University of the Third Age
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The effect of music on well-being

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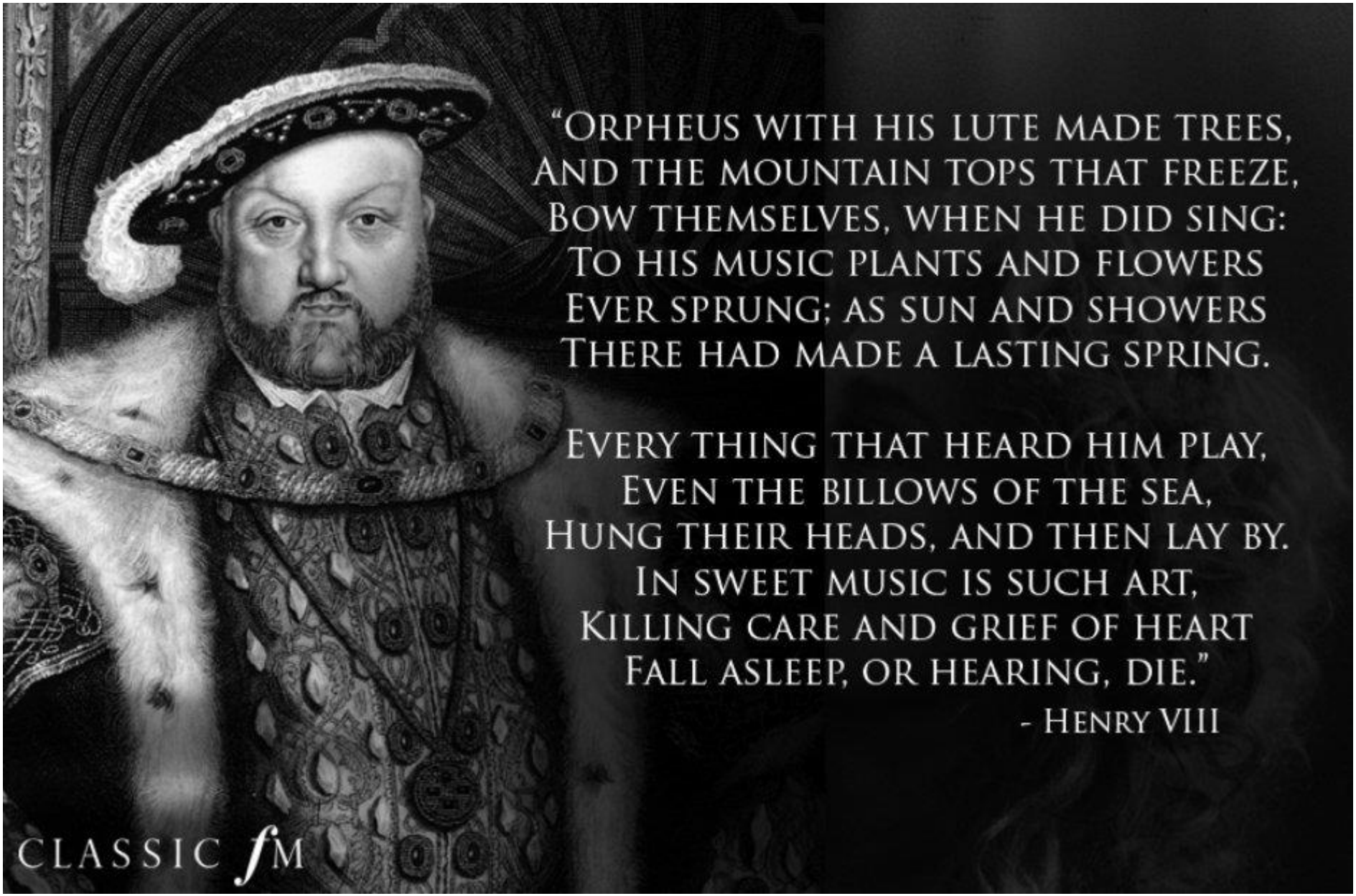
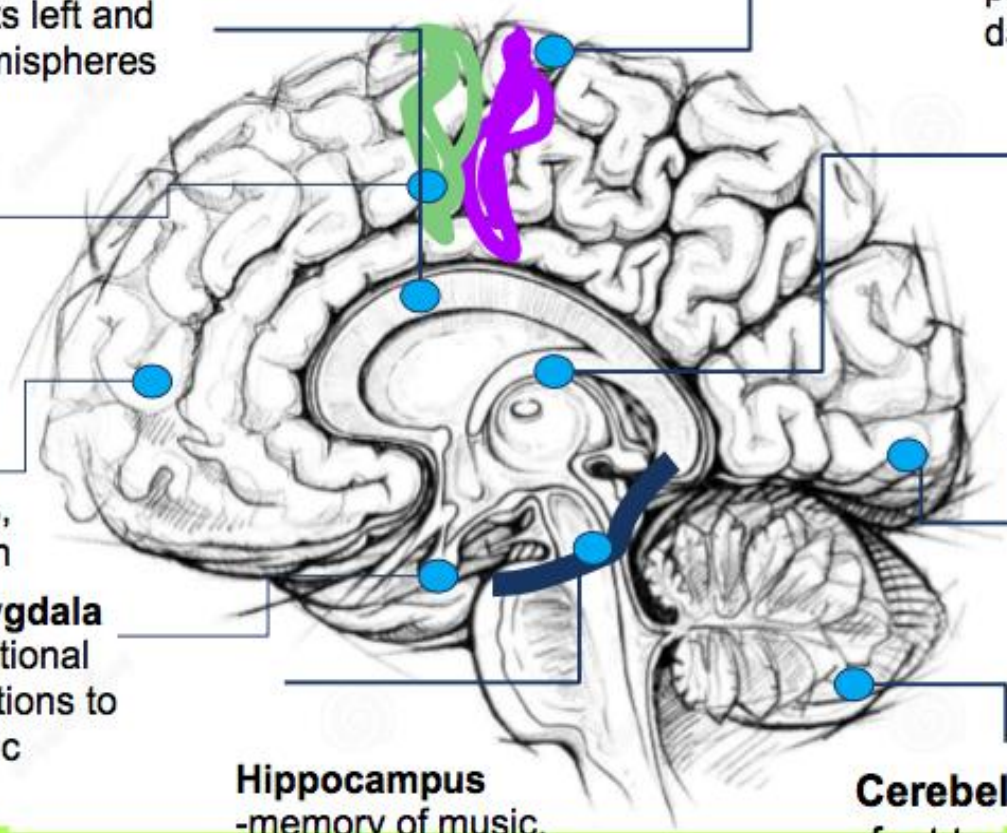

"Orpheus with his lute made trees,
And the mountain tops that freeze,
Bow themselves, when he did sing:
To his music plants and flowers
Ever sprung; as sun and showers
There had made a lasting spring.
Every thing that heard him play,
Even the billows of the sea,
Hung their heads, and then lay by.
In sweet music is such art,
Killing care and grief of heart
Fall asleep, or hearing, die."
- Henry VIII
CLASSIC fM

*If **music** be the food of love, play on; Give me excess of it, that, surfeiting, The appetite may sicken, and so die. That strain again! it had a dying fall: O! it came o'er my ear like the sweet sound That breathes upon a bank of violets, Stealing and giving odour.*

Twelfth Night William Shakespeare


Musical notes
Trombone
Saxophone
Trumpet
Tuba
French horn
Recorder
Clarinet
Piano
Microphone
Records
Keyboard
Bell
Harmonica
Accordion
Harp
Banjo
Double bass
Cello
Violin
Bass guitar
Guitar
Drum
Drums
Bass drum
Conga
Xylophone
Snare drum
Maracas

Music & The Brain



Corpus Callosum
-connects left and right hemispheres

Sensory Cortex
-tactile feedback from playing instrument or dancing

Motor Cortex
-movement
-foot tapping
-dancing
-instrument play

Auditory Cortex
-Listens to sounds
-perceives/analyzes tones

Prefrontal Cortex
-creation of expectations, violation, and satisfaction of expectations

Visual Cortex
-reading music
-looking at dance moves

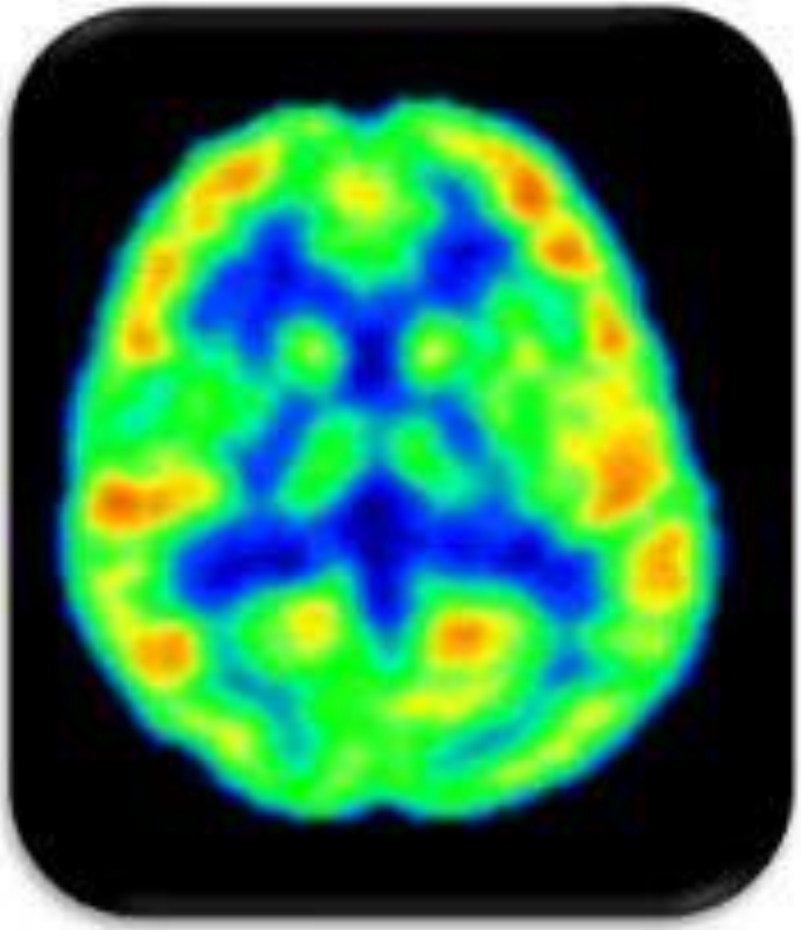
Amygdala
Emotional reactions to music

Hippocampus
-memory of music, musical experiences, and contexts

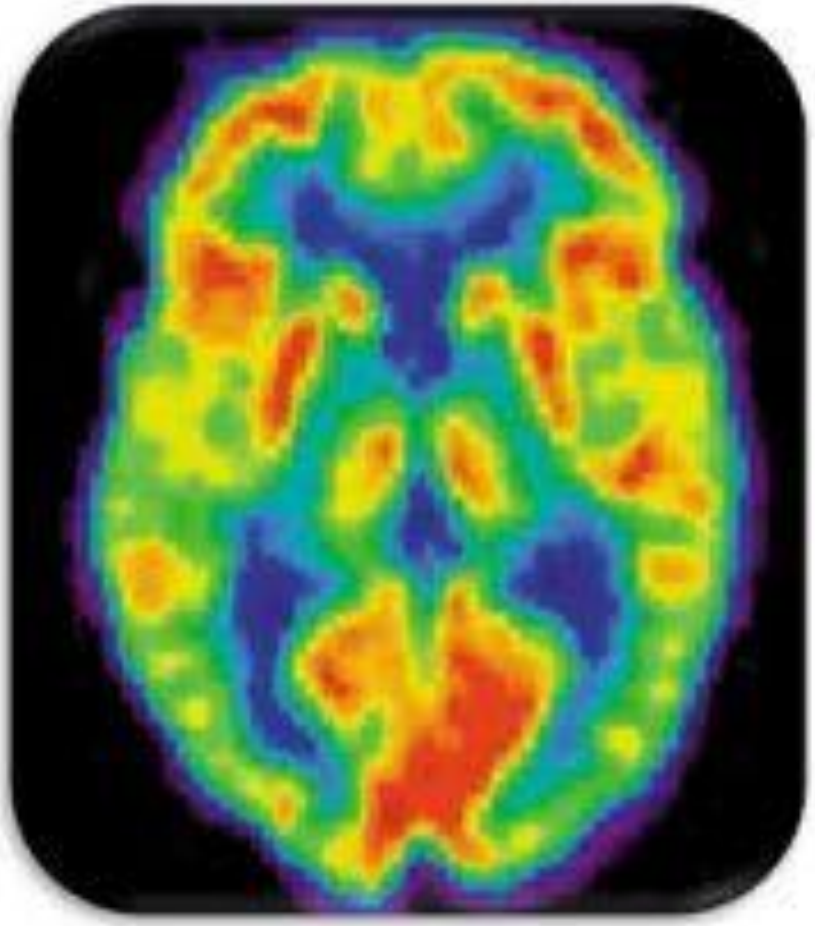
Cerebellum
-foot tapping
-playing instrument
-Emotional reaction to music

Source: *This is Your Brain on Music:* The Science of Human Obsession by Daniel J. Levitin

The brain at rest



The brain's reaction to music



The study of '***music and emotion***'

- Seeks to understand the psychological relationship between human affect and music.
- It is a branch of music psychology with numerous areas of study, including the nature of emotional reactions to music, how characteristics of the listener may determine which emotions are felt, and which components of a musical composition or performance may elicit certain reactions.
- The field draws upon and has significant implications for such areas as philosophy, musicology, music therapy, music theory and aesthetics, as well the acts of musical composition and performance.

- Hearing a particular song can bring back a special memory or make one feel happy or calm or pumped up?
- People are born with the ability to tell the difference between music and noise.
- Our brains actually have different pathways for processing different parts of music including pitch, melody, rhythm, and tempo.
- And, fast music can actually increase your heart rate, breathing, and blood pressure, while slower music tends to have the opposite effect.
- While the effects of music on people are not fully understood, studies have shown that when you hear music to your liking, the brain actually releases *dopamine* that has positive effects on mood.


The Neuroscience of
vivid musical memories

A series of recent studies have found that listening to music engages ***broad neural networks in the brain, including brain regions responsible for motor actions, emotions, and creativity.***

In the first of its kind, a 2013 Australian study, used popular music to help severely brain-injured patients recall personal memories.

Although their study only involved a small number of participants, it is the first to examine ‘music-evoked autobiographical memories’ (MEAMs) in patients with acquired brain injuries (ABIs), rather than those who are healthy or suffer from Alzheimer’s disease. In their study, the researchers played snippets from "Billboard Hot 100" number-1 songs in a random order to people with ABI.

The songs—taken from the whole of the patient's lifespan from age five—were also played to control subjects with no brain injury. All participants were asked to record how familiar they were with a given song, whether they liked it, and what memories the song evoked.

Interestingly, the highest number of MEAMs in the whole group was recorded by one of the ABI patients. In all those studied, the majority of MEAMs were of a person, people or a life period, and were typically positive. Songs that evoked a memory were noted as being more familiar and more well liked than songs that did not trigger a MEAM.

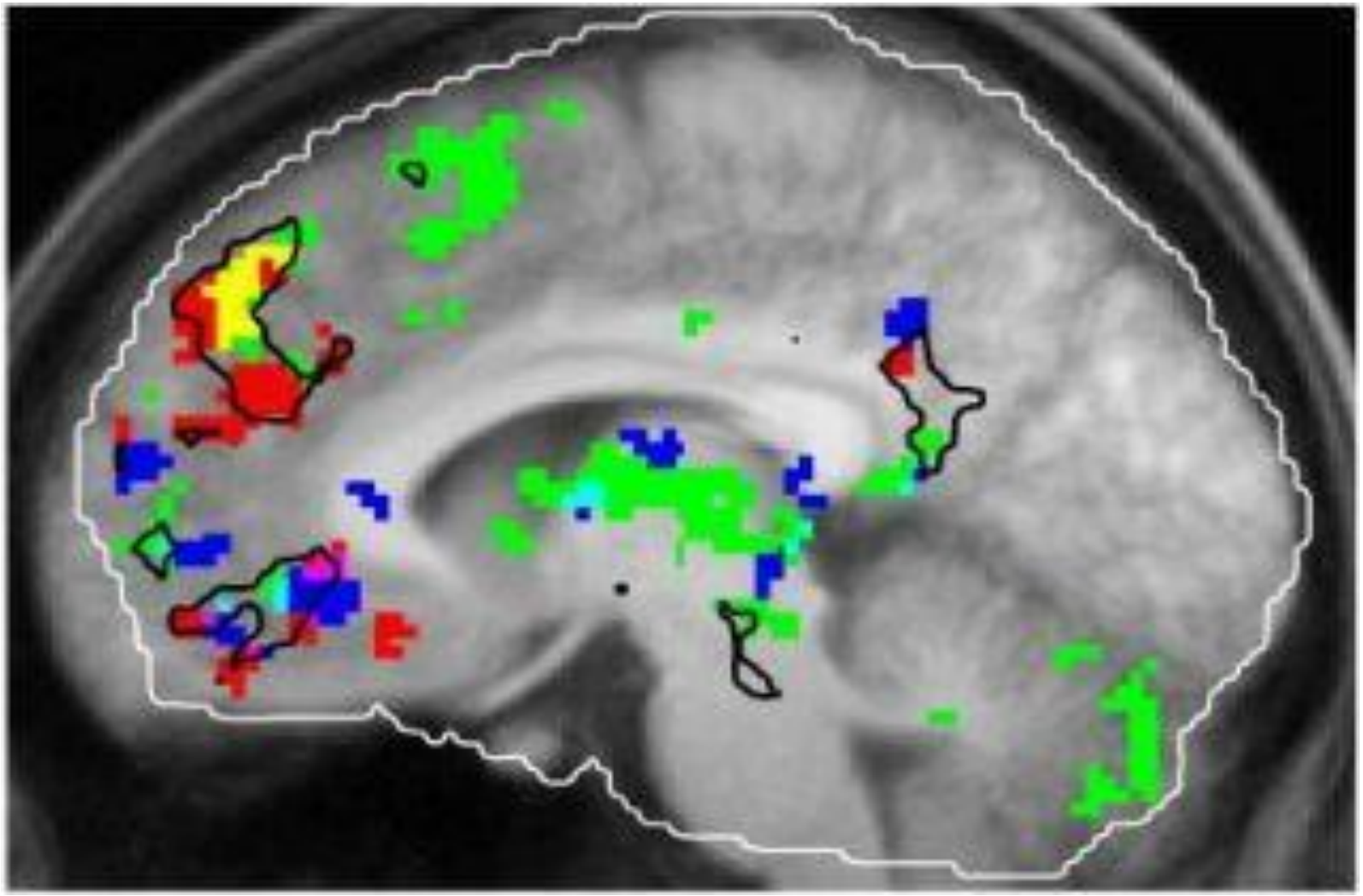
This is common sense.

Two previous studies identified the broad range of neural networks that are engaged when we listen to music.

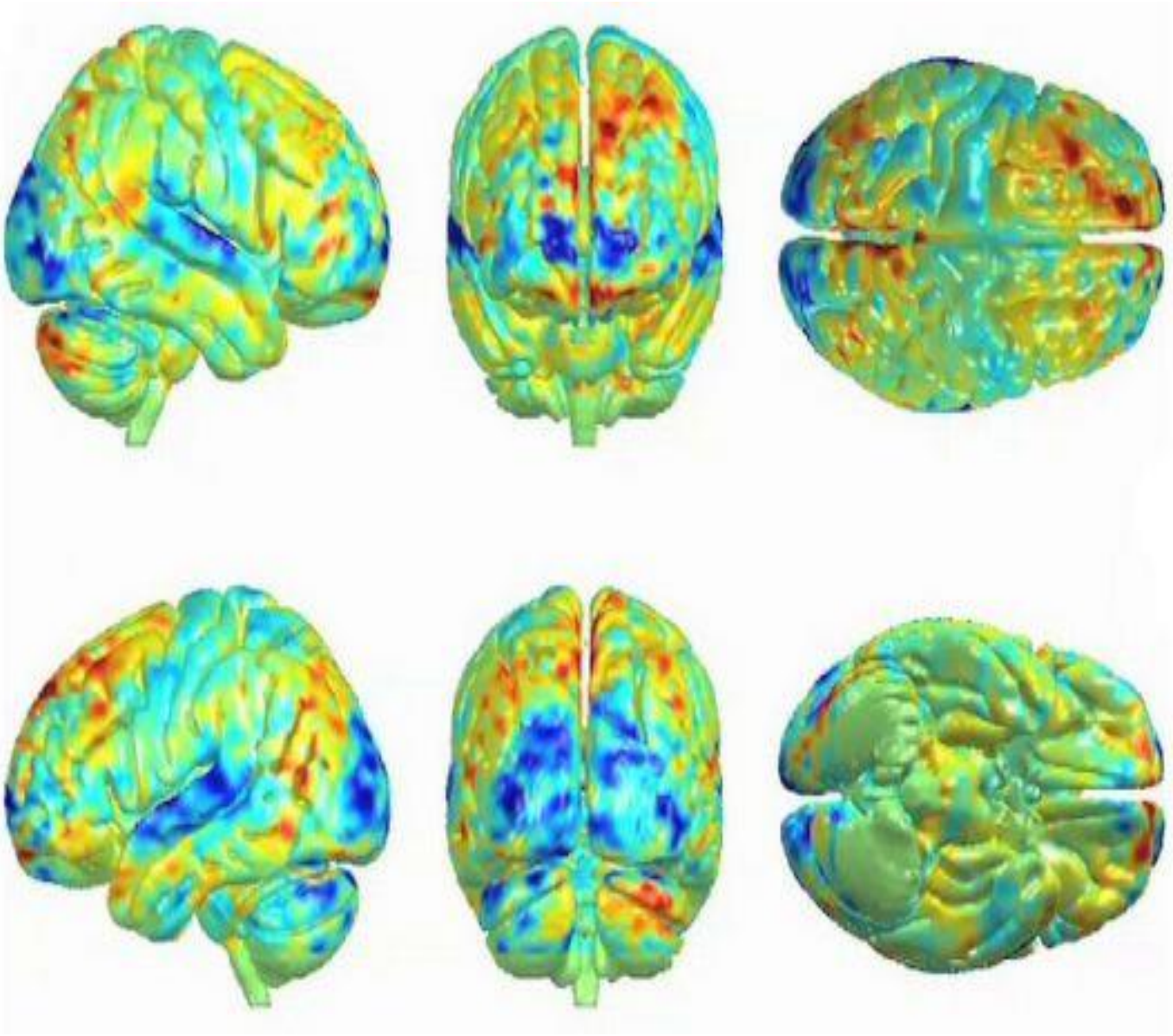
A 2009 American study mapped the brain while people listened to music and found specific brain regions linked to auto- biographical memories and emotions are activated by familiar music.

The discovery may help to explain why music can elicit strong responses from people with Alzheimer's disease.

The hub that music activated is located in the medial prefrontal cortex region—right behind the forehead—and one of the last areas of the brain to atrophy over the course of Alzheimer's disease.



Familiar songs light up areas in green



Music lights up the entire brain

What seems to happen is that a piece of familiar music serves as a soundtrack for a mental movie that starts playing in our head.

It calls back memories of a particular person or place, and you might all of a sudden see that person's face in your mind's eye.

Now we can see the association between those two things—the music and the memories.

To assure the best chance that students would associate at least some of the tunes with memories from their past, the researchers also chose songs randomly from "Billboard Hot 100" charts from years when each subject would have been 8 to 18 years old.

After each excerpt, the student responded to questions about the tune, including whether it was familiar or not, how enjoyable it was, and whether it was associated with any particular incident, episode or memory.

The study revealed that, on average, a student recognised about 17 of the 30 excerpts, and of these, about 13 were moderately or strongly associated with an autobiographical memory.

When the researchers studied the MRI images and compared them to these self-reported reactions, they discovered that the degree of salience of the memory corresponded to the amount of activity in the upper (dorsal) part of the medial prefrontal cortex.

This correlation supports the hypothesis that this brain region helps link music and memory.

They were also able to create a model for mapping the tones of a piece of music as it moves from chord to chord and into and out of major and minor keys. By making tonal maps of each musical excerpt and comparing them to their corresponding brain scans, they discovered that the brain was tracking these tonal progressions in the same region as it was experiencing the memories: in the dorsal part of the medial prefrontal cortex, as well as in regions immediately adjacent to it.

And in this case, too, the stronger the autobiographical memory, the greater the "tracking" activity.

Songs that were linked to the strongest, most salient memories were the ones that evoked the most vivid and emotion-laden responses.

Music engages brain regions linked to motor actions, emotions, and creativity

In a 2011 study, Finnish researchers used a ground-breaking method that allowed them to study how the brain processes different aspects of music, such as rhythm, tonality and timbre (sound colour) in a realistic listening situation.

They discovered that listening to music activates wide networks in the brain, including areas responsible for motor actions, emotions, and creativity. This mapping revealed complex dynamics of brain networks and the way music affects us. For this study participants were scanned with functional Magnetic Resonance Imaging (fMRI) while listening to a stimulus with a rich musical structure, a modern Argentinian tango.

The researchers correlated temporal evolutions of timbral, tonal, and rhythmic features of musical stimulus. While timbral* feature processing was associated with activations in cognitive areas of the cerebellum, and sensory and the default mode network grey matter of the cerebral hemispheres, musical pulse and tonality processing recruited cortical and subcortical cognitive, motor and emotion-related circuits.

**Timbral is the distinguishing quality of a sound that distinguishes one sound from another sound. When a voice resonates deeply and has a rich sound quality, this is an example of a timbral characteristic of that voice.*

The researchers found that music listening recruits the ***auditory areas of the brain***, but also employs large-scale neural networks. For instance, they discovered that the processing of musical pulse recruits motor areas in the cerebellum and cerebrum, supporting the idea that music and movement are closely intertwined.

Limbic areas of the brain, known to be associated with emotions, were also found to be involved in rhythm and tonality processing.

Processing of timbre was associated with activations in the so-called default mode network, which is assumed to be associated with mind wandering and creativity. The results show for the first time how different musical features activate emotional, motor and creative areas of the brain.

Conclusion: Music Has Broad ***Therapeutic*** Potential

In sum, the Finnish researchers combined neuroimaging, acoustic feature extraction and behavioural methods, and revealed the large-scale cognitive, motor and limbic brain circuitry is engaged while listening to music.

In addition, their study has practical and potential therapeutic relevance because it creates a way to observe individual neural processing based on how someone responds to music based on his or her unique history.

Music was more efficient at evoking autobiographical memories than verbal prompts of the Autobiographical Memory Interview (AMI) across each life period, with a higher percentage of MEAMs for each life period compared with AMI scores.

Music is an ***effective stimulus for eliciting autobiographical memories*** and may be beneficial in the rehabilitation of autobiographical amnesia, but only in patients without a fundamental deficit in autobiographical recall memory and intact pitch perception.

Because autobiographical memories linked to music seem to be spared in people with ***Alzheimer's disease***, one of the long-term goals is to use this research to help develop music-based therapy for people with the disease.

Music can make us feel strong emotions, such as joy, sadness, or fear—some will agree that it has the power to move us.

According to some researchers, music may even have the power to improve our health and well-being.

Though more studies are needed to confirm the potential health benefits of music, some studies suggest that listening to music can have a number of positive effects on health.

Music:

1. Improves mood.
2. Reduces stress.
3. Lessens anxiety.
4. Improves exercise.
5. Improves memory.
6. Eases pain.
7. Provides comfort.
8. Improves cognition.
9. Helps children with autism spectrum disorder.
10. Soothes premature babies.

1. *Improves mood.*

Studies show that listening to music can benefit overall well-being, help regulate emotions, and create happiness and relaxation in everyday life.

2. Reduces stress. Listening to 'relaxing' music (generally considered to have slow tempo, low pitch, and no lyrics) has been shown to reduce stress and anxiety in healthy people and in people undergoing medical procedures (e.g., surgery, dental, colonoscopy).

Music has a unique link to our emotions, and research has found that it can be used as an extremely effective stress management tool.

3. Lessens anxiety. In studies of people with cancer, listening to music combined with standard care reduced anxiety compared to those who received standard care alone.

4. Improves exercise. Studies suggest that music can enhance aerobic exercise, boost mental and physical stimulation, and increase overall performance.

Listening to music while ***exercising*** doesn't just relieve boredom — it can help improve the quality of workout by increasing stamina and putting one in a better mood. ... The lyrics or catchy rhythm of motivational music inspires to ***exercise*** longer or work harder during exercise routine.

***5. Improves memory*.** Research has shown that the repetitive elements of rhythm and melody help our brains form patterns that enhance memory. In a study of stroke survivors, listening to music helped them experience more verbal memory, less confusion, and better focused attention.

6. Eases pain. In studies of patients recovering from surgery, those who listened to music before, during, or after surgery had less pain and more overall satisfaction compared with patients who did not listen to music as part of their care.

Researchers have found that music can help reduce chronic pain. Previous studies in this field have only focused on acute pain. Most of us know that a good song can boost our mood. ... A 2016 study found that fibromyalgia patients experienced less chronic pain after listening to their favourite musi**c**.

7. Provides comfort. Music therapy has also been used to help enhance communication, coping, and expression of feelings such as fear, loneliness, and anger in patients who have a serious illness, and who are in end-of-life care. Musical experiences affect the emotional state, altering emotions and mood. Music has the potential to change, maintain and enhance mood, while providing solace, acting as a comforting friend. Music listening is an effective means for mood regulation, relaxation and emotional self-regulation

8. Improves cognition.

The available evidence indicates that music listening leads to enhanced performance on a variety of cognitive tests, but that such effects are short-term and stem from the impact of music on arousal level and mood, which, in turn, affect cognitive performance; experiences other than music listening have similar effects Listening to music can also help people with Alzheimer's recall seemingly lost memories and even help maintain some mental abilities.

9. Helps children with autism spectrum disorder.

Studies of children with autism spectrum disorder who received music therapy showed improvement in social responses, communication skills, and attention skills.

One of the reasons that music has quickly become a tool used in autism therapy is that it can stimulate both hemispheres of the brain, rather than just one. This means that a therapist can use a song or instrument to support cognitive activity so that we can build self-awareness and improve relationships with others.

***10. Soothes premature babies*.** Live music and lullabies may impact vital signs, improve feeding behaviours and sucking patterns in premature infants, and may increase prolonged periods of quiet–alert states.

Culture in music cognition refers to the impact that a person's culture has on their music cognition, including their preferences, emotion recognition, and musical memory.

Musical preferences are biased toward culturally familiar musical traditions beginning in infancy, and adults' classification of the emotion of a musical piece depends on both culturally specific and universal structural features. Additionally, individuals' musical memory abilities are greater for culturally familiar music than for culturally unfamiliar music.

The sum of these effects makes culture a powerful influence in music cognition.

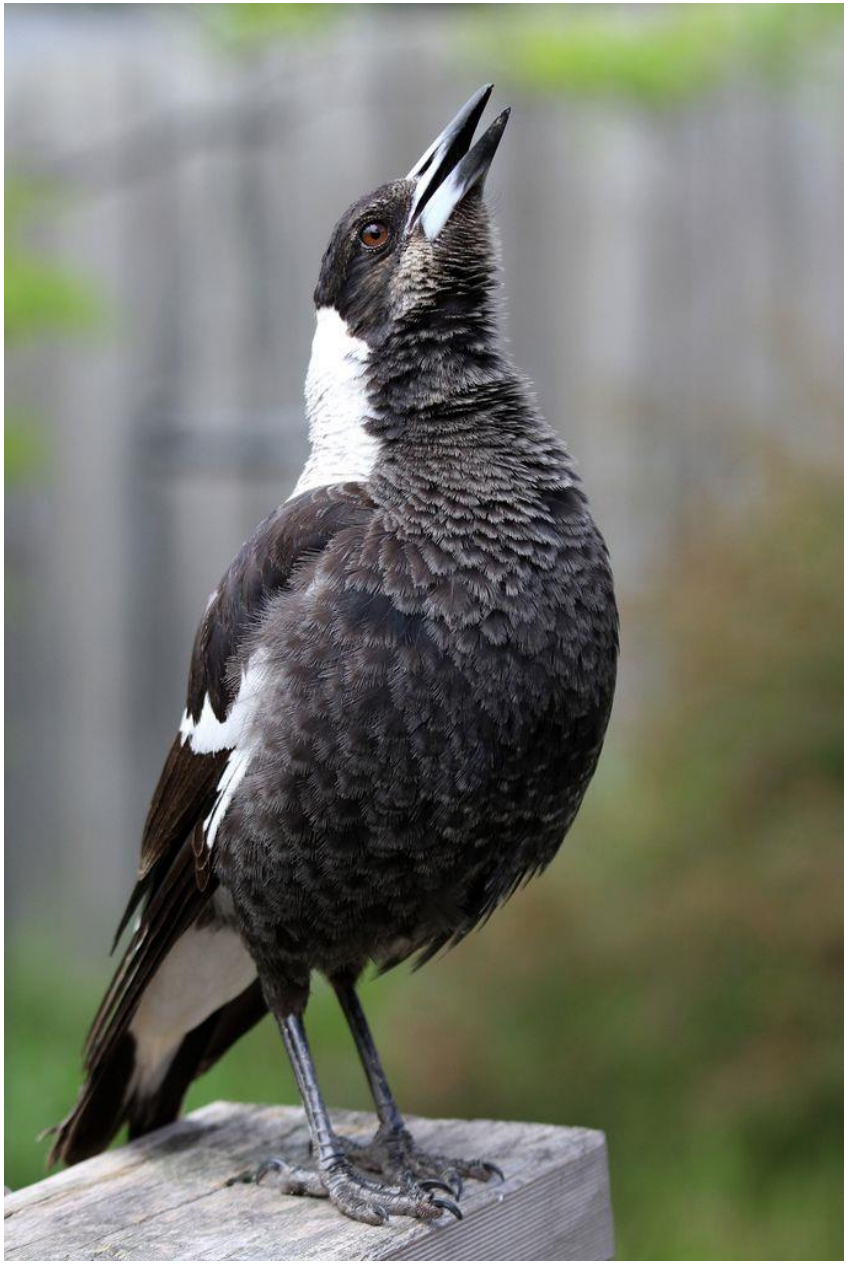
Singing:

1. the activity of performing songs or tunes by making musical sounds with the voice.

"the singing of hymns in Latin"

2.melodious whistling and twittering sounds made by a bird or birds "the cries of laughter from children are a pleasant counterpoint to the singing of blackbirds"

The fine, fluty **song** of the Australian Magpie is a much-loved sound of the Australian bush (think Nillumbik). Loud, melodious carolling phrases are often given as a duet or group, with the first notes usually initiated by the dominant male or female. This species makes a variety of other vocalisations with some local variations as well.




Roland


Lullabies

A **lullaby**, or cradle song, is a soothing song or piece of music that is usually played for (or sung to) children. The purposes of **lullabies** vary. In some societies they are used to pass down cultural knowledge or tradition.

Singing "hush little baby, don't say a word" can actually help babies relax and sleep. ... By recreating this womb experience through song, parents can comfort and soothe the baby off to sleep.

However, modern research methods have found that lullabies do much more than help a baby sleep.

Archaeological evidence suggests that parents have used lullabies to soothe their young for ***at least 4,000 years.***

Despite the general assumption that lullabies help babies relax, it wasn't until fairly recently that scientists began to understand exactly why these gentle tunes are so effective.

One simple explanation is that lullabies feature a ***triple meter, or 6/8 time***. This gives the song a rocking or swaying rhythm, closely matching the movements the foetus experienced while in the womb. By recreating this womb experience through song, parents can comfort a child and soothe him or her off to sleep.

However, modern research methods have found that lullabies actually create a physiological response in the body, which can have far-reaching effects on health and wellness.

6/8 time

A time signature of **6/8** means count 6 eighths notes to each bar.

This is also an very often used time signature.

You would count the beat:

1,2,3,4,5,6,1,2,3,4,5,6, and so on…

In a 2010 study, researchers played recorded lullabies to premature infants. These recorded tracks improved oxygen levels and respiration rates but failed to affect other areas, like heart rate and weight gain.

When another research group repeated this experiment in 2013 using live music, they found the lullabies had an even greater effect; the premature infants enjoyed improved respiratory function, reduced heart rates — indicating lower stress levels — as well as better sleeping and sucking patterns. These lullabies also reduced ***parental*** stress as well .

A 1997 British study showed that premature babies who listened to recorded singing enjoyed greater health benefits than those who listened to a recording of spoken words or those who listened to no recording to all.

The babies who listened to lullabies showed such improvement that they were able to leave the hospital an average of three days sooner than the other babies in the experiment.

Researchers believe that they benefited from the smooth, even rhythm of the tunes. Another UK study in 2013 found that listening to lullabies during a medical procedure actually reduced stress and pain levels. In the study, lullabies were more effective than spoken stories at reducing stress and pain for children. It's possible that these songs activate the brain's limbic system, which responds to the melodies by releasing pain-killing endorphins .

Why Do the Songs from past Past Evoke Such Vivid Memories?

Listening to music engages large scale neural networks across the entire brain.

We all know the power of an old song to trigger vivid memories that seem to transport us back in time and space.

What songs bring back emotional memories from your past?

The songs we love become woven into a neural tapestry entwined with the people, seasons, and locations throughout our lifespan.

What is the neuroscience behind the ability of music to evoke such strong memories of the past. (see earlier)

Music and emotion

Besame mucho	Anrea Bocelli
Yesterday	The Beatles
Yesterday when I was young	Charles Aznavour
Les Feuilles mortes	Yves Montand
Ochi Chernye	The Red Army Choir
Ode to joy	*Ludvig van Beethoven*
Try to remember	Harry Belafonte
My Yidishe momme	The Barry sisters
L Marseiliase	Edith Piaf
Ave Maria	Various composers
Dance me to the dance of love	Leonard Cohen


THANK YOU!