

Does music really make you better at math?

In a recent opinion piece in The Calgary Herald (and also the Ottawa Citizen), Kristy Fletcher, President of MusiCounts, Canada's music education charity associated with the Juno Awards, bemoans the state of "underfunding of music education countrywide" (Sept. 2, 2023). She says, "For kids, the impact music makes can be transformative. ... I constantly hear from parents and teachers about ... how the music room is a space for creativity, self-expression, confidence and community. Music allows kids to explore their potential, and has been proven to increase cognitive function, math test scores and language skills. Quite plainly, kids need music."

I am going to agree wholeheartedly with everything she said EXCEPT "has been proven to increase cognitive function (and) math test scores". The idea that learning music could make people smarter is appealing – especially to those who devote themselves to music education. I want to suggest that music education is indeed transformative in wonderful ways, but not including special cognitive benefits or help with math. OK, deep breath, this is still a good news story!

How Did We Get Here?

Journalists caused a sensation in the 1990s with uniformed headlines about music and math. At the APA convention of 1994, Rauscher et al. presented research about improvements in spatial skills among children who had weekly music lessons. The reporter's headline, however, read; 'Music may open mind to math and science'. This did not come from the paper, but from Rauscher's offhand comments to the journalists (Costa-Giomi, 2018). The notion spread like wildfire.

In 1998, Zell Miller, the governor of Georgia distributed free classical music CDs to mothers of newborn babies because of "research on the relationship between music, intellect and child development" (Office of Legislative Research, Georgia, 98-R-0888). The recording, "Build Your Baby's Brain Through the Power of Music" was sent out despite the absence of even a single study to suggest that children exposed to classical music would get any smarter. Commercial ventures also stepped in with Baby Mozart and Baby Einstein videos, however Disney would later offer parents a refund on those products as they could not be shown to be "educational" (Costa-Giomi, 2018).

The story from the scientific literature is quite different. In the early 1900s, studies tended to look at the opposite effect – that of IQ upon music! Later, there were studies on the relationship of musical ability and intelligence, but without saying the relationship was causal. Yes, there was support from a series of meta-analyses for an association between learning music and other good things; "memory, spatial abilities, IQ, reading, and maths achievement" (Costa-Giomi, 2018). Other studies looked at arts and music enrollment and academic achievement, attendance, drop-out rates, and verbal and maths aptitude tests and found correlations.

The problem

My statistics teacher told me that statistics can be used to show that storks deliver babies; as the children's story says. Looking at data from France, you can see that per capita birth rates are higher in areas where more storks are present. More storks = more babies, so 'proof' that storks are delivering them down the chimneys. The problem is that storks are more numerous in rural areas than in cities. Birth rates per family are higher in rural areas for other reasons – the true variable of interest is the familial situation.

Other variables of interest to explain both music and math success include: socioeconomic status (SES), the educational achievements of parents, and the home environments of children. One study found that academic achievement and family structure were the predictors of *signing up for music in the first place*. Kids with two parents and higher SES homes were also less likely to drop out. Many studies support the idea that music programmes *attract* higher SES students, including a six-year study of 13,000 high school students in the US (Costa-Giomi, 2018). In her textbook chapter, Costa-Giomi, concludes that “a process of selection that occurs ... by which students with higher SES, motivation, discipline, responsibility, concentration ... persist in learning music while those with lower levels of motivation and SES and who are less disciplined and responsible drop-out of music lessons. In other words, those who choose to study music come from a more privileged environment than those who don’t.”

The neurological evidence does not show increases in IQ but rather structural changes in the brain associated with sound-related tasks. At the same time, many studies have confirmed that there are no negative effects in other areas from learning music (Costa-Giomi, 2018).

Where are we without the music and math myth?

Is de-bunking the music math myth a setback for justifying music education? I will argue it is not. Is predicating appeals for music funding based on misunderstood research results a tactic that is likely to blow up in your face? You decide. I refuse to even adopt the narrative of those unfortunate people who think “education” is a fancy word for “job training”. Education cannot be reduced to job training without becoming stagnant and hollow. It is not necessary to say music leads to math which then leads to employees in science and technology fields. Music is intrinsically social after all (Dotov et al. 2021).

What about the other merits of music? Fletcher did say music can be transformative, motivational, a space for creativity, self-expression, confidence and community. Some of these aspects could be said of athletics as well, and they are getting funding. These aspects, and the life-long joys of music making and music appreciation are worth fighting for. Music is also an important element of the cultural heritage of peoples the world over.

I will not prioritize among these wonderful benefits of music and music education. Yet since we are talking about research, let’s consider what is supported. Take the language skills that Fletcher notes. While it is not the case that any musical learning will necessarily improve language skills, it is true that the teaching of vocal music is a golden opportunity for teachers to introduce many linguistic concepts.

Consider “synchrony-prosocial behaviours”. There is strong support for the idea that the endorphins released by listening and (even moreso) by performing music is provoked by synchronized rhythmic behaviours (Demos and Palmer, 2023). Moreover, Dotov et al. (2021) report in a meta-analysis support for the idea that this synchrony can increase interpersonal trust, affiliation, and cooperation. This is why music should “groove”! They also say that difficulty to perceive or join in with beats is linked to all the major development disorders. They conclude that the development of the sorts of social attention and coordinated actions described in the synchrony-prosocial behaviours literature “may also be critical for our technological and cultural achievements”, but this the argument I promised not to use. I will stay with Fletcher’s “community”.

Cooperative behaviour has even been observed to extend beyond the groups that did the music or synchronous activities and toward outsiders (Mogan et al., 2017). Those researchers found “that when compared to non-synchronous conditions, synchronous movements and synchronous vocalizations (1) increase prosocial behaviors, (2) enhance perceived social bonding, (3) improve social cognition, and (4) increase positive affect.”

Affect, the noun, or feeling, links to a surge in research about emotions since the late 1980s. 'Feelings' may sound like a woolly notion - because it is! Pioneering emotions psychologist Nico Frijda admits that "A definition of "emotion" ... is not to be found, and is not to be searched for" (2016, 618). And yet emotions actually drive much more behaviour than we want to believe. We want to say we (cognitively) decided to do something, but we discount the extent to which our emotions are driving the bus (Lerner et al. 2015). Research in psychology finds emotions are bound up with cognitions (Rothermund and Koole (2018), while in sociology emotions are seen as bound up with social relations, rather than being a private 'feeling' (Spencer, Walby and Hunt, 2012). From the sociological view, "Instead of agency resting on ... reflexive deliberation ..., agency emerges from our emotional relatedness to others as social relations unfold ..." (Burkitt, 2016). A meta-analysis and systemic review found a consensus that emotions are functional, and that increased awareness of emotions can help inform an optimal course of action (O'Toole et al., 2020, 23). My point is that it is non-trivial for children and adolescents to acquire "emotional intelligence" (Hughes, 2010).

From a recent meta-analysis about music for children (Gaudette-Leblanc et al., 2021) we discover that researchers have looked at social competence as including "interacting positively with peers and adults ... listening to others, taking turns, initiating and maintaining conversations." Emotional competence as in the ability to regulate one's emotions has also been studied. These are important because "children who are socially and emotionally competent are more likely to have friends and to adjust to the demands of school". As discussed above, synchrony due to music has also been found to promote prosocial behaviours in children. The overall effect size for socioemotional development of young children taking music was significant and higher than the results of other meta-analyses on children's cognitive and language development."

The benefits of music education are several and non-trivial. We can promote music wholeheartedly without repeating unsupported claims that music makes you 'good in math'.

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