Music is an integral part of everyday life and culture. For most people, listening to or playing music is a pleasurable experience that may evoke a memory or emotion. But for people with epilepsy, the relationship with music can be far more complex.

For a small number of people, it would seem that certain musical stimuli may trigger seizures. This is called musicogenic epilepsy. By contrast, studies have shown that in some cases, specific musical patterns have the potential to help control seizures. This is known as ‘the Mozart effect.’

The contrasting effect of music on epilepsy is intriguing. Unlike other triggers, music seems to be both proconvulsant and anticonvulsant.

The relationship between music and the brain has been much researched over the last century. Yet the interaction between music and epilepsy remains poorly understood and under researched.

Musicogenic epilepsy is a rare form of complex reflex epilepsy with seizures induced by listening to music, although playing, thinking or dreaming of music have all been noted as triggers.

Seizures may be provoked by different musical stimuli in different people. Some report seizures according to genre of music such as jazz, classical, choral or popular music. For others, the trigger may be a particular type of instrument or even a composer.

For some, seizures are said to have been triggered by church bells, hymns or even the French national anthem.

‘…playing, thinking or dreaming of music have all been noted as triggers for seizures’

Statistically, musicogenic epilepsy is thought to affect one in 10,000,000 people. However research suggests it may be more common. While the link between photosensitivity and epilepsy is routinely tested for using EEGs (electroencephalography), the same tests do not monitor for music. And indeed, how could they?

Photosensitive epilepsy is triggered by flickering light stimulation most commonly between the frequencies of 10 and 30 flashes per second. Music, as a trigger, has infinite possibilities.

Alongside this there may be a delay of several minutes between musical stimulus and a seizure. During this period, the person may experience distress, agitation, rapid beating of the heart and rapid breathing.

The time lapse may mean that they do not associate the music with the seizure. The combination of the delayed response and the lack of testing could mean that many cases of musicogenic epilepsy go unreported.

The therapeutic effect of music has been widely explored in cognitive science, but yet again there is little research relating to epilepsy. Research tends to focus around Mozart’s Sonata for Two Pianos in D major.

College students exposed to 10 minutes of the sonata showed an instant enhancement in spatial-temporal reasoning. Studies of patients with Parkinson’s disease, dementia and attention deficit/hyperactivity disorder, all reported benefits from listening to the sonata.

Three studies have explored the Mozart effect in epilepsy. The first looked at 58 Taiwanese children with partial epilepsy. After eight minutes exposure to Mozart’s sonata, 81 per cent of the children showed an average 33 per cent reduction in seizure activity. However, the remaining children showed an average 14 per cent increase in seizure activity.

The second study involved 11 Taiwanese children with refractory epilepsy. Exposure to Mozart resulted in 73 per cent having a 50 per cent or more reduction in seizure frequency.

In the third study, 73 adults and children with neurological impairment and refractory epilepsy were exposed to Mozart overnight for a year. Eighty per cent had a reduction in seizure frequency with a quarter seizure free.

We do not have a definitive answer:

Dr Melissa Maguire speculates why music may trigger seizures for some people, while for others, it may help to reduce seizures. Over the page, three personal stories illustrate the impact of music on people’s lives.
as to why music seems to cause seizures in some people but helps to control them in others. We can only speculate.

Research suggests hyper excitable areas of the brain may become sensitised to specific musical triggers and may explain the basis of musicogenic epilepsy. It is possible that brain mechanisms involved in the processing of music may be involved in the generation and propagation of seizures.

Other studies hypothesise that emotion triggered by music may cause the seizure, rather than the auditory content of the music. Merely thinking about music has been cited as a trigger, suggesting the importance of musical memory and emotion.

One possible explanation for these two contrasting effects of music on the brain could be the two different effects of dopamine on brain receptors.

Exposure to music is said to increase dopamine in the brain and in recent years dopamine has been reported to have an important role in epilepsy.

Studies have shown that in people with temporal lobe epilepsy, dopamine may have an anticonvulsant effect. However, in musicogenic epilepsy, it is possible that the emotional effect of the musical trigger could increase dopamine in the prefrontal cortex resulting in seizures.

Questions around what makes a certain type of music epileptogenic to a particular person remain unanswered. The basic science behind the Mozart effect remains unexplored. What is undisputed is that the dual role of music is fascinating and for some people, could be significant.

Dr Melissa Maguire is consultant neurologist at Leeds General Infirmary.
Adrian’s story

Adrian Carter, 53, lives in a world of semi silence. He can only watch the television with the sound turned off and the sub-titles on. He had to leave his mother’s funeral before the hymns began, and his own wedding to wife Christine was a very quiet affair. No wedding march and no music.

Father-of-three Adrian has musicogenic epilepsy. This rare form of the condition is made all the more uncommon in that rather than being caused by a particular pattern of music, his seizures are triggered by any sort of music with a steady beat, from classical compositions through to contemporary music.

‘As soon as I hear music playing, I go into a seizure. There is nothing I can do to stop it. It can be embarrassing and very isolating,’ says Adrian.

The debilitating condition means that even a trip to the shops in his home town of Exmouth, can be fraught with danger. And he has recently lost his job due to his epilepsy. Today he volunteers as a counsellor.

‘These days, wherever you go there is music,’ says Adrian. ‘It is playing in shops, supermarkets, restaurants and cafes. Even in the quiet carriage of trains, the muffled sound of people listening to music through their head phones can be enough to trigger a seizure.’

Wearing ear plugs does not sufficiently block out noise to make Adrian feel safe, and asking people to turn their music down can be a problem. ‘If people in my local cafe see me coming they instantly turn the background music off,’ continues Adrian. ‘But quite often, people listening to their iPhones don’t understand. I often encounter aggressive behaviour and find myself being pushed around.’

Adrian’s epilepsy affects his family too. His three children from his first marriage, now aged 18, 20 and 22, have grown up knowing that they cannot listen to music when they are with their dad. His wife Christine – a teacher – can only enjoy music when she is away from home. The car has become her retreat for the chance to listen to the radio.

In spite of trying various anti-epileptic medications, Adrian’s seizures are getting worse. His hope now is that he may be suitable for brain surgery. He is waiting to undergo an intracranial EEG which will involve placing electrodes in his brain to monitor seizures and locate their point of origin.

‘I have been referred to the National Hospital for Neurology and Neurosurgery and I have tremendous hope that an operation could give me back my life,’ he says. ‘I know there are risks involved – my seizures are very close to the part of my brain that controls language and I worry that my speech or personality could be affected by surgery. ‘But if the tests are alright, I would undergo the operation tomorrow. I would just like to be part of the world again – I would like to sit down and enjoy music with my family.’

Maurice’s story

Maurice Thompson describes 10CC’s hit ‘I’m not in love’ as one of his all time favourites. The only thing is, it causes him to have seizures.

Like Adrian, left, Maurice has musicogenic epilepsy. Now 60, he had his first seizure at the age of 48 when he was working as a painter and decorator. ‘I always liked to listen to the radio when I was up the ladder painting, but every time ‘I’m not in love’ came on, I would have a fit,’ explains Maurice.

‘Even if I tried to turn the music off, the song would get into my head and I couldn’t stop the seizure. During one fit, I smashed into a wall, split my head open and broke my teeth.’

Maurice is no stranger to epilepsy. As a child, his twin brother Malcolm, had seizures, and Maurice was used to spotting triggers. But it was a while before he linked his own seizures with the track and when he did, he had difficulty persuading healthcare professionals that it was the music causing them.

It was only when staff at Salford General Hospital played the music during an EEG, that they were able to see how the music was triggering Maurice’s seizures. ‘They could not believe it,’ recalls Maurice. ‘They had never seen anything like it before.’

The Mozart effect – a case study

Fifty-six-year-old James (not his real name) had experienced gelastic seizures – laughing fits – since shortly after birth. He developed complex partial seizures as a teenager and secondarily generalised tonic-clonic seizures in his mid thirties. He had tried seven anti-epileptic drugs without gaining seizure control.

James underwent surgery for a tumour, but his laughing fits continued. He was having seizures with intense laughter five or six times a day.

James was due to be admitted to hospital to be assessed for further surgery. A few months before admission, he began listening to Mozart – not necessarily his sonata in D major – for an average of 45 minutes a day.

Within days of listening to the composer regularly, James noticed his tonic clonic seizures had stopped and although he continued to have five gelastic seizures a day, they appeared simply as a brief smile rather than as a laughing fit. These were far easier to disguise when he was with other people.

The Mozart effect: encore, Nayana Lahiri, John S. Duncan, Epilepsy and Behavior 2007
To hear Mozart’s Sonata for Two Pianos in D Major go to http://tinyurl.com/mozartD