

## Listen and learn: Music for the brain

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Music. Like good literature, it comforts the disturbed; disturbs the comfortable and gives voice to the secrets of the heart. Yet a single plaintive note, a whisper of a melody, goes where the boots of words can no longer tread.

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Music is a moral law, according to Plato. Since man crawled out of the primordial soup and banged two rocks together, it has been the source of comfort and communication, and a perfect tool for managing social uncertainty.

We use music to celebrate life, commemorate death and, occasionally, to intimidate at sporting matches. A tune can unite a crowd of thousands in a stadium, or be the arms that comfort a solitary shape, curled up in a bedroom. Music, according to the 19th-century German philosopher Arthur Schopenhauer, has a truly exceptional status among the arts: it is, he believed, a direct expression of the will of nature, while all other art forms are simply expressions of ideas. While it may be true that nothing can capture the poignant tenderness of childhood like Robert Schumann's *Kinderszenen*, or explore political and cultural zeitgeists, like say, Bob Dylan's loose-limbed blues, or the moody, artistic despair of The Smiths, can it really make you brighter? More empathic? A better listener?

These are some of the questions being posed in fairly new phenomena known as the cognitive neuroscience of music, which measures the effects of music on the brain. The stories are coming thick and fast: listening to music makes you fitter; music boosts brain function in people with dementia; music lessons in childhood make you smarter; music evokes the same feelings as good food or drugs. While philosophers and great thinkers have always had a hunch about the powers of music, we now have the technology and the expertise to prove it.

"We have a lot more natural ways of looking at the brain these days, that are not so artificial," says behavioural neuroscientist Nikki Rickard, Associate Professor at Monash University's School of Psychology and Psychiatry. "And we have more understanding of what emotions are, which has been one of the big blocks in understanding how we listen to music."

The interest in music and cognition first leapt into public consciousness in the early 1990s with the so-called Mozart effect, when a study found that college students did better on a spatial reasoning task after listening to a 10-minute Mozart piano piece. This morphed into a general "music makes kids smarter" movement that was gobbled up by music educators and capitalists alike.

Further studies went on to show that it wasn't just Mozart that led to an improved performance among students; listening to Schubert, excerpts from a Stephen King novel or British pop band Blur produced similar effects. In fact, anything you like that ramped up your arousal state could produce the same results as a pretty piano rondo by the boy genius. And then, a Japanese study found that playing children's songs to five-year-olds also had the same outcome. In other words, it is how you

feel that drives the effect.

University of Toronto psychologist Glenn Schellenberg has been an outspoken critic of efforts to present music lessons as intelligence boosters. However, at a recent conference at the Brain Institute in Melbourne, he acknowledged that music lessons do boost IQ. In a study he did in which a group of children was assigned a year of music lessons, drama lessons or no extra lessons, the children who took the music lessons had larger increases in IQ by almost three points. Another study showed that the more lessons a child has, the higher his IQ. Six years of music training was associated with an increase of 7.5 points: "So we know that kids who take music lessons tend to have higher IQs and the more training they have the higher their IQs."

However, Schellenberg acknowledged that environment plays an important role. High functioning children are more likely to seek music lessons, which in turn enhance the child's genetic endowment. "The environment exaggerates what you start out with. Smarter kids take music lessons and then music lessons enhance those initial benefits. That is what I have come to conclude from doing research for seven years now."

Crucially, though, Schellenberg discovered that a child's temperament plays more of a role than first thought. "Personality is a variability that has been virtually ignored throughout the research. The bottom line is that bright, open, conscientious children take music lessons."

There has been much talk of the link between music and maths but before you sign your struggling child up for a year of clarinet lessons Schellenberg warns there is very little evidence to corroborate this. True, mathematical whiz-kids are often musical, but that is because bright kids with outgoing personalities are drawn to music rather than the other way round. Still, Rickard feels there could be some benefits: "The brain has to work very hard when a child is mastering a piece of music, it has to deal with visual and auditory stimuli and doing something with movement and fingers that is complex for young people. If you can master that, it's quite a big ask for a brain. So when you go off and do maths, or reading, you are going to be more of an efficient learner."

In Broadmeadows, Meadows Primary School principal Julie Cooke doesn't need statistics to tell her how important music is for children's growth and wellbeing. The school has been part of the Melbourne Symphony Orchestra Pizzicato Effect for the past four years, a philanthropic partnership between the orchestra and the school, where children from prep to grade 6 are involved in music training. They start with singing, but by grade 3, they move on to the viola, violin, cello or double bass.

Such instruments seem incongruous at this school, where 95 per cent of the parents are unemployed and generational poverty is rife. A mix of nationalities flow through the school gates; children of refugees, migrants and asylum seekers arrive clutching instruments more traditionally associated with affluence.

Last August, 20 of the students performed at the Melbourne Convention and Exhibition Centre, an event that capped months of obstacle-climbing. "It was a 7am start," says Bronwyn Lobb, the MSO's education manager. "That meant that the students had to be ready for the coach with their music, organised. To see them walk through the gates with their instruments is something that seemed unattainable when I started with this program."

Initially, the Pizzicato Effect met resistance from the parents, who were suspicious of the program.

"And the school has many different cultures whose religious beliefs may potentially clash with the idea of Western music," says Lobb: "We have adapted our program to be sensitive to their needs. We try and explain that we are not trying to channel Miley Cyrus."

At the first concerts, only a few parents turned up. But with persistence, the children have flourished and the families won round. Now there are up to 100 parents at each performance.

Says Cooke: "The pride they have in their children is amazing. They tell me they could never have imagined their child would have the confidence to stand up and perform. It gives me goosebumps to talk about it. You can't put figures on that."

The University of Melbourne, however, has managed to do so, and research into the program's effects on academic performance looks promising so far, showing improved literacy and stronger non-verbal reasoning skills. Anecdotally, Cooke believes truancy rates are down, with children telling her they don't want to miss their music classes.

A century ago, the Austrian scientist, mystic and educator Rudolf Steiner adopted Schopenhauer's view on the power of music and implemented it into his schooling system, decreeing that every child should learn a stringed instrument from an early age and play in a class orchestra. At East Bentleigh Primary, a state-run school with a Steiner Stream, music teacher Teresa Wilkie sees daily how music not only gets the cogs whirring and the neurons firing, but develops a sense of community and empathy among students. "A lot of the ways that music is helpful is really in agreement with every philosophy out there; they have to think for themselves, they have to anticipate things, they are learning a new language in terms of notation, they are learning how to problem-solve all the time."

She says playing in an orchestra gives the students, some as young as eight, a sense of collaboration. It presents them with a way of thinking that weaves together disparate ideas. An orchestra, in many ways, is a wonderful metaphor for a perfect world, with each musician having something to offer; the sum of which creates an ordinary miracle of sound. "They learn to listen to each other and work together. There is a big community feel."

But the powers of music extend beyond the school gates. The American musician, neuroscientist and author of *This Is Your Brain On Music*, Dr Daniel Levitin and colleagues, have documented many striking benefits including music's ability to lower cortisol levels in patients about to undergo surgery more than taking anti-anxiety drugs. Other evidence showed music has an impact on antibodies linked to immunity and may also lead to higher levels of bacteria-fighting immune cells. Still more research revealed that playing music in a hospital's neonatal intensive care unit improved the health of premature babies with respiratory distress or sepsis.

So how does it work? What sort of alchemy happens among the hidden highways and byways in this vastly unknown organ that creates such healing? Clearly there have to be many variables; Cliff Richard may be sonic balm to some but the cause of a tension headache in others. Music that we like, it seems, triggers activity in the nucleus accumbens; a part of the brain that releases the feel-good chemical dopamine and is involved in forming expectations.

"One way a piece of music becomes really popular is when it plays around with your expectations," says Rickard. "If a piece of music gets you deep down and you don't know why, it is playing with the fundamental expectation that you have." However, if a song is too simple and predictable we don't like it; likewise if it's too complex. The best song is the one that balances expectancy and surprise and bingo, your brain reacts in the same way it does to good food, good sex, or drugs and like all good things, leaves you wanting more. Rickard is wary of the old joke that while drugs have nasty side-effects, music is harmless. "We know that people who are depressed can select music that is consistent with their mood, sometimes that can be really helpful but sometimes it can cause further rumination and get you more stuck. If you are just using it to go deeper and deeper and that's how you are using it all the time, I think that's really unhealthy."

Reducing the majesty of song and harmony to neural impulses in an organ which seems little more than a giant prediction device can be a sobering way to look at music. Long may musicians continue to drag the horsehair over strings and blow into tubes of twisted metal, add a pinch of mystery and create something that still manages to be transcending. In the vast iceberg that is the brain, Rickard acknowledges, there is still much that remains unexplored.

*This story was found at: <http://www.smh.com.au/entertainment/music/listen-and-learn-music-for-the-brain-20140206-32382.html>*