A medical maestro: Can Mozart treat heart disease

But, shortly before the patient was scheduled for tests, there was a remarkable improvement. The gelastic (or laughing) fits he had suffered up to six times day subsided. Instead of uncontrollable laughing fits, they became six- to nine-second-long involuntary smiles that he was able to control. He had also been having about seven generalised seizures a month, but he had had none in three months.

When doctors investigated, they found that the transformation was down to a lifestyle change. He had started to listen to Mozart for 45 minutes a day.

The case of the 46-year-old man, being reported by doctors at the Institute of Neurology in London, is the latest success put down to the "Mozart effect", which has been linked to benefits as diverse as improved mathematical skills, enhanced foetal brain development, reduced stress, improved learning and IQ, less arthritis pain, and improved performance on eye tests. Rats exposed to the music also perform better in maze tests, while fish appeared to be happier and healthier.

The original Mozart-effect research looked at the effects of the K448 piano sonata on the performance of spatial IQ tests. Volunteers had to visualise correctly the unfolded shape of a piece of paper that had been folded several times. The performance of those who listened to the Mozart was quantified as being equivalent to a temporary increase in IQ of eight to nine points.

One theory put forward to explain this performance is that areas of the brain involved in processing music overlap those concerned with spatial perception, which become stimulated, or warmed up. But, while some researchers found similar effects, others found none or proposed countertheories, including the suggestion that the increased performance is simply due to people becoming more aroused when exposed to music. As a result, the concept of a Mozart effect has become mired in controversy.

A Mozart effect has also been linked to behavioural and other changes, including stress, depression, arthritis pain, foetal development and performance on eye-test charts. And it is now attracting attention as a potential treatment for epilepsy.

Some research offers clues as to just why this composer's music seems to have such an effect. It suggests also that the music does not have to be appreciated, or consciously listened to, to have an effect. Only a small number of studies have been carried out on the Mozart effect and epilepsy, but most of them show a beneficial effect. Neurologists at the University of Illinois found that a child with Lennox-Gastaut syndrome, a rare form of epilepsy, had fewer seizures while exposed to K448 for 10 minutes every hour. A second study at the centre found changes in brain activity in 23 out of 29 cases when Mozart was played. In some cases the changes occurred during coma, suggesting that any effect is not conditional on the music being appreciated; it appears to have some kind of direct effect.

But what could it be? According to Dr John Hughes of the University of Illinois, it may be that Mozart's complex music has an effect similar to pulsating electrical stimulation, bringing order to malfunctioning nerve cells in the brain. "The architecture of Mozart's music is brilliantly complex, but also highly organised. The organisation of the cerebral cortex would seem to resonate with the architecture of Mozart's music to normalise any sub-optimal functioning of the cortex," he says.

"Part of his genius is to repeat themes in a way that was not boring, but instead was engaging to the listener. A theme would be repeated, not necessarily with the same notes but with different notes and the same interval. Repetition and periodic changes are found in all aspects of our brain function and also of our bodily functions."

It's suggested that the same effect isn't seen with other composers because this technique of musical construction is unique to Mozart, who repeats melodic lines much more often than composers such as Bach, Beethoven, Wagner and Chopin do. According to epilepsy researchers, it is this repetition, acting rather like repetitive electrical stimulation, which may be responsible for the effects being seen.

And some research does suggest that electrical stimulation can work in epilepsy. In a study of nine patients implanted with electrodes, four had a 95 per cent reduction in seizures, and four a 50 to 70 per cent drop. "Electrical stimulation provides improved seizure outcome," say researchers from Hospital General de Mexico. Epilepsy researchers believe it's time for more research: "We report a remarkable improvement in seizure control in one patient with refractory gelastic epilepsy and suggest that it is now time to study further the Mozart effect," say the team from the Institute of Neurology in London.

Increasing research into epilepsy may also trigger more study on other aspects of the Mozart effect. Could the same repetitive stimulation in much of Mozart's work account for the reported changes in behaviour and intellectual performance? The final verdict on the Mozart effect may soon be given, but whether it will be a prelude or a requiem remains to be seen.

Listen to a clip from Mozart's Sonata K448 - courtesy of EMI

Medical notes: the healing power of the Mozart effect

Epilepsy

Research is showing that Mozart may reduce brain activity involved in epilepsy. A study in Chicago found that 23 of 29 patients had a significant drop in the kind of brain activity that is followed by a seizure. In one case, this activity dropped by more than 60 per cent while the patient was in a coma. One theory is that the effects may be due to the repetitiveness of melody and periodicity – wave forms that are repeated regularly.

Intelligence

The first Mozart-effect study showed that spatial reasoning and intelligence increased temporarily after listening to the K448 piano sonata, compared to relaxation tapes or silence. The results of the California University study show that 10 minutes of Mozart's music improved performance on paper-cutting and folding tests. Spatial IQ went up by eight to nine points. The same team found that rats negotiated a maze faster after hearing K448. Other researchers found that children taught a keyboard instrument for six months performed better on spatial tests. The kind of effect found by the California researchers has been shown by some teams, but others have found no effect.

Eye tests

Eye tests are performed more accurately when carried out with Mozart playing in the background. Results were significantly better, with fewer false positive or negative results and greater concentration and accuracy. In the research, 60 men and women either listened to music for 10 minutes, or sat in silence before carrying out the tests. The music was Mozart's Sonata for Two Pianos in D major. One theory is that the music helps to speed up the processing and interpretation of information coming from the eye to the brain. "Listening to Mozart seems to improve performance," say the researchers from the School of Medical Sciences in Sao Paulo.

Heart rate

Mozart soothes the beating heart. A study at Oberwalliser Hospital in Switzerland on the effects of music on heart-rate variability in 23 adolescents showed that listening to music may be helpful in heart disease. The study showed that listening to Mozart or Bach resulted in reductions of heart rate and variability.

Stress

Anecdotal evidence has suggested that listening to Mozart may ease stress in newborn babies. Newborns at the Kosice-Saca hospital in Slovakia are played his music to help them get over the trauma of birth. Now, doctors at Weill Medical College of Cornell University are running a clinical trial to see whether Mozart's music can reduce stress, heart rate and motor activity in premature babies. Mozart is played through a small speaker in the baby's incubator; a monitoring device will record movement, while a video camera will capture the infants' reactions to the music.

Fish

The latest Mozart research is not on humans, but on carp. Researchers at the Agricultural University of Athens played Mozart's Eine Kleine Nachtmusik to carp to test its relaxing and antidepressant effects. The music was played underwater to carp for 30 minutes at time. The results show that the fish exposed to music grew more and, in some cases, had less stress.