

Which musical instrument is “better” for cognitive development?

A very common question I get asked by parents and the media is – Which instrument is best for my child to learn?

I always answer with two further questions “Do you mean better for cognitive OR musical development, or cognitive AND musical development?” and “What do you mean by best or better?”. The reason I ask these questions is that many values and personal experiences influence this question. For example, does this question imply that we should encourage our children to learn a musical instrument only for cognitive or musical development and not both? Does the question imply the need for a justification for the financial and family investment in a child learning a musical instrument, which may further suggest that learning an instrument is an extra or add-on which needs rigorous justification? Do the questions reveal the possibility of positive or negative personal experience that is informing the instrument choice? If the parent had a negative experience learning piano, would that parent want an explanation or validation for their experience? Similarly, if a mother learned cello and loved every minute of it, does she want to hear reinforcement of her own experience that cello is the best instrument for cognitive and musical development?

Behind every “simple” question is a very complex web of information, values and experiences. But let’s look at this question through the lens of a new study from the psychology field. The study from the Faculty of Education at the Pontificia Universidad Católica in Chile tests the notion that learning different musical instruments enhances different, and possibly better, cognition and executive function skills.

Instrument types

The researchers first divided instrument types into three groups – rhythm, melody and harmony instruments. You can see the division below in the table. As this study was conducted in a country with high numbers of Latin percussionists, there are a number of Latin musical instruments included.

Table 1. Musical instrument classification examples by music element.

Rhythm	Melody	Harmony
Cymbal	Flute	Piano
Snare	Trumpet	Guitar
Timbale	Saxophone	Organ
Agogo	French Horn	Harpsichord
Jam Block	Ocarina	Harp

Image source: Porflitt, F., et al. (2020). Core music elements: rhythmic, melodic and harmonic musicians show differences in cognitive performance.

The description in the research paper of the participant’s musical background, for example, how long the participants learned their instruments for and at what frequency they practiced and performed, is not clearly detailed. However, participants were recommended by Directors of Music Schools in Chile, so it could be assumed that the participants had significant music training in childhood. Interestingly, the average age

of the 141 participants was 30 (with a standard deviation of 6 years), so the researchers measured far transfer of cognition and executive function skills retained into adulthood. Note participants who were still performing musicians were excluded from the study.

Cognition and Executive Function tests

The participants underwent a battery of tests to measure different aspects of cognition and executive function.

Table 2. Test battery.

Dependent Variable	Test	Test Type
Cognitive flexibility	Wisconsin Card Sorting Test	Form
Verbal Working Memory	Digit Span (WAIS-IV)	Form
Cognitive Inhibition	Stroop Test	Form
Visual-Spatial W. Memory	Binding (YellowRed)	Tablet
Go/No-Go	Cats&Dogs (YellowRed)	Tablet
Divided Attention	Divided Attention (HAL2)	Tablet
Fluid Intelligence	FIX (HAL2)	Tablet

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Some of the descriptions are self-explanatory but below we provide definitions:

- **Cognitive flexibility** is a critical executive function that can be broadly defined as the ability to adapt behaviours in response to changes in the environment.
- **Cognitive inhibition** controls the “executive functions” of the brain including judgment, impulse control, management of aggression, emotional regulation, self-regulation, planning, reasoning and social skills. Inhibitory control is the ability to inhibit interfering information or previously activated cognitive processes in order to focus attention on the relevant task requirements.
- **Working memory** is a system for temporarily storing and managing the information required to carry out complex cognitive tasks such as learning, reasoning, and comprehension. Working memory is involved in the selection, initiation, and termination of information-processing functions such as encoding, storing, and retrieving data.
- **Fluid Intelligence** is being able to think and reason abstractly and solve problems. This ability is considered independent of learning, experience and education.

What did they find?

In a nutshell, the research found that harmony players scored higher on five out of eight tests. In the researcher’s words

“Our data shows an order of cognitive complexity, where harmonic musicians showed better performance, followed by the melodic group, and in the last position rhythmic musicians.”

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If you were thinking of the results like a podium at the Olympics, it might look something like this.



I am sure many piano teachers and pianists reading this are jumping for joy that finally, researchers have found that they truly are the smartest musicians. But let’s take a deeper look at the findings to consider the many understandings we could take from this result.

A somewhat obvious answer

In the discussion section of the paper, the researchers examine how such a result may have come about due to the way or order in which music is taught.

“These findings are related to music educational programs for children, where rhythm is presented first, followed by melody and, in some cases, harmony. As an example, the Orff Method teaches children basic rhythmic patterns (using percussion instruments adapted for these ages), and if the students learn these rhythms, they then move on to learn melodies.

If learnt in this order, playing a rhythmic instrument does not require a knowledge of melody, just like playing a melodic instrument does not require knowledge of harmony.

Conversely, harmonic musicians need a knowledge of melody and rhythm, and melodic instrumentalists need rhythmic knowledge. Thus, our results align with the music-cognitive order complexity of certain music programs.”

Looking at the order in which we teach music, is it possible that we teach music through a structure of less to more cognitive difficult tasks. In other words, we start with the easier cognitive task with rhythm and then progress onto melody and harmony as the student’s brain build the capacity to process the increasing difficulty of music?

Furthermore, does it follow that increased musical complexity transfers across into increased cognitive complexity as measured by these eight tests? All big questions and ones that we should be asking as we consider these types of findings. It would be very easy to say to a group of parents - *all of our students learn piano because research has shown that this instrument produces the greatest cognitive enhancements of all the instruments.* But is this strictly correct? Does it value music learning for cognitive

development over musical development and does such a statement negate the other skills that music learning enhances in students?

What is missing from this study?

While we would all wish for one study that definitively proves it all, they don’t exist, and neither should they. There is a reason why it is called a field of research; where many minds do many studies in many ways to determine a deeper and better understanding of any given phenomenon.

This study measures several cognitive and executive function skills through eight different tests. It does not measure other skills such as social and communication skills, empathy or wellbeing, which are just a few skill sets that have been found to be improved by music learning.

If the researchers were to take the same musician groups and run a battery of social and communication skills tests, they may find some very different results. When I look at the Harmony instrument list - piano, guitar, organ etc. - for the most part, they are solitary instruments. Yes, they do play with others, but generally speaking, they spend most of their time creating music alone. And why wouldn’t they, they have all the musical elements at their disposal.

When I look at the Rhythm and Melody lists, these instruments do not make musical sense on their own. After all, an Agogo is a great instrument but not that engaging without an entire Latin band to play along with. The musical nature of these instruments means that learning and performance occurs predominantly in groups, and group settings have been found to enhance social and communications skills. The impacts of singing and moving together has also not been taken into account in this study but found to be vital components of music learning that results in cognitive and musical development in several other studies.

While this type of research enhances our understanding of the nature of music learning, and why we as music educators may have found that starting with rhythm, then melody and then harmony is the most effective structure to produce musicians, it may not serve as good advocacy if taken as a shallow statement such as *piano (or harmony) players are smarter and better.* Music learning is a complex experience, and to ensure cognitive and musical development, needs to be far richer than a single answer to *which instrument is best.*

Read More

Porflitt, F., & Rosas, R. (2020). Core music elements: rhythmic, melodic and harmonic musicians show differences in cognitive performance. *Studies in Psychology*, 1-31.

Researcher to Follow

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Professional Reflection • Part 1

Personal Brain Buzz

Which category of instrument do you fit into? If you play more than one instrument, which was your primary instrument or the one you learned for the longest time with the greatest intensity? Does your personal experience of the transferability of the cognitive and executive function skills listed in the study fit the findings, or do you believe it is very different? Explain why.

Experiment Time

Musicians and music teachers often have musicians and music teachers as friends and colleagues. Select a group of people who would fit into each musicians group in the study and then compare their cognition and executive function skills. Do you see similarities or differences? If they are not music teachers or professional musicians, which types of jobs and professions have they gone into? Any similarities or differences when you compare them?

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Professional Reflection • Part 2

Teaching Brain Buzz

Do you notice any correlations, similarities or differences between your students when you sort them into instrument groups such as in the study? Do they approach their learning, musical and non-musical, differently or similarly? Do you teach them differently because of their primary instrument and the skills that instrument may or may not enhance?

Experiment Time

If you do differentiate your teaching for the three different instrument groups, what would happen if you swapped the teaching strategies around – teach the harmony musicians like they are melody musicians and the rhythm musicians like they are harmony musicians? How do the students respond to the changes in your teaching approach?

Questioning Brain Buzz

After completing this professional reflection, write at least two questions you have about this topic.