motor parts of the brain are activated when they do scans of the brain when people listen to music & play music. So in terms of motor function the brain does not distinguish whether you are playing or listening to the music.

What instruments are the best for stimulating

the brain?

Different instruments will create different “road maps” in the brain when you are learning them. This most impacts the motor function part of the brain, as you develop different relationship in doing the physical action of playing the piano. For example, the piano will coordinate the hands very differently than the violin. I don't know which instruments are 'best', I would say each instrument has their unique properties that impact the brain differently in terms of small motor skills.

Does music help your memory?

Yes. It has been seen in some people with Alzheimer Disease they may forget about a lot of things, but they can still remember how to play a musical instrument. Some studies also show a melody of a song is helpful for people in learning and recalling ideas. There is a study that shows people remember the words better if they associate

the words with a song. Music often allows us to “chunk” words and ideas, hence it makes it easier for us to remember a little more than if we were looking at things individually. For example, we can easily remember a musical phrase if we hear it or play it, rather than just naming aloud the individual random notes of the same phrase.

What is the best age to learn music (why)?

I strongly believe every person has the potential to learn music. Science shows the most powerful and effective period is during the development of childhood. Gruhn, W. (2005). Children need music. *International Journal of Music Education*, 23(2), 99-101. Science research also showed children who received music training demonstrated better verbal and math skills. Schlaug, G., Norton, A., Overy, K., & Winner, E. (2005). Effects of music training on the child's brain and cognitive development. *Annals-New York Academy of Sciences*, 1060, 219.

Is it better for your brain to learn more

**challenging
instruments?
Does
different
music help
with different
diseases?**

I'm not certain about different diseases. But I know different types of music influence the various emotions in our bodies. For example, happy feeling in rock music and sad emotions in rap style as indicated in one study: A. M. Bhatti, M. Majid, S. M. Anwar and B. Khan, "Human emotion recognition and analysis in response to audio music using brain signals", *Comput. Hum. Behav.*, vol. 65, pp. 267-275, Dec. 2016.

**If you don't
like a certain
type of
music, will it
still help your
brain?**

Yes, the brain stimulates the same part of the brain. You can see the chart below that I copied from an article. It's from: Weinberger, N. M. (2004). Music and the brain. *Scientific American*, 291(5), 88-95.

**-Do other
parts of your
body get
affected by
music?**

You can see the chart below that I copied from an article. It's from: Weinberger, N. M. (2004). Music and the brain. *Scientific American*, 291(5), 88-95.

**Music
therapy**

This is often a great tool to help individuals improve on their verbal ability, social skills, memory and mood. I have a friend who is a music therapist, let me ask her if I can share her contact with you. She will have more in depth thoughts on this topic. If you're interested in reading about it you can check out: A. Zarghi, A. Zali, F. Ashrafi and S. Moazezi, "Assessment of brain function in music therapy", *Amer. J. Appl. Psychol.*, vol. 2, no. 3, pp. 66-68, 2014. It's a bit more intense of reading but may be mom

can help

Does music have an effect in animal brains?

This is an area I really don't know much about, but would be very interesting to find out about

Does dynamic music affect the brain more or less?

I would imagine dynamic would have been effect on the emotions an individual feels, however, I'm not too familiar with this area.

Lisa Natagaal

-How does the brain work?

So much of this is still unknown! What we do know is that neurons (brain cells) are activated by neurotransmitters (chemicals) to send messages down various pathways in our brain. When new pathways are formed, we are learning new things.

-What type of music calms the brain best? (ex: rock, classical etc.)

The best type of music to use is music a person likes. Everyone's musical preferences are unique. Someone who likes classical music may feel more relaxed when listening to it. Someone who doesn't like classical music is not likely to feel more relaxed when listening to it.

-Does your brain change with age?

Our brains are constantly changing throughout our lifetime as we learn and experience new things. New neural pathways are formed as we learn.

-How does your brain receive input?

From our senses: what we see, hear, touch, taste, and smell.

-What is the difference of learning music vs. listening to music?

New pathways will form in our brains as we learn new things. When listening to familiar music, we may be recalling memories associated with a particular song.

-What instruments are the best for stimulating the brain?

Similarly to music preferences, instruments that tend to make us feel better when we hear them are those that we like the sound of. Because everyone's experiences and memories are unique, everyone's preferences are different.

-Does music help your memory?

Music is a great tool to help retrieve memories. It acts like a trigger - reminding us of a particular person, time, or place. Singing can also bypass damaged language centers in the brain: individuals who have lost their ability to speak due to a neurological disorder such as dementia or stroke are often still able to sing along with their favorite songs.

-What is the best age to learn music (why)?

Learning music is similar to learning anything else: the younger we learn, the quicker we tend to be able to learn it. This is because our brains are more plastic (adaptable/flexible) when we are children. This is why, for example, children tend to be very fast at learning new languages, and it tends to be more difficult for adults. However, learning new things at an older age can be excellent for maintaining brain health. Really, it's always good to learn something new!

-Is it better for your brain to learn more challenging instruments?

What is challenging for each person is also very unique. One person might find learning how to play a flute very easy, while another may find it very difficult.

Challenging ourselves to learn something new is good for our brain health.

-Does different music help with different diseases?

Music can be an excellent tool to work towards goals such as improving speech, maintaining memory, or improving social skills. As music therapists, we use music everyday to help individuals overcome their challenges and reach their goals.

-If you don't like a certain type of music, will it still help your brain?

Probably not. As music therapists, we are always very aware that music can also do harm: trigger bad memories or negative experiences.

-How does your brain deal with mental diseases?

This varies greatly depending on the disorder and the person. Various disorders affect the brain in different ways, and their progression is unique in each individual person. Doctors and scientists are constantly researching the progression of diseases, and ways to combat their progression.

-Do other parts of your body get affected by music?

Because music is sound, it is received by the ear, and then that information is sent to the brain for processing. Then, that information is sent to other parts of the body. For example, music can be a great motivator in exercising - it's easier to run a little further when you're listening to your favourite music. Music tends to be a great motivator for movement - it can make us feel like dancing, or just tapping our toes.

-What is music therapy?

Music therapy is a discipline in which Certified Music Therapists (MTAs) use music purposefully within therapeutic relationships to support development, health, and well-being. Music therapists use music safely and ethically to address human needs within cognitive, communicative, emotional, musical, physical, social, and spiritual domains. (from the Canadian Association of Music Therapists).

-Does music have an effect in animal brains?

Good question! I don't know much about this, but would be interested to find out!

-Does dynamic music affect the brain more or less?

Variances in music can help capture attention: whenever there's change, we tend to perk up a bit and pay attention. When things are the same for a while, we tend to zone out.

-What are mental conditions?

The term mental disorder covers a great many different disorders with different symptoms. They are generally characterized by a combination of abnormal thoughts, perceptions, emotions, behaviours, and relationships with others that impedes a person's ability to function in their everyday life.

-What other things help mental conditions?

Every disorder is treated uniquely. Treatments can include various forms of therapy (counselling, music therapy, etc), medication, identification of 'triggers', and social support.

Simon Kassem

-How does the brain work?

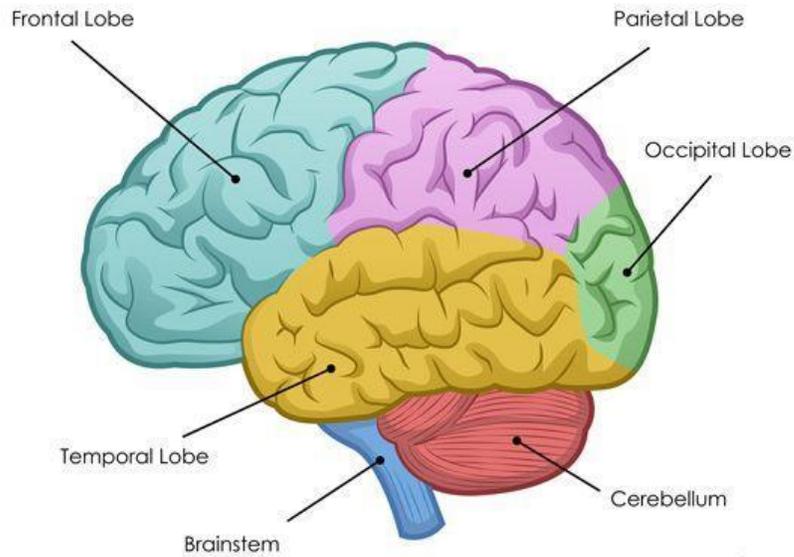
This is a really broad question. Essentially, you can picture the brain as many separate parts that work together as a whole. There are evolutionarily "early" parts of the brain, like the brainstem, that are responsible for basic functions such as sleep, hunger, thirst, breathing, sex drive, reflex management and "fight or flight" responses. Typically, many mammals have corresponding types of systems in that they, too, have need for these functions.

Then there are the "higher" functions that some mammals possess, such as motivation, emotion, memory, and the ability to plan and execute intelligent problem-solving skills. While we think that humans are capable of these because we have heavily evolved forebrains (large and dense cortical cells and connections on the anterior (frontal lobes) part of our brain, many other mammals such as gorillas and dolphins also have these capabilities. This is a sagittal (half brain) view of the major parts of the brain:

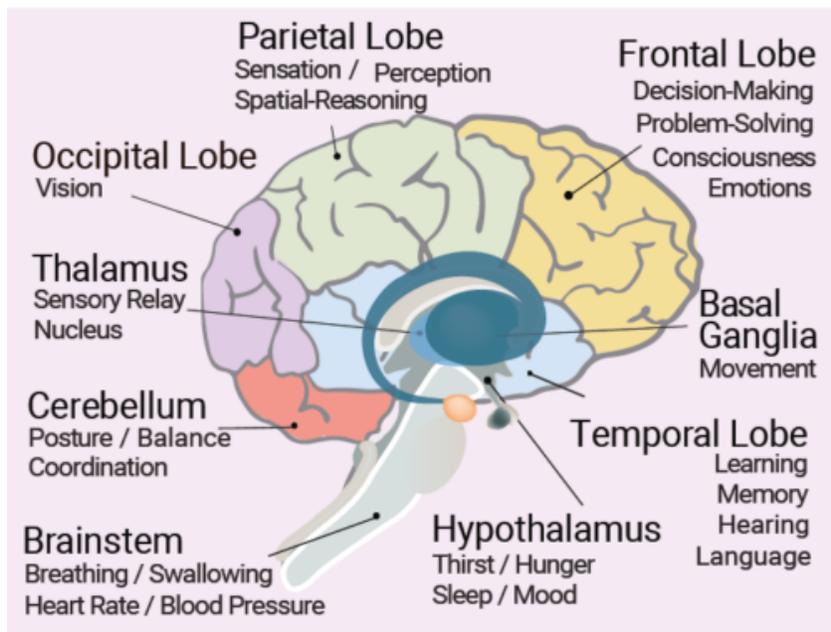
There are many main divisions:

- Frontal lobes (motivation, problem solving, emotion, planning)

- Occipital lobes (primary vision centres)
- Temporal lobes (memory and hearing functions)
- Parietal lobes (special orientation, sensory perception)
- Thalamus (almost like a central station for all sensory connections to travel through)
- Brainstem (hunger, thirst, breathing, basic functions of life)



Your eyeballs would be resting just under the frontal lobes



Note that the brain is flipped the other way

-What type of music calms the brain best? (ex: rock, classical etc.)

Lots of research exists, but most would state that soft music with no lyrics would help calm your brain the best, as it creates a sort of “white noise” that consciously/sub-consciously creates rhythmic patterns to assist in attention. However, it can be up to the individual. I love heavy rock music!

<https://www.health.harvard.edu/staying-healthy/music-and-health>

-Does your brain change with age?

Yes! Unfortunately, mostly you start to lose brain cells and, just like your body when you get old, your brain needs to work harder to keep up. Also, as you age, many start to develop cognitive disorders such as dementia which is, simply, malfunctioning connections due to a variety of possible issues.

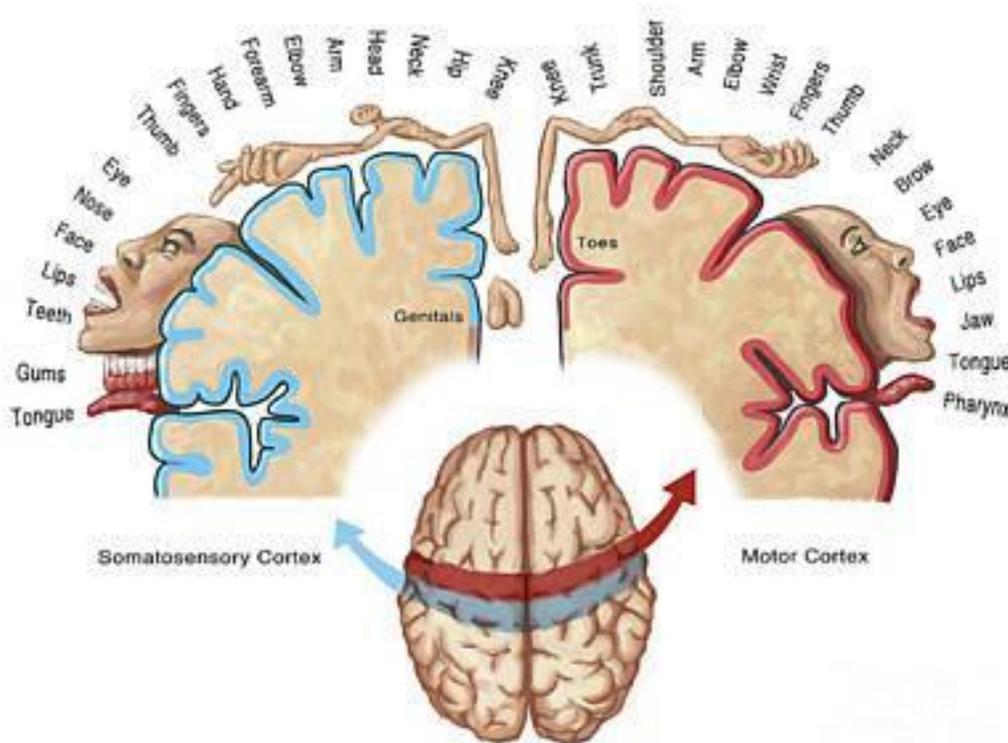
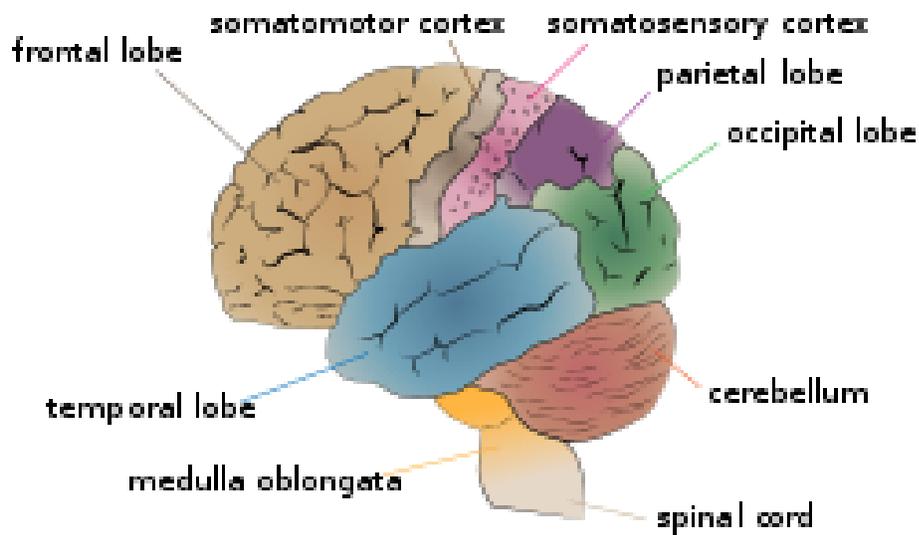
<https://www.nia.nih.gov/health/how-aging-brain-affects-thinking#:~:text=Changes%20in%20the%20Aging%20Brain,may%20not%20be%20as%20effective.>

-How does your brain receive input?

There is literally a part of your brain called the “somatosensory cortex” that receives input. The cortex is connected to all sensory parts of your body. Stimulating these parts in surgery (the patient is awake) will produce sensations in different parts of the body. Don't worry, there are no pain receptors in the brain, so it doesn't hurt!

Likewise, right next to the somatosensory cortex, there is the sensorimotor (somatomotor) cortex. This is the response centre that sends responses due to

sensory input. Also, likewise, stimulating these areas will produce motor responses! There are diagrams below:



-What is the difference of learning music vs. listening to music?

Briefly, listening to music can help you learn, calm, enrage, and produce essentially any type of emotional response in the listener. LEARNING music is like learning another language. The ability of the brain to learn another language helps the brain open up to learn even more. Studies suggest that people who know more than one language are better at learning new things, and tend to have healthier brains.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6368928/>

-What instruments are the best for stimulating the brain?

It doesn't matter! But piano and string instruments are quoted a lot.

<https://www.lifehack.org/531251/you-play-any-musical-instruments-your-brain-very-different-from-others>

-Does music help your memory?

Absolutely! Again, it goes to the notion of "use it or lose it". As well, fluent musicians will develop "musical" or "muscle" memory that can translate into day to day living. Studies show the benefits of music on memory related disorders such as Alzheimer's and dementia as well:

<https://capstonemusic.ca/the-power-of-music-and-memory/#:~:text=Any%20upbeat%20or%20classical%20music,recall%2C%20particularly%20in%20facial%20recognition.>

-What is the best age to learn music (why)?

This question is related to learning in general. Children and teens tend to absorb a greater amount of information than adults. Between the ages of 5 and 21, your brain can be at an optimal point of receiving and uniting information.

<https://www.musikalessons.com/blog/2013/05/the-best-age-to-start-music-lessons/>

-Is it better for your brain to learn more challenging instruments?

Again, it's not just challenging instruments, it's challenges in general. If you want a healthy brain, you need to exercise it, just as you would need to do so with your body. There are many studies that suggest puzzles and reading continue to strengthen connections in the brain, and learning how to play instruments is no different. I would contend that learning the piano would be more challenging than the kazoo, and thus more efficient brain processing would ensue.

<https://www.didgeproject.com/kids/10-best-musical-instruments-children-learn/>

-Does different music help with different diseases?

I'll cite this article again:

<https://capstonemusic.ca/the-power-of-music-and-memory/#:~:text=Any%20upbeat%20or%20classical%20music,recall%2C%20particularly%20in%20facial%20recognition.>

-If you don't like a certain type of music, will it still help your brain?

Research suggests that familiar music produces the best results. I'd have to explore more on the subject.

<https://www.brainfacts.org/diseases-and-disorders/neurodegenerative-disorders/2019/music-as-therapy-011719>

-How does your brain deal with mental diseases?

I'm going to cite a relatively large source; keep in mind that your brain will always lose and strengthen connections throughout life. If a person develops a brain disorder, the brain tends to compensate in different ways. When I say "strengthen connections", that is typically what is called "learning".

<https://www.ncbi.nlm.nih.gov/books/NBK234144/>

-Do other parts of your body get affected by music?

To say that the body is separate from the brain is a fallacy. Your body is directly and indirectly yoked to your brain. When you move, it's your brain that is telling your body to move. When you cut your finger, your brain is the thing that allows you to feel pain. So if your body parts are affected by music (or anything else), it's because of the sensory-motor responses from your brain.

-What is music therapy?

I'll let this article answer...

<https://www.musictherapy.org/about/musictherapy/>

-Does music have an effect in animal brains?

YES!

<https://www.mic.com/articles/92571/scientific-studies-on-animals-reveal-just-how-much-music-shapes-the-natural-world#:~:text=But%20it%20isn't%20just,essentially%20a%20force%20of%20nature.&text=At%20dog%20kennels%2C%20researchers%20found,sleep%20more%20and%20bark%20less.>

-Does dynamic music affect the brain more or less?

If you mean upbeat, rhythmic music, then yes. Studies suggest that more upbeat "happier" music will typically induce more positive responses in listeners. On the other hand, darker, more oppressive music can produce darker and more depressive moods. However, individual responses may vary. One of the brain's reward chemicals is dopamine. Studies suggest that the release of dopamine triggers good feelings. Incidentally, many drugs are dopaminergic agonists (release excessive amounts of dopamine), so good music that you love can produce the same effect as a drug (but obviously not as destructive to the body)!

<https://www.sclhealth.org/blog/2019/04/how-listening-to-certain-songs-can-impact-our-brain-and-affect-our-mood/>

-What are mental conditions?

This is a tough question. We all want to think that there is a thing called "normal". But everyone experiences and perceives things differently. That stated, there are many disorders that have been outlined, and psychologists/psychiatrists are trained to deal with these disorders. The major publication that help counsellors is called the Diagnostic and Statistical Manual of Mental Disorders – 5. This is a link that can help you with some of the more common disorders.

<https://www.psychiatry.org/psychiatrists/practice/dsm/educational-resources/dsm-5-fact-sheets>

-What other things help mental conditions?

Like all things with the body, exercise, good nutrition, good sleep, proper treatments, and positive lifestyle are keys to living a full and positive life, regardless of mental condition.

<https://cmha.bc.ca/documents/improving-mental-health/>

Thank you to Peter Thai for answering my questions. Unfortunately I do not have his interview written down but your contribution has been greatly appreciated.

How does the brain work?

There are many parts of the brain that do different things. These are: the Frontal Lobes, Occipital Lobes, Temporal Lobes, Parietal Lobes, The Thalamus (which is the main spot for sensory connections to go through), and the Brain Stem (this controls the main basic functions). These all come together to help the brain function. In general the brain is a very complex organ that houses many neurons that work together to control you. These neurons are activated by chemical messages called

neurotransmitters. These are sent down different paths in our brain and when we learn something new new pathways are made. We know a lot about the brain but there is still a lot to be learned about it, as it is a very complex organ.

What type of music calms the brain best?

According to research lyricless music or white noise calms the brain best. Though this is proven to be the best music to calm the brain it depends on the person. If a person doesn't like classical music they might not feel calm listening to classical music. Because they don't like it this isn't very calming music to them. Some people may like rock or jazz music and this calms them down. It also depends on emotional feelings from the past or different memories that help you feel calm.

Does your brain change with age?

As you age your brain changes too. As you learn new things and have different experiences new neural paths are formed. As you grow older your brain can shrink or atrophy. Your brain can lose cells and it makes it harder for your brain to keep up. This can lead to developing different disorders like dementia.

How does your brain receive input?

Your brain receives input from the nervous system. Like if you touch something hot the signal will go up your spine and go to your brain. These signals come from your five senses: sight, sound, touch, taste, and smell. The somatosensory receives these signals.

What is the difference between learning vs. listening to music?

When we learn music new pathways are formed in our brains. It is like learning a new language. It helps our brains get better. Studies also show that some of the motor functions on our brain do realize the difference between learning and listening to music. When listening to music new memories might form or some might be remembered. It also has an emotional response to the person listening to the music. In general music is both good to be listened to and played.

What instruments are best for stimulating the brain?

Each instrument created different pathways that help us learn. Different instruments help us with different motor skills as well. It also depends on the instrument that the person like listening to. This recalls memories and might feel different to each person. Thus a specific instrument isn't the best or the worst at stimulating the brain. Though this is all true string instruments and piano are very recommended instruments because they require both hands to do different things at the same time.

Does music help your memory?

Yes it does. Music can help recall memories for people with memory issues. Some

people with Alzheimer's disease can forget a lot of things but can still remember how to play a musical instrument. It is easier for people to remember things if they can associate it with something else. Music helps with this because it helps us group words and notes together. Music also triggers memories

What is the best age to learn music?

The best age to learn music is at a young age. Young brains are still developing and can soak up information easier. Ages 5-21 are usually a good age to learn a new instrument.. though it is easier to learn a new instrument when you are young it is also good to learn when you are older. It helps challenge older brains keeping them healthy. In conclusion all ages are good for learning.

Is it better for your brain to learn more challenging instruments?

Musical instruments have different difficulties for different people. The piano might be way easier to learn to one person but might be the hardest thing in the world to another. Some instruments are probably a bit harder than others (like a violin would probably be harder to play than a kazoo) but it is different to every person. It is good for your brain to be challenged though so anything that is challenging to you is good for your brain.

Does music help with different diseases?

Yes music is a very good tool to help with different diseases. It helps calm anxiety, helps recall memories, get parkinson's patients moving by motivating them, and can help boost moods. Music therapists use music as a helpful tool to help their patients.

If you don't like a type of music will it still help your brain?

Probably not. Even though all music still stimulates the brain it won't help you or your brain. If you have listened to a piece of music during a tragic time it might trigger bad memories. Music therapists like to have their patients listen to familiar music that they like and enjoy.

How does your brain deal with mental diseases?

It is a quite complicated process. Depending on the person and what disease they have reflects on how they deal with it. Different diseases will affect the brain in different ways. The brain will make new connections as it learns, helping deal with the disease.

Do other parts of your body get affected by music?

Music goes through the ear and is sent to the brain to process. The brain controls the music sensor and tells the body what to do like tapping toes or singing along to your favorite song. Music is also great to motivate you.

What is music therapy?

Music therapy is a tool to help improve your mood and well being. It uses music to help recall memories, boost mood, help verbal skills, and social skills.

Does music have an effect on animal brains?

Not much is known about how music affects animals as they can't tell us directly. Though, studies have shown that classical music can help reduce anxiety in dogs. Heavy metal music will cause dogs to bark loudly and shake vigorously. It has also been shown that cows listening to music 100 beats per minute or less produce more milk!

Does dynamic music affect the brain more or less?

Yes it does. Music that had different dynamics (loud, soft, in between) can help us pay attention better. Change will keep our brains alert. If something is the same all the time we will tend to drop out a bit. Happy or more joyful music will create dopamine which will cause you to be happier.

What are brain conditions?

Mental disorders/conditions is a very broad topic. This is because it is hard to define a "normal" brain. Some mental disorders are caused by chemical imbalances in brains though that is only one cause. Some other causes are traumatic experiences, life circumstances, and many others. Mental disorders involve emotional changes, abnormal thoughts, and stops some people from functioning in everyday life.

What other things help mental conditions?

There are many treatments for mental conditions other than music therapy. Medications are a big help. Things like group therapy, social support, and counselling are also good ways to treat mental conditions. Even though these are all good ways to treat mental conditions the best is to have a healthy active lifestyle.

Alzheimer's disease

Is a disease that gradually breaks down memory and thinking skills. Eventually it leads to troubles doing everyday tasks. It usually starts showing symptoms during mid-60s, but a rare form of the disease called early onset Alzheimer's disease can start showing symptoms during mid-30s to 60s. It is a common cause for dementia for many elderly adults.

Dementias

Is mostly caused by abnormal changes in the brain. The changes can cause slowing of thinking skills and can be severe enough to cause slowing of daily life and independent functioning. It can also change behavior, relationships and feelings.

Epilepsy

Is diagnosed when the brain has recurring seizures. Seizures are caused when there is a lot of electrical activity in the brain. Other things that cause epilepsy are head injuries, infections in the brain, and strokes.

Parkinson's

In the center of the brain there are some nerves that will degenerate gradually. This causes problems with coordination and movement. Some signs that you might have parkinson's disease is that you may find tremors in your hands, stiff limbs slow movement and your posture might be unstable.

Amyotrophic lateral sclerosis (ALS)

Is also called Lou Gehrig's disease. Nerves that control the muscle functions are quickly destroyed. It leads to paralyzation and difficulty breathing without assistance.

Analysis

- There seemed to be an impact to the brain with music
- There are still lots to be research as there are many impacts to the brain that haven't been taken into consideration
- There are many conditions that the brain faces
- There are lots of inputs to the brain - some of the senses are combined

Conclusion

Music affects the brain in many ways. It can helps patients with parkinson's disease get moving, help recall memories and boost mood. To some people it challenges the brain and helps build new neural pathways when we learn a new instrument. Even though it is easier to learn an instrument when you are young it is a good challenge for you when you get older as well.

Improvements

- More time to work on things

Applications and future research

- Other diseases

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- Dr. Peter Tai (neurologist)
- Ms. Lisa Natagaal (music therapist)
- Ms. Jennifer Buchanan (music therapist)
- Ms. Heather Lai (mom)

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