



Exhibit message

Music can have a powerful emotional effect.

While scientists don't fully understand the biological or evolutionary reasons why humans react to music emotionally, movie directors are very familiar with the impact that music can have on the emotional power of their films.

Viewers have come to recognise musical and visual cues in movies, so when they are mismatched they may be humorous or non-sensical.

Quick Fact

While music is often used to entice people into shops to stay longer and buy items, a shopping centre in Wollongong, NSW played music by Bing Crosby over the public address sound system to discourage young people from hanging around.

Graphic panel text

Movie music helps us to feel a character's emotions, or keeps us on the edge of our seats in a horror movie.

If you are watching a sad scene, then it makes sense to hear solemn music, rather than upbeat or slapstick music.

Listening to 'sad' music seems to lower your heart rate and perspiration rate, but raises your blood pressure.

Listening to 'scary' music increases your pulse rate, but lowers the strength (or amplitude) of your pulse.

Listening to 'happy' music seems to make you take shallow breaths.

Responses to music may be interpreted in your brain's limbic system, which controls your level of arousal.

The first movies shown in the late 1800s were accompanied by a person playing an organ or piano within the movie theatre.

Want to know more about the psychology of movie music?

The brain is a mysterious organ and scientists are unsure about why and how we react emotionally to music—or whether our emotional responses to music have some kind of evolutionary purpose.

If you've ever felt 'shivers' down your spine or goose bumps on your skin while listening to music, then the 'pleasure centre' or limbic area of your brain may be reacting to the music.

Psychologists have different theories to explain how music arouses emotions.

Cognitive psychologists believe that music stimulates existing emotional meanings to listeners, but music itself cannot arouse these feelings.

Emotivist psychologists argue that music itself arouses emotional responses in listeners (similar to reacting with fright to a sudden movement).

Film music may include a musical score, ambient sound, dialogue, sound effects and silence. These help to 'tell the story', but movie soundtracks tend to be more effective when the visual content is 'ambiguous'.

Music in any one culture tends to share common patterns such as tonality, rhythm and harmony, so we make predictions about what's

going to ‘come next’ as we listen to music. For most people this ‘guessing’ happens subconsciously and passively while listening to music.

Usually, these subconscious predictions are fulfilled. But film makers use this subconscious expectation of ‘what’s coming next’ to create surprise us and play upon our emotions.

By changing melody structures (such as expecting the tune to go up yet sending the tune down in pitch), your brain is a little surprised and reacts emotionally. So your emotions go up and down according to what is happening in the music.

In an experiment using Alfred Hitchcock’s *Psycho* movie, viewers watched a rain storm sequence from the movie, accompanied either by its normal tension-building soundtrack or in silence.

When viewers watched the rain storm sequence in silence, they reported a far more neutral response to the footage than when they watched the scene with the ‘scary’ music.

In another experiment, a researcher named Vitouch did a study with 48 movie watchers.

They watched the same movie segment accompanied by either the original music score or a fake music score, then they were asked to write a continuation of the movie’s plot.

The results were surprisingly different, simply because of the different music scores.

Sometimes the emotional ‘energy’ level can be twisted or made ironic (particularly in war movies) by playing a gentle or upbeat soundtrack to accompany vision of a bloody battlefield or other violent scenes.

This mismatch of music and vision is sometimes used to invite the audience member to analyse the scene more closely. Even silence is used by some movie directors to make the scene more unsettling.

As well as communicating general mood or characterisation, movie soundtracks can provide a ‘sense of order’, such as a beginning, a climax and an ending.

Music can be used to introduce a character or indicate that a character on screen is thinking about a character not being shown on the screen. Music also helps to set the story’s place in time by using music of the period (such as up tempo jazz music for a 1920s scene).

Extra for experts

Scientists think that music has been performed by humans for more than 30 000 years. But unlike food or sex, music has no obvious survival value.

Possible reasons given by scientists as to why humans react to music in this pleasurable way include:

- courtship rituals
- improving social cohesion within a community
- to create social groups (particularly amongst adolescents and young adults)
- to generate certain social activities, such as lullabies for sleep, war marches for war, work songs for harvest time, etc.

Whatever the evolutionary reason, it appears that music can have a powerful effect on our brains and film makers have taken advantage of this response since film was invented.

Certain types of stimulus (including music, smells and tastes) seem to become associated in human memory with particular events or places in earlier life. Sometimes, when people are re-exposed to these stimuli, they trigger recall of memories about these events and places.

The ‘pleasure centre’ of the brain (called the limbic system), is active or stimulated during pleasurable activities such as eating chocolate, taking certain drugs or even listening to music.

As well as studying the **psychology** of music, scientists have measured people's bodily or **physiological** reactions, such as:

- body chemistry
- heart rate
- pulse rate
- blood pressure
- respiration/breathing rate
- skin conductance (how much the skin perspires) and
- brain activity (**EEG** or electroencephalograph)

when they listened to sad, intense, or happy music.

For example, one scientific study measured heart rate and **IgA** (a protein found in saliva) in people listening to different styles of music.

When we experience pleasure, our body reacts by producing IgA in our saliva. Levels of salivary IgA can be monitored to measure positive emotional responses.

Heart rate and production of salivary IgA was measured in humans listening to New Age, Classical, Grunge and 'Designer' music, which the composer had deliberately structured to affect biorhythms such as heart and breathing rate.

The specially composed 'Designer' music was found to have the greatest effect on the salivary IgA, while the Grunge music was found to decrease the production of salivary IgA.

Sad music such as Albinoni's *Adagio with slow tempos*, tends to have minor harmonies and fairly constant ranges of pitch and dynamics. Generally, listening to sad-sounding music produces decreases in heart rate and skin-conductance level but increases in blood pressure. Increased right-frontal EEG activity is associated with unpleasant music.

Frightening music such as Musorgsky's *Night on Bare Mountain* tends to have rapid tempos, dissonant harmonies and large variations of dynamics and pitch. Listening to frightening music leads to increases in pulse transmission time and decreases in pulse amplitude. Frontal

EEG activity is greater for intense music than for calmer music.

Happy music such as Vivaldi's *Four Seasons* tends to have rapid tempos, dance-like rhythms, major harmonies, and relatively constant ranges of pitch and dynamics. Listening to happy-sounding music tends to decrease depth of respiration, but increase respiration rate and increase left-frontal EEG brain activity.

The Mozart Effect

For many years, it was thought that listening to classical music (particularly Mozart) would make you 'smarter'.

This theory—commonly known as the 'Mozart Effect'—has been studied in humans and rats, particularly in testing their spatial ability (such as navigating mazes for rats) after listening to music—usually Mozart.

Compared with sitting in silence or listening to sad music, spatial abilities (such as folding and cutting paper into origami shapes) improve very slightly after listening to Mozart's sonatas.

Scientists believe that any positive effects observed in people listening to Mozart may be due to a general lift in mood, rather than specific qualities of the music itself.

While humans seem to perform better on spatial tasks after listening to fast tempo music, it is believed that this is because the music improves arousal and mood, which in turn makes people more inclined to perform better.

People who listen to a particular piece of music and experience a euphoric feeling known as 'chills or shivers down their spine' have had their brain waves measured as they listen to moving music.

Scientists have found that pleasant physiological responses to music correlated with activity in limbic brain structures known to be involved in reward/motivation and arousal.

Also, when listening to music, activity tended to decrease in the regions of the brain known as the amygdale (with greater decreases in activity in the left amygdale than in the right amygdale).

These findings suggest that activity decreases in this brain region may be related more to states of anticipation or craving than to rushes of euphoria.

Even when allowing for musical tastes (such as punk through to opera), the human brain seems to react to dissonance (such as minor chords or disharmony) in music.

For example, when people listened to a tune that developed increasingly dissonant chords, the listeners' brain regions associated with unpleasant emotional states, (though not fear) were activated.

Further information

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