The impact of music training programs on inhibition control in children: a meta-analysis

Kevin Jamey[1,2,3], Nicholas E. V. Foster[1,2,3], Krista L. Hyde[1,2,3], Simone Dalla Bella[1,2,3]

1 International Laboratory for Brain Music and Sound Research (BRAMS), University of Montreal, Montreal, Canada.

2 Faculty of Psychology, University of Montreal, Montreal, Canada.

3 Center for Research on Brain, Language & Music, Montreal, Canada.

CRBLM

Brams
International Laboratory for Brain, Music, and Sound Research

Université de Montréal

CIHR IRSC

Introduction and Background

- A vast literature exists on the relationship between executive functioning and music training in adults.
- It is still unclear, however, whether or not music training causes a strengthening in executive control during child development (Sala & Gobet, 2017)
- Inhibition control is a key executive function for young children's development that has important ramifications for academic and social outcomes (Baker et al., 2019)
- Inhibition control is an important executive function for music practice (Zuk et al., 2014; Vuust et al., 2011).
- It is often required when synchronizing in an ensemble, prioritizing among auditory streams and processing complex rhythms. (Jentzsch et al., 2014)

Aims & hypotheses

Aim: 1) to examine if music-based training programs can increase inhibition control abilities in children.

- It is expected that Inhibition control is heavily recruited during music playing and will improve with training.

Aim: 2) to examine if music training intensity, degree of individualization of training and training setting (school vs. out of school) influences training improvement.

- It is expected that the more intense and individualized the training, the greater the improvement.
- It is expected that training outside of school will show greater improvement.

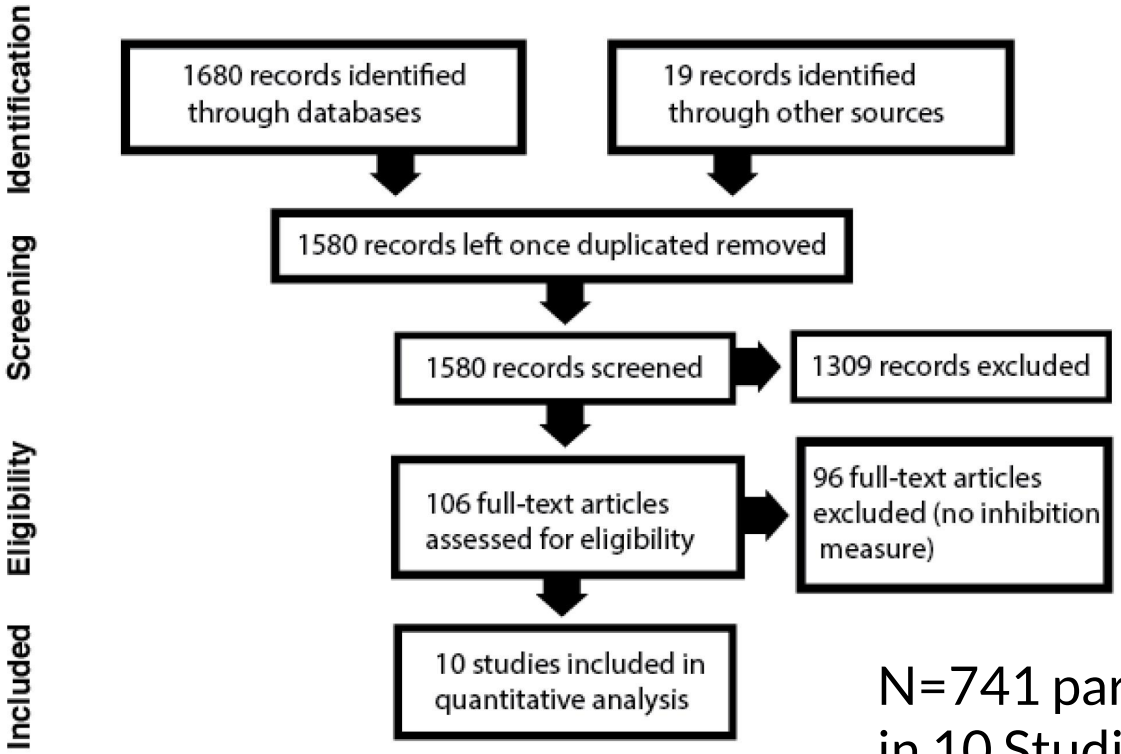
Methods

Comprehensive literature search on databases (PubMed, Web Of Science, Psycnet, Scopus): music* training or music* learning or music* education or music* lessons or musician* AND executive* or executive function* or executive control or cognitive function* or cognitive control or inhibition AND development* or child or learning or cognitive development or childhood or children or adolescent*

Inclusion criteria:

- Randomized control trial + longitudinal design
- Non-music control group
- Music group involves music production or designed to improve EFs
- Pre-post mean and standard deviation reported
- Includes inhibition control outcome measure
- 1980-2020

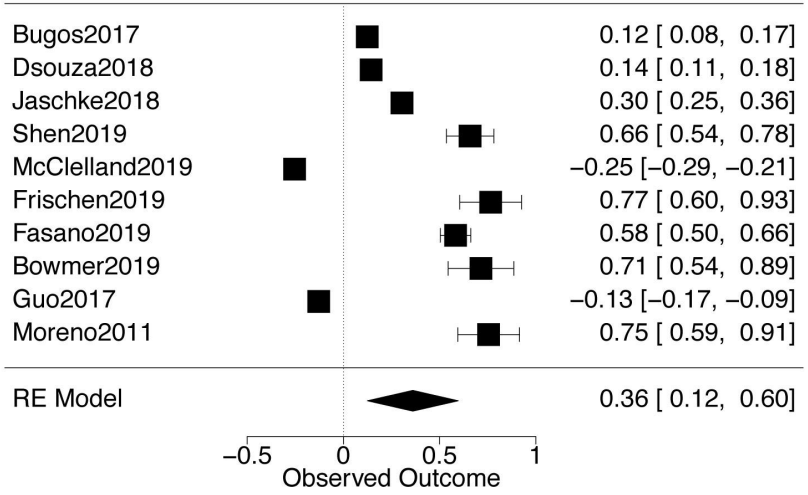
PRISMA FLOW CHART



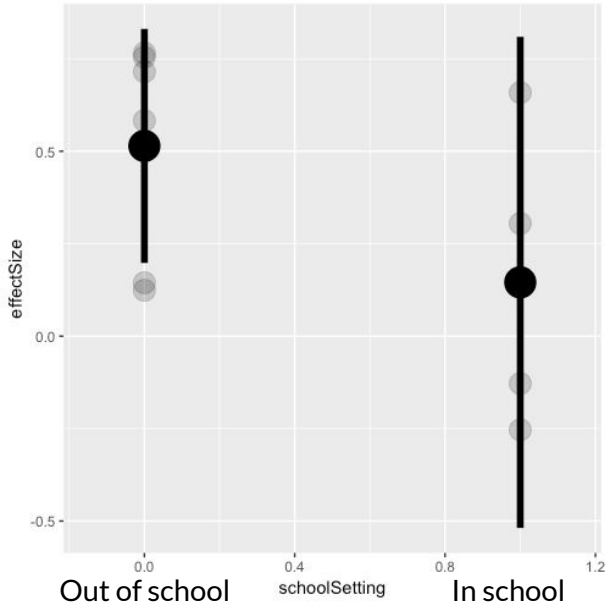
N=741 participants in 10 Studies

Results

1) Significantly greater improvement in inhibition control for music training programs than control programs (*SMD* = 0.36, *CI* = 0.11 to 0.60, *p* = .004)



2) Trend towards a greater effect of training outside of school (p=0.1) and more individualized training (p=0.06). No significant effect of training intensity.



Conclusions

- Music programs for young children lead to skill transfer in the domain of inhibition control, an executive function important for music and child development in terms of academic and social outcomes.
- Music training intensity did not have an impact on the transfer effect.
  - However: the two studies with negative ES had lowest training duration (<300 min).
- Individualized training and training outside school may show greater improvement effects.

References

Sala & Gobet (2017) Does Far Transfer Exist? Negative Evidence From Chess, Music, and Working Memory Training, Current directions in psychological science, https://doi.org/10.1177/0963721417712760

Baker, Erin & Liu, Qingyang & Huang, Rong. (2019). A View from the Start: A Review of Inhibitory Control Training in Early Childhood. 10.5772/intechopen.88700.

Zuk, J., Benjamin, C., Kenyon, A., & Gaab, N. (2014). Behavioral and neural correlates of executive functioning in musicians and non-musicians. *PLoS ONE*, *9*(6).

Vuust, P., Wallentin, M., Mouridsen, K., Østergaard, L., & Roepstorff, A. (2011). Tapping polyrhythms in music activates language areas. *Neuroscience Letters*, *494*(3), 211–216. https://doi.org/10.1016/j.neulet.2011.03.015

Jentzsch, I., Mkrtchian, A., & Kansal, N. (2014). Improved effectiveness of performance monitoring in amateur instrumental musicians. *Neuropsychologia*, *52*(1), 117–124. https://doi.org/10.1016/j.neuropsychologia.2013.09.025

CRBLM

Brams
International Laboratory for Brain, Music, and Sound Research

Université de Montréal

CIHR IRSC