

# A longitudinal study on the impact of music training on children's neurocognitive plasticity

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AIMS. To determine brain/cognition links in music- and language-related abilities in children at structural and connectivity levels. Neurocognitive effects of collective music training in regular schools have been poorly examined; we probe effects of a short collective music training compared to analogous training in sports and to no training (passive control group).

### DESIGN

### MEASURES

**Behavior**

- MUSIC DOMAIN**
  - Music Aptitude Tests (Overy et al., 2003)
    - Melody discrimination
    - Rhythm discrimination
    - Rhythm copy
    - Note number detection
- MOTOR DOMAIN**
  - Fine motor abilities
    - Purdue Pegboard Test (Tiffin, 1968)
    - Grooved Pegboard Test (Trites, 1989)

**COGNITIVE DOMAIN**

- WISC – III (Wechsler, 2003)
  - IQ
  - Verbal short-term memory
  - Working memory
- Visuospatial short-term memory (PathSpan)

**READING & MATHS**

- Words correct per minute index
- Reading age test (TIL; Sucena & Castro, 2010)
- Word & Pseudoword Reading (3DM; Reis et al., 2019)
- Phonological awareness (ALEPE; Sucena & Castro, 2011)
- Addition (Hyde et al., 2014)

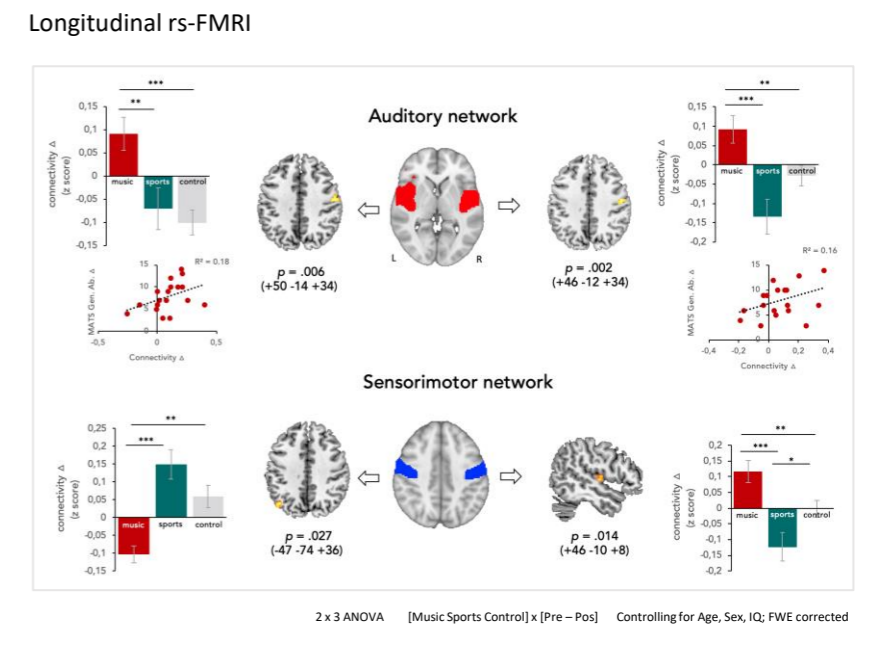
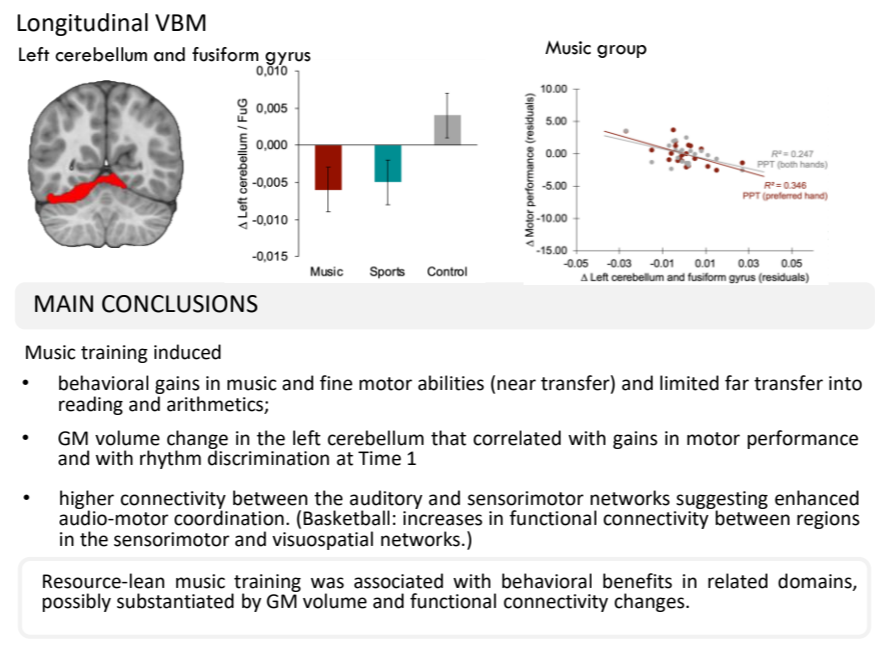
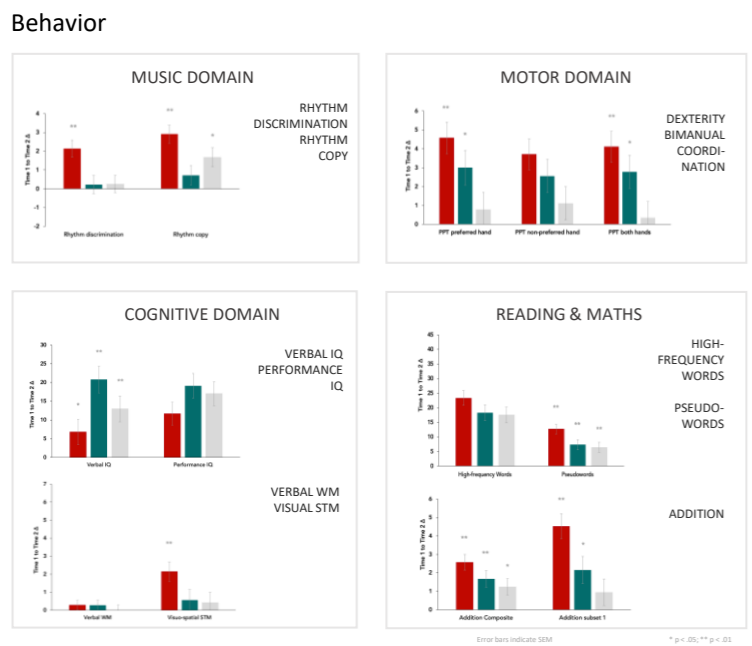
**Neuroimaging**

- Structural MRI: gray-matter volume analyzed through voxel-based morphometry – VBM
- Functional connectivity with resting-state fMRI – rs-fMRI

### TIME 1

	MUSIC (n = 25)	SPORTS (n = 25)	CONTROL (n = 24)
SEX	13 F / 12 M	13 F / 12 M	15 F / 9 M
AGE (yrs)	8.35 (0.31)	8.29 (0.42)	8.29 (0.31)
SES	14 L / 11 M	11 L / 14 M	8 L / 16 M

## CHANGE TIME 2 - TIME 1



## PUBLICATIONS

[1] Correia, A. I., Branco, P., Martins, M., Reis, A. M., Martins, N., Castro, S. L., & Lima, C. F. (2019). Resting-state connectivity reveals a role for sensorimotor systems in vocal emotional processing in children. *NeuroImage*, 201, 116052. <https://doi.org/10.1016/j.neuroimage.2019.116052> [2] Martins, M., Neves, L., Rodrigues, P., Vasconcelos, O., & Castro, S. L. (2018). Orff-based music training enhances children's manual dexterity and bimanual coordination. *Frontiers in Psychology*, 9, 2616. <https://doi.org/10.3389/fpsyg.2018.02616> [3] Martins, M., Silva, S. & Castro, S. L. (2020). Perceiving rhythmic repetition and change across development: Effects of concurrent pitch. *Empirical Studies of the Arts*, 38(2), 212-235. <https://doi.org/10.1177/0276237418822895> [4] Martins, M., Reis, A. M., Castro, S. L., & Gaser, C. (2021). Gray matter correlates of reading fluency deficits: SES matters, IQ does not. *Brain Structure and Function*, 226, 2585-2601. <https://doi.org/10.1007/s00429-021-02353-1> // Forthcoming [5] Branco, P., Martins, M., Lima, C. F. & Castro, S. L. (2022). Dynamic reorganization of functional connectivity after music and sports training: A longitudinal study. Manuscript in preparation. [6] Martins, M., Coimbra, D., Reis, A. M., Gaser, C., & Castro, S. L. (2022). Orff-based music training fosters plasticity in the developing brain. Manuscript in preparation.