

Is it all in our head?

The field of neuromusical research has reached a new stage – large data-driven studies that are seeking to understand the overall effect of music learning on cognitive development and academic achievement. This is a natural and necessary stage in the development of every field of research. Just like periodic literature reviews, it is important to stop and look back at a body of research and ask the question – what have we learnt?

The two impact studies I have found interesting have quite ominous titles. Dr Patrick Cooper, Associate Professor of Psychology at Lynn University in Florida, has just had his impact study published with the title “It’s all in your head”. Dr Giovanni Sala, from the Department of Psychological Sciences, University of Liverpool, United Kingdom, had his impact paper published in 2017 with the title “When the music’s over”. To music educators looking for a silver bullet in the argument for music learning being the most impactful activity for cognitive development in children, these titles might seem quite ominous.

The titles are both interesting choices because as you read through the abstracts, both researchers found that music learning had reliably small (Sala) to medium (Cooper) impacts on cognitive and academic skills. They also both point to the need to take other factors into account, which Cooper calls moderating factors. To explain in plain language, this means taking into account other factors that have been found to impact significantly on cognitive and academic development.

These factors can include:

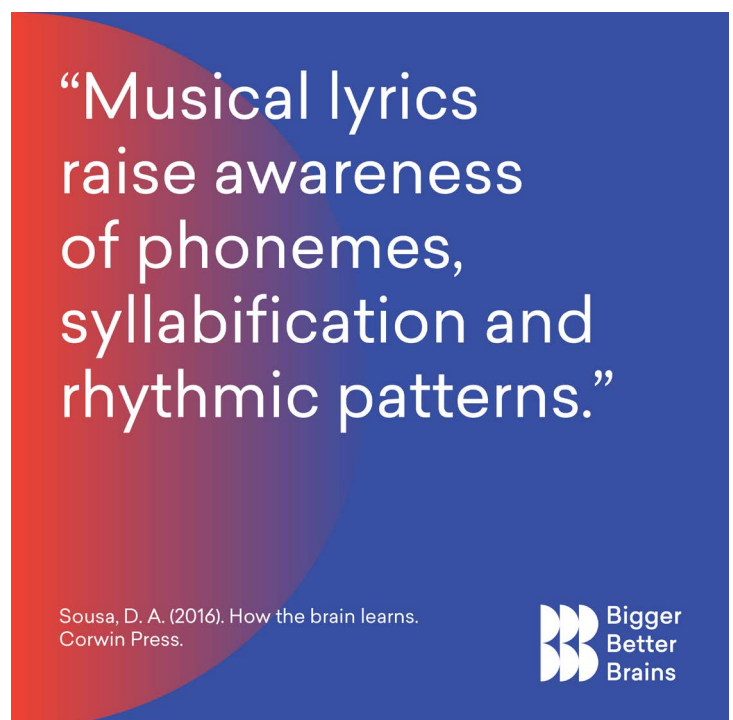
- Mother’s education level.
- Socioeconomic status.
- Child’s age in months and not years.
- Amount and type of music learning that was included in the intervention.

Why would this be a disappointing outcome, as per the titles of the papers suggested? One reason is because neuromusical research has been used as a tool to advocate for music education.

Advocacy approaches tend to neglect to include the terms “may”, “could” and “might” from the research findings, and state that “definitely”, “absolutely” and “definitively” music learning improves cognitive development. Anyone who has met a working researcher, or read a research paper, will know the wobble words of “might”, “could” and “may” are always included. They are included for good reason, research is about seeking to understand and to explore, very rarely is it to prove and be definitive.

What these two papers could tell us is that across a large number of studies the impact of music learning was varied and this was very much dependent on the study design, the moderating factors and the areas the researchers were testing.

In Cooper’s study he quoted the number “5,612”, but it is not clear from the abstract if this



is studies or participants. I would suggest it is likely participants in total across the studies, which is a lot of studies as most large studies have around 100 participants. Sala's study, because we have access to the whole paper, gives us more of an idea of how they chose the studies. Look under Section 2 Method to get a really good idea of how the researchers chose their final list of studies. Here is what they came up with in the end.

"Among the studies screened ($n = 166$), we found 38 studies, conducted from 1986 to 2016, that met all the inclusion criteria. These studies included 40 independent samples and 118 effect sizes, and a total of 3085 participants." (Sala, 2017)

Both studies did extensive statistical analysis of the research papers, and the manner of analysis is very important. If you have a statistical mind and training, I would recommend going deep and looking at the statistical methods in Section 2 of the Sala study. Needless to say, the conclusion any research comes to when looking at data and data outcomes is overlaid by their interpretations of those results.

I wanted to pick out three aspects from Cooper's abstract and look into what they could mean.

"The purpose of this study was to conduct a random-effects meta-analysis to measure the overall mean effects of music training on cognitive measures in schoolchildren. Results showed small to medium overall effects ($N = 5,612$, $k = 100$, $g = .28$, $p < .001$, 95% confidence interval [CI] [.21, .34])."

Firstly, Cooper is looking at the mean, the middle level of effect. Secondly - and this will be answered when we get access to the full paper - was Cooper looking across comparable cognitive measures such as studies that focus on attention, or across every cognitive skill that has been measured in the neuromusical field (which is extensive)? The numbers in brackets give you an idea, statistically, of the reliability of the findings.

In a nutshell, what he found is considered more reliable due to such a high number of participants. If you are looking for that silver bullet to end the philosophical showdown that music learning is the best activity for cognitive development, this finding doesn't support that. However, if you are looking for reliable statistical evidence that music learning has a measurable and positive impact for most children, then this finding helps you enormously.

"When compared to active control groups, music training yielded more improvement on a range of cognitive measurements ($g = .21$, $p < .0001$)."

Here is another useful finding, depending on your point of view. "Active control groups" means research study design that has a second group to compare to, which does a different activity. This can look like a two-group design with one undertaking music learning and the other undertaking an active activity that could be sport, an arts activity such as drama, or a cognitively demanding activity such as chess. It could also be a three-group design, which would include a final group as a control group that undertakes no activity.

Cooper's finding shows that music learning has a higher impact measure than the active group, which could be interpreted as being a more impactful activity than sport or chess.

"While some studies did result in large effect sizes, significant moderators related to

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methodological quality rendered the overall findings non-significant ($g = .08$, $p = .19$, 95% CI $[-.04, .20]$).

The final aspect points to an issue in the research field that is still being addressed. Neuromusical research investigates human development, and human development is not a straightforward proposition. Multiple factors contribute to every human being's development, and while researchers can work very hard to mitigate all the variables, it is almost an impossible task.

The research studies currently underway, but not yet finished or published, have taken these variables into account as standard, so we should see some interesting new research emerging over the next two years.

Ultimately, these types of studies are important for the progression of any research field and need to be taken into account across the broader field of neuromusical research. Only a few months ago, we looked closely at a population level statistical study in British Columbia (have a look at our reading on this study) which found that

“Highly engaged instrumental music students were, on average, academically over 1 year ahead of their peers. The findings suggest that multiyear engagement in music, especially instrumental music, may benefit high school academic achievement.” (Guhn, 2019).

This study has rather sensational findings for those who are arguing for the benefits of music learning on cognitive development.

When we are presented with multiple research studies that have such different outcomes, how do we as music educators use these varying results to support our position in the philosophical showdown?

Read More

Cooper, P. K. (2019). It's all in your head: A meta-analysis on the effects of music training on cognitive measures in school children. *International Journal of Music Education*, 0255761419881495.

Sala, G., & Gobet, F. (2017). When the music's over. Does music skill transfer to children's and young adolescents' cognitive and academic skills? A meta-analysis. *Educational Research Review*, 20, 55-67.

Guhn, M., Emerson, S. D., & Gouzouasis, P. (2019). A population-level analysis of associations between school music participation and academic achievement. *Journal of Educational Psychology*.

Researcher to Follow

Patrick K Cooper
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“Music learning fine tunes a child’s brain to be able to identify sounds that make up speech. Through this fine tuning children can identify speech sounds earlier, learn to communicate better and faster and wires their brain so it can remain healthy for longer.”

Strait, D. L., et al. (2012). Musical training during early childhood enhances the neural encoding of speech in noise. *Brain and language*.

