



Impact of group vs. solo music education on cognitive development in disadvantaged children (7-12y)

Gaëlle Rouvier, Lorna Le Stanc, Indiana Wollman, Grégoire Borst

► To cite this version:

Gaëlle Rouvier, Lorna Le Stanc, Indiana Wollman, Grégoire Borst. Impact of group vs. solo music education on cognitive development in disadvantaged children (7-12y). Society of Research in Child Development, Mar 2023, Salt Lake City, United States. . hal-04057016

HAL Id: hal-04057016

<https://hal.science/hal-04057016>

Submitted on 3 Apr 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

IMPACT OF GROUP VS. SOLO MUSIC EDUCATION ON COGNITIVE DEVELOPMENT IN DISADVANTAGED CHILDREN (7-12y)

Gaëlle ROUVIER^{1 2}, Lorna LE STANC¹, Indiana WOLLMAN², Grégoire BORST¹

¹Laboratory for the Psychology of Child Development and Education (LaPsyDÉ, UMR CNRS 8240), Université Paris Cité, France

²Démos, Cité de la Musique – Philharmonie de Paris, France

BACKGROUND & OBJECTIVES

- Actively **making music entails enhanced cognitive activity** and even cortical transformation (1)
- In children, it fosters enhanced **cognitive development of various cognitive abilities** such as IQ (2) or executive functions (3)
- It has a **privileged impact** on cognition over other leisure activities (4)
- Group music activities have a **positive impact on social cognition** (5)
- And group music programs seem to **positively counter-act the developmental effects of a low socioeconomic (SES) background** on cognitive development (of phonological awareness for instance, 6) – although the SES variable is never precisely controlled for.
- But a **comparison of cognitive effects between modes of music training is lacking**.
- Yet, given that to learn properly :
 - Being actively engaged is critical (7)
 - Social interaction is critical (8)

we wonder whether, controlling for the SES variable, all modes of music training (especially the contrasted solo vs. group ones) have the same cognitive impact :

- **Is there an impact of music in general on the cognitive development of children** (i.e. are the effects observed in solo training also present in group training and *vice versa*) ?
- **Is there a differentiated impact according to the group or solo form of music learning ?**

- Musical cognition** : music training (in solo and group) might have an immediate impact on musical skills (perception and production). This impact is probably different between modes of training.
- Executive functions** : the demanding activity in which music training (in solo and group) consists might entail transfer effects on executive functions. This impact is probably different between modes of training.
- Social cognition** : music training in group or solo might entail different transfer effects on social cognition skills.

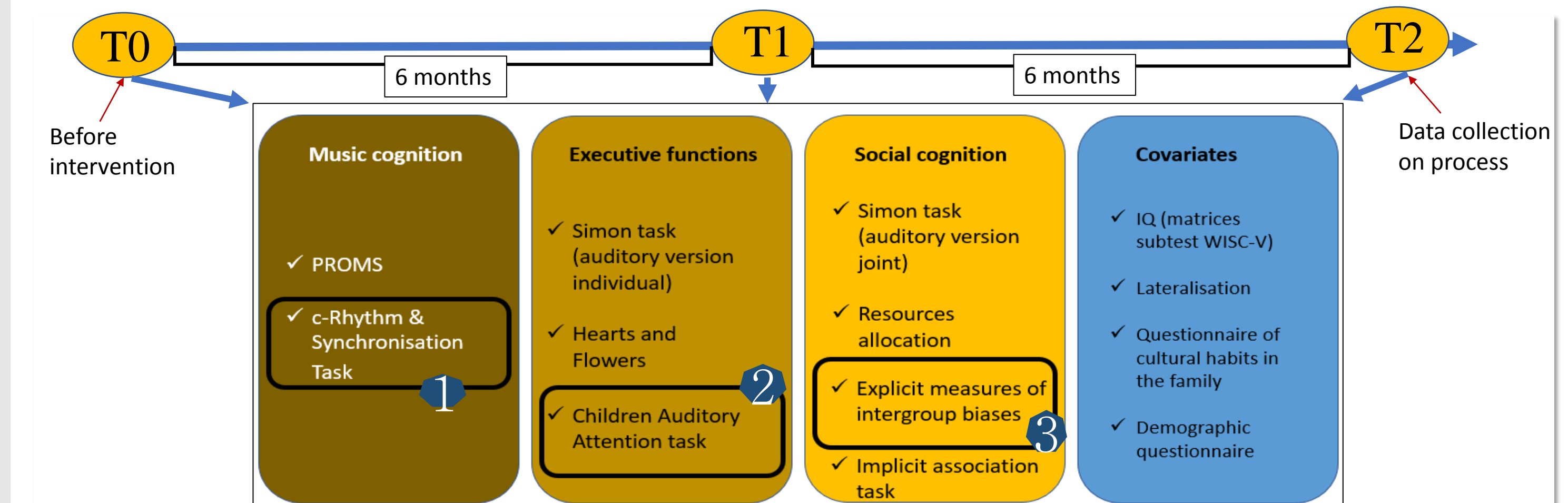
PARTICIPANTS

| | groups | | |
|---------------------|--------------|-------------|-------------|
| | no music | solo music | group music |
| N | 82 | 79 | 57 |
| sex (female/male) | 41F/41M | 46F/33M | 35F/22M |
| age (mean ± SD) *** | 8.91 ± 1.11 | 8.02 ± 1.12 | 8.18 ± 1.29 |
| SES (mean ± SD) ** | -0.15 ± 0.98 | 0.32 ± 1 | 0.07 ± 0.92 |
| IQ (mean ± SD) | 7.03 ± 2.72 | 7.68 ± 2.87 | 7.62 ± 2.63 |

*** : significant difference in age between no music and group music and between no music and solo music
** : significant difference in SES between solo music and group music

METHOD

LONGITUDINAL DESIGN



TWO TEAMS

- Quasi minimal group paradigm (9)
- Participants are allocated to one of the two teams to induce a sense of group belonging.

FOCUS ON SOME TASKS

1 children Rhythm & Synchronisation Task (adapted from 10)

INSTRUCTIONS
“Listen and then tap in synchrony with the rhythm heard”

PRINCIPLE
Structure of a stimulus
N trials = 18

DEPENDENT VARIABLE
✓ C-RST score, a composite score of :
1) The ability to tap as many times as the rhythm heard
2) The ability to replicate the rhythmical pattern heard

2 children Auditory Attention Task (adapted from 11)

INSTRUCTIONS
“Tap each time you hear the target sound (low long tone)”

PRINCIPLE
N trials = 6

DEPENDENT VARIABLE
✓ d-prime

3 Explicit Measures of Intergroup Biases (adapted from 9)

INSTRUCTIONS
“Who do you prefer
- To play with
- To share your 2 euros with ?”

PRINCIPLE
N trials = 10
“Who do you prefer ?”

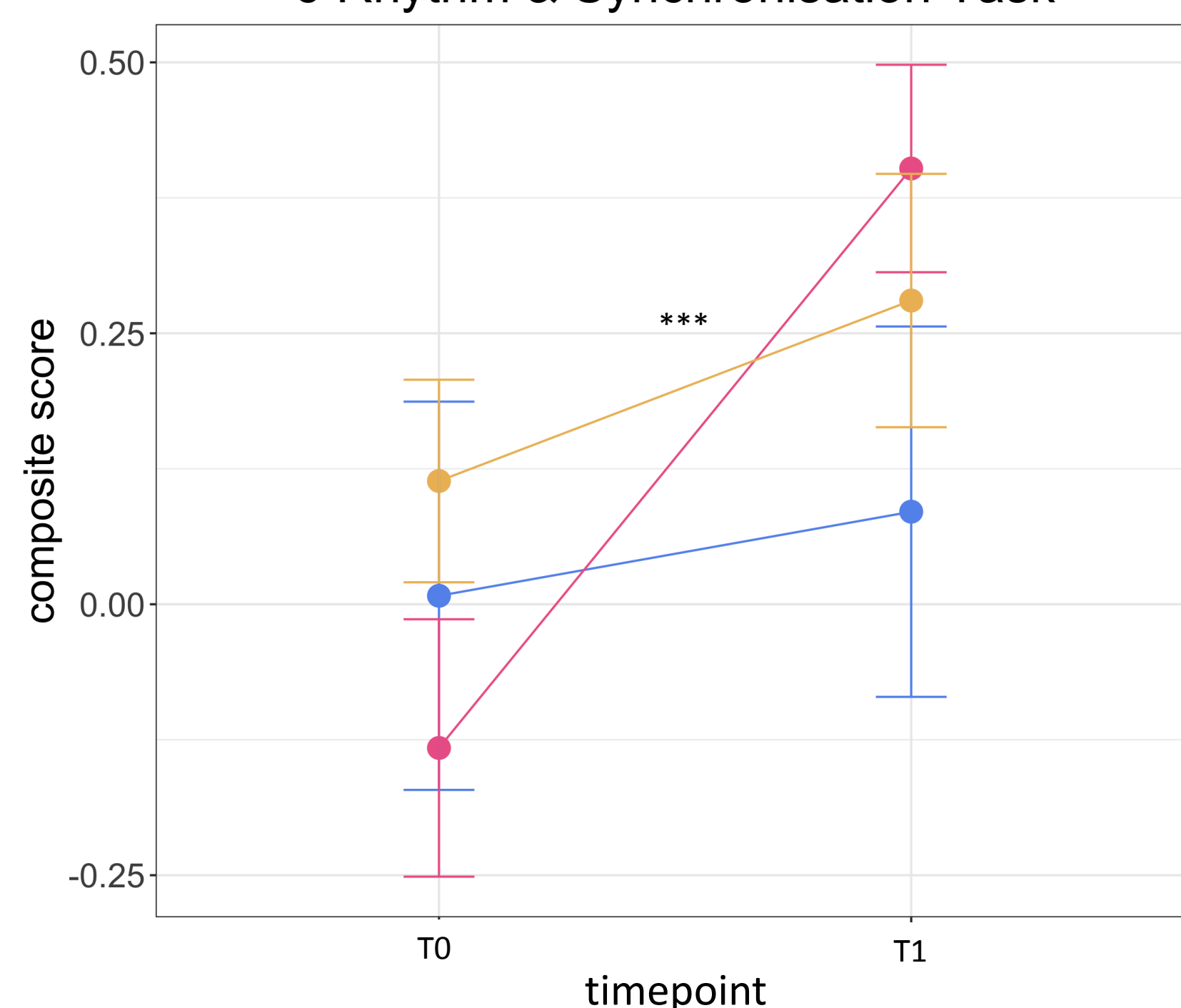
DEPENDENT VARIABLE
✓ Preference (% in favour of the ingroup)
✓ Sharing & Collaboration (% in favour of the ingroup)

ANALYSES :

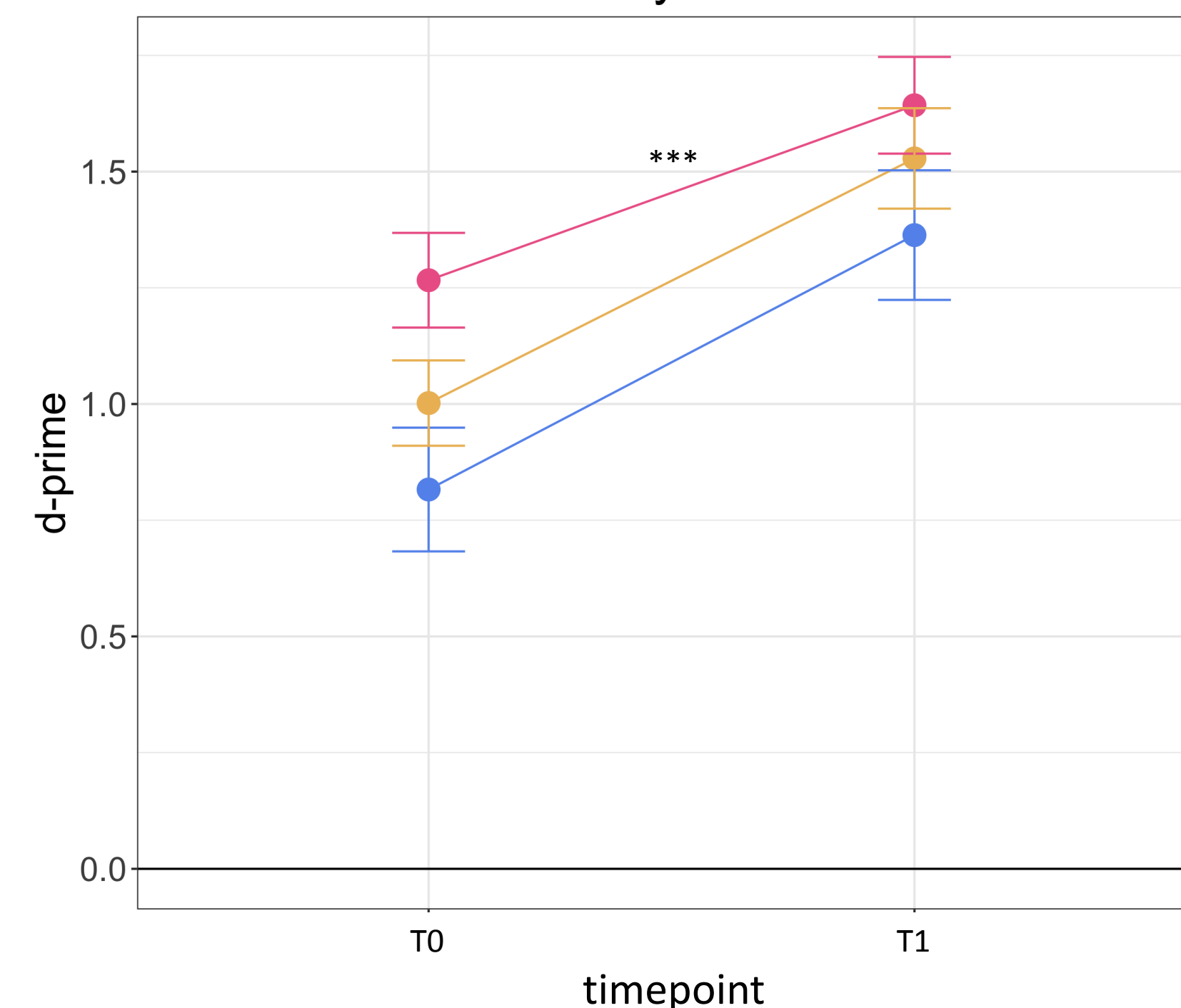
- children Rhythm & Synchronisation Task**
Mixed models to compensate for missing values
• DV : composite score
• IV : group, timepoint
• Covariates : SES, age
- children Auditory Attention Task**
Mixed models to compensate for missing values
• DV : d-prime
• IV : group, timepoint
• Covariates : SES, age
- Explicit Measures of Intergroups biases**
Mixed models to compensate for missing values
• DV : preference, sharing & collaboration
• IV : group, timepoint
• Covariates : SES, age

RESULTS

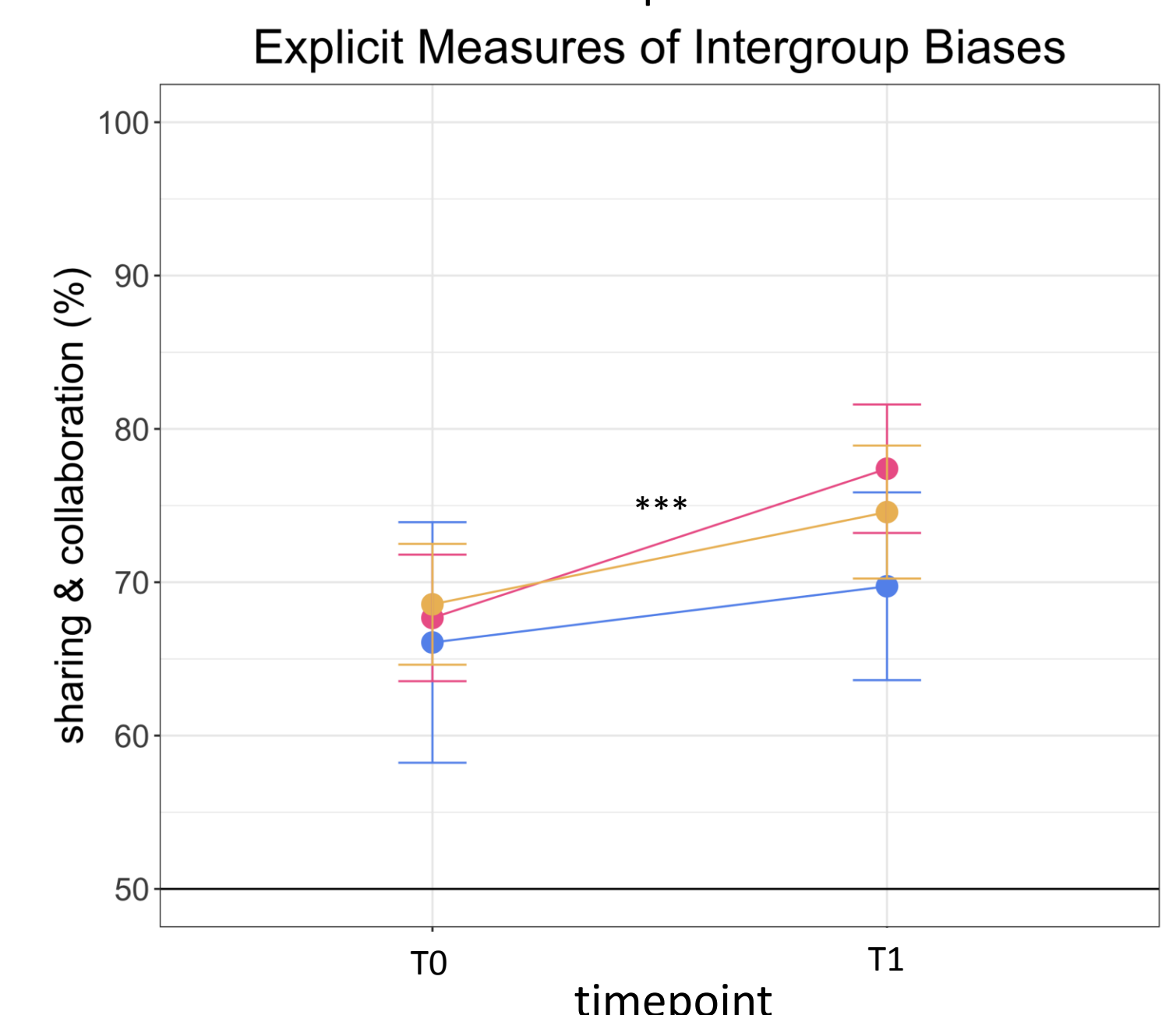
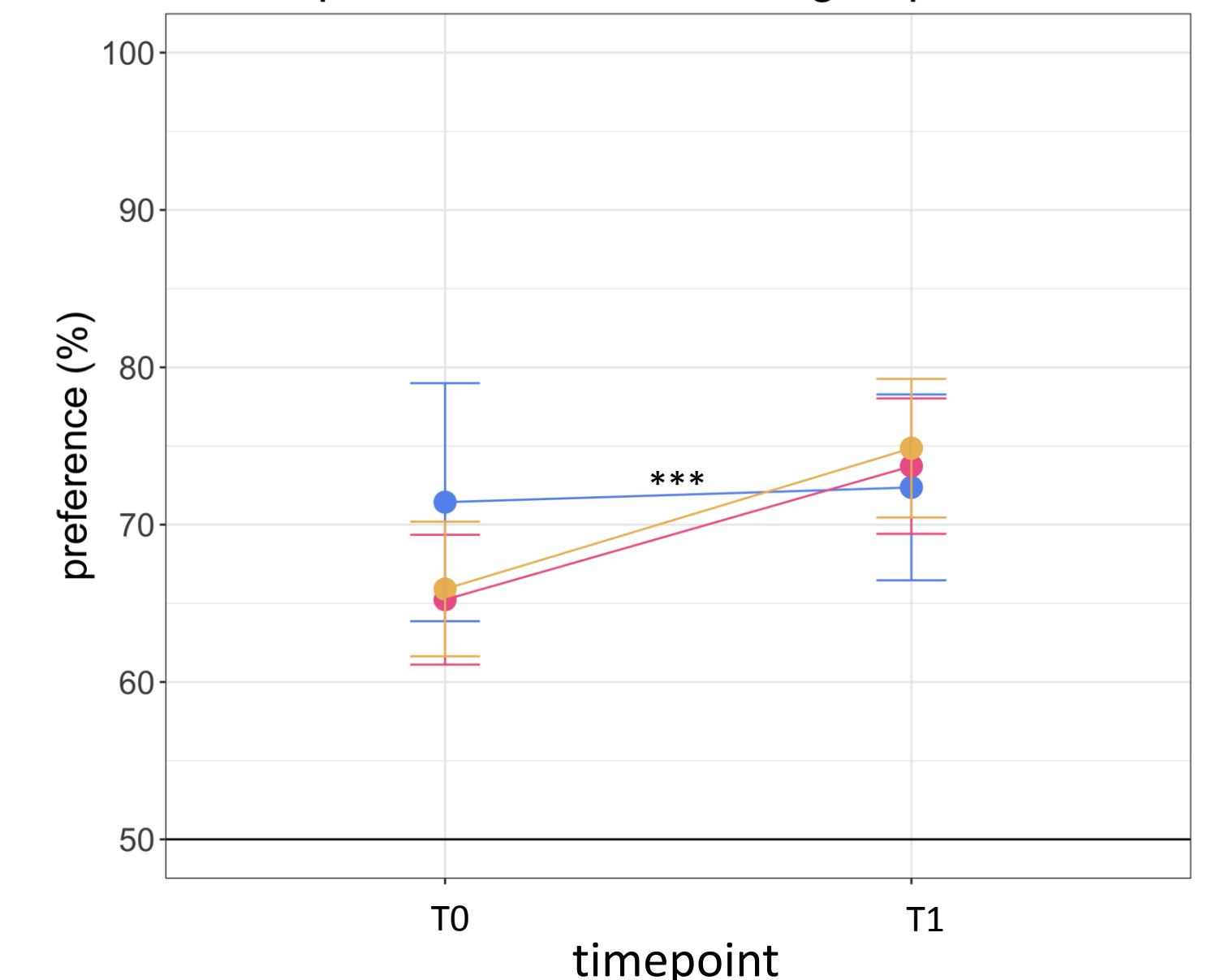
1 c-Rhythm & Synchronisation Task



2 c-Auditory Attention



3 Explicit Measures of Intergroup Biases



DISCUSSION

- Between T0 and T1, there is a significant increase in rhythmic motor synchrony (1), in selective auditory attention (2) and in the propensity to favour members of one's outgroup vs. one's ingroup (3). These **improvements are the same between all three groups (there is no interaction between timepoint and group)**.
- Thereby, **we cannot assess any effect of music on these capacities after only 6 months** of intervention.

➔ As shown in the literature (3, 12), **effects of music intervention might appear after 1 year of training**. We expect an interaction between group and timepoint at the third measurement timepoint.

- REFERENCES :
- Hyde, K. L., Lerch, J., Norton, A., Forgeard, M., Winner, E., Evans, A. C., & Schlaug, G. (2009). The effects of musical training on structural brain development: A longitudinal study. *Annals of the New York Academy of Sciences*, 1169, 182–186.
 - Schellenberg, E. G. (2011). Examining the association between music lessons and intelligence. *British Journal of Psychology*, 102(3), 283–302.
 - Jaschke, A. C., Honing, H., & Scherder, E. J. A. (2018). Longitudinal Analysis of Music Education on Executive Functions in Primary School Children. *Frontiers in Neuroscience*, 12(Febuary).
 - Schellenberg, E. S. (2004). Music Lessons enhance IQ. *Psychological Science*, 15(8), 511–514.
 - Kirschner Sebastian, S., & Tomasello, M. (2010). Joint music making promotes prosocial behavior in 4-year-old children. *Evolution and Human Behavior*, 31(5), 354–364.
 - Krius, N., Hornickel, J., Strait, D. L., Slater, J., & Thompson, E. (2014). Engagement in community music classes sparks neuroplasticity and language development in children from disadvantaged backgrounds. *Frontiers in Psychology*, 5(DEC), 1–9.
 - Gerry, D., Urram, A., & Trainor, L. J. (2012). Active music classes in infancy enhance musical, communicative and social development. *Developmental Science*, 15(3), 398–407.
 - Kirschner, S., & Tomasello, M. (2009). Joint drumming: Social context facilitates synchronization in preschool children. *Journal of Experimental Child Psychology*, 102(3), 299–314.
 - Dunham, Y., Baron, A. S., & Carey, S. (2011). Consequences of “Minimal” Group Affiliations in Children. *Child Development*, 82(3), 793–811.
 - Ireland, K., Parker, A., Foster, N., & Penhune, V. (2018). Rhythm and Melody Tasks for School-Aged Children With and Without Musical Training: Age-Equivalent Scores and Reliability. *Frontiers in Psychology*, 9(APR), 1–14.
 - Hansen, J. C., Hillyard, S. A., & Hansen, J. C. (1980). ENDOGENOUS BRAIN POTENTIALS ASSOCIATED WITH SELECTIVE AUDITORY ATTENTION I. In *Electroencephalography and Clinical Neurophysiology* (Vol. 49).
 - Barbaroux, M., Dittinger, E., & Besson, M. (2019). Music training with Démos program positively influences cognitive functions in children from low socio-economic backgrounds. *PLoS ONE*, 14(5), 1–21.

contact :
gaëlle.rouvier@gmail.com

