

# संगीत त्रिवेणी

(गायन-वादन-नर्तन)

उत्तर भारतीय संगीत (गायन, वादन, नृत्य) के विविध आयाम



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नोट-प्रस्तुत प्रोसिडिंग में शामिल किये गए समस्त शोध पत्रों की सामग्री एवं तथ्यों की सम्पूर्ण जबाबदारी लेखकों की होगी इस हेतु सम्पादक या समिति किसी प्रकार से जिम्मेदार नहीं होगी।

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# Interrelation between music and chemistry: An Overview

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## Abstract

There is a great effect of music on our brain. As we all know listening to certain music or songs elevates our mood or let it down. These fluctuations in moods has a science behind it. Our life revolves around music. Whether it is singing while driving car, playing musical instruments, group singing or simply recreation. Listening to music is fascinating and interesting. Music stimulates the brain by producing dopamine and serotonin which are happy chemicals for the brain. This paper deals with the impact of music on human brain and relating music with chemistry.

**Keywords** : Music, chemical composition, dopamine, serotonin, neurotransmitter, frequency, rhythm.

## Introduction

Effect of music on the brain is not an exact science, as it relates to various factors. The biggest factor is that, as human beings, we all have our own opinion and everyone is different. Research has found that when a person listens to music that gives happiness, it triggers a release of dopamine to the brain. Dopamine is a kind of naturally occurring happy chemical we receive as part of a reward system. Music helps to change the ability to perceive time, make a better communicator, makes stronger, boost the immune system, assist in repairing brain damage, makes smarter and it evokes memories.

## Role of chemicals Dopamine and Serotonin

Dopamine and serotonin are both neurotransmitters. This means they are chemical message carriers between nerve cells in the brain as well as to and from other areas of your body. Both are also considered the happy hormones as they both play a role in positive mood and emotion. Serotonin is associated with happiness, focus and calmness. Dopamine is associated rewards and motivation. Dopamine and serotonin also share involvement in some mental health conditions, including depression and mood disorders. Dopamine controls body movements and coordination. Serotonin helps regulate digestive functions including bowel function and appetite. Dopamine causes a feeling of hunger while serotonin suppresses that feeling. Dopamine is mostly stored in your brain while serotonin is found in gut.

### **Composition of dopamine**

$C_8H_{11}NO_2$  is the chemical makeup of dopamine and it is a neurotransmitter of the brain, which means it helps to regulate movement in the extrapyramidal system part of the brain. Dopamine is obtained from a certain type of protein we eat called tyrosine. Tyrosine then gets broken down into dopa which we as humans then process into dopamine. Dopamine can't cross the blood brain barrier which means it must be manufactured in the brain.

### **Composition of serotonin**

$C_{10}H_{12}N_2O$  is the chemical composition of serotonin, which is also a neurotransmitter in the brain. It is known for regulating body temperature, moods, hunger, tiredness and sexuality. It is found mostly in the raphe nuclei all over the brain and contributes to several more areas than dopamine but works with dopamine in the areas it is found in as well.

Serotonin is obtained from the precursor tryptophan. The effect that music has on the human brain is naturally occurring and chemistry helps the proteins from which the chemicals can change into the chemicals that your brain forms.

### **How the brain responds to music**

According to the neuroscientists sugaya (2006) and yonetani, teaching one of the most popular courses in The Burnett Honors College. "Music and the Brain" explores how music impacts brain function and human behavior, including reduction in stress, pain and symptoms of depression as well as improving cognitive and motor skills, spatial-temporal learning and neurogenesis, which is the brain's ability to produce neurons. Sugaya and yonetani teach how people with neurodegenerative diseases such as Alzheimer's and Parkinson's also respond positively to music. Following are the parts of brain and the effect of music on them:

**Frontal Lobe-** This part of brain is used in thinking, decision-making and planning. Human have a big frontal lobe compared to other animals. By listening to music we can enhance its function.

**Temporal Lobe-** This part of brain processes what we hear. We use the language center to appreciate music, which spans both sides of the brain, though language and words are interpreted in the left hemisphere while music and sounds are interpreted in right hemisphere.

**Broca's Area -**This part of brain enables us to produce speech. We use this part of the brain to express music.

**Wernicke's Area-** This part of brain comprehends written and spoken language. This part of brain is used to analyze and enjoy music.

**Occipital Lobe-** This part processes what we see. Professional musicians use the occipital cortex, which is the visual cortex, when they listen to music, while laypersons, use temporal lobe- the auditory and language center. This suggests that musicians might visualize a music score when they are listening to music.

**Cerebellum-** It coordinates movement and stores physical memory. If once a person learns to play piano he cannot forget it because playing a piano has become a muscle memory. Those memories in the cerebellum never fade out.

**Nucleus Accumbens-** This part of brain seeks pleasure and reward and plays a big role in addiction, as it releases the neurotransmitter dopamine. Music can be a drug, a very addictive



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drug because it is also acting on the same part of the brain as illegal drugs. Music increases dopamine in the Nucleus Accumbens, similar to cocaine.

**Amygdala-** This part of the brain processes and triggers emotions. Music can control your fear, make you ready to fight and increase pleasure. When you feel shivers go down your spine, the amygdala is activated.

**Hippocampus-** This part of the brain produces and retrieves memories, regulates emotional responses and helps us navigate. Considered the central processing unit of the brain, it is one of the first regions of the brain to be affected by Alzheimer's disease, leading to confusion and memory loss. Music may increase neurogenesis in the hippocampus, allowing production of new neurons and improving memory.

**Hypothalamus-** This part of the brain maintains the body's status quo, links the endocrine and nervous systems, and produces and releases essential hormones and chemicals that regulate thirst, appetite, sleep, mood, heart rate, body temperature, metabolism and growth. By playing music heart rate and blood pressure reduces.

**Corpus collosum-** This part of the brain enables the left and right hemisphere to communicate, allowing for coordinated body movement as well as complex thoughts that require logic and intuition. As a musician one has to have the right-hand side and the left-hand side of the brain in coordination, so they talk to each other. This allows pianists, to translate notes on a sheet to the keys their fingers hit to produce music.

**Putamen-** This part of the brain processes rhythm and regulates body movement and coordination. Music can increase dopamine in this area, and music increases our responses to rhythm. By doing this, music temporarily stops the symptoms of Parkinson's patient function, such as getting up and down and even walking because Parkinson's patients need assistance in moving, and music can help them.

### **Impact of Music on brain**

The composition of music's reaction in brain consists of Music, dopamine, serotonin, and the conscious human brain that has been well maintained.

Music is just a sound waves at different frequencies that our brains organize into patterns. Music itself does not have a composition of its own. Our brain has to work to interpret sounds or else it would sound meaningless. Our brain can understand the patterns music make in tone, frequency, and rhythm and our brains enjoy it. Our body secretes the chemicals when you listen to music you like.

Many studies have proved from infants to adults. It shows that infants who listen to classical music were more likely to have higher IQ's as teenager. This is because pattern in the music and the instruments used makes your brain work harder to understand the patterns and interpret all the different sounds and frequencies than listening to any other kind of music. This wakes up your brain and kicks the areas that produce dopamine and serotonin into action and therefore, releasing those chemicals into your body and making you happy. As your brain is more stimulated, it also helps you focus and concentrate on the tasks and activities you are doing. Listening to complex music at younger age received better IQ scores than those who

does not. Their brains were used to being stimulated from a very early age. So, in the next stages of development they could process information better than those who did not listen to complex music at early stage. There are many factors about how a song or music affect you that is its beat, genre, lyrics, instrument etc. Some people like slow music, some like loud music, and some like classical music and so on. Lyrics are also a very powerful tool when it comes to how your brain reacts to the music because your brain can interpret the intonation of a voice and can process the words being said, some songs make you happy and some make you sad.

#### Conclusion

It is thus concluded that serotonin and dopamine chemicals are secreted in brain when effective music is heard. These neurotransmitters work together to stay in a careful chemical balance in human body. The sufficient amount of these chemicals in brain helps effectively to keep humans happy. Its excess secretion or less availability may lead to certain physical and psychological imbalances or disorders which may need certain medication. Music and chemistry are positively interrelated and has a good impact on humans.

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