On the role of ancillary body movements in interpersonal synchronization during joint music making

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Introduction

Research in joint music making typically focuses on trained musicians, without considering natural predispositions[1]. In joint music making, musicians use ancillary movements to facilitate interpersonal synchronization[2-6]. Is such use of ancillary movements generalizable to non-musicians?

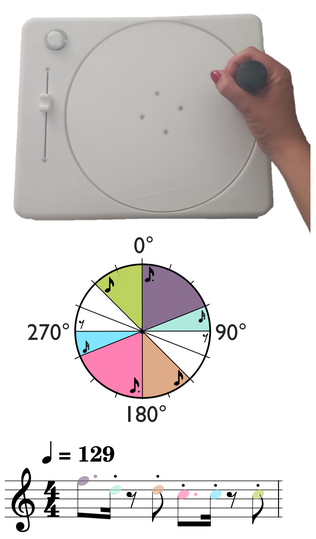
Research goals

1. To test whether the perception of ancillary movements facilitate interpersonal synchronization during joint music making.

2. To test whether the above (predicted) effects depend on musical training.

Methods

eMusic Box (eMB)

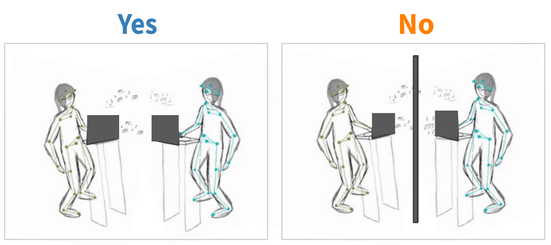


The eMB plays preregistered songs with tempo controlled through rotary movements[5].

Task

"Synchronize your music with your partner's as accurately as possible"

Visual feedback

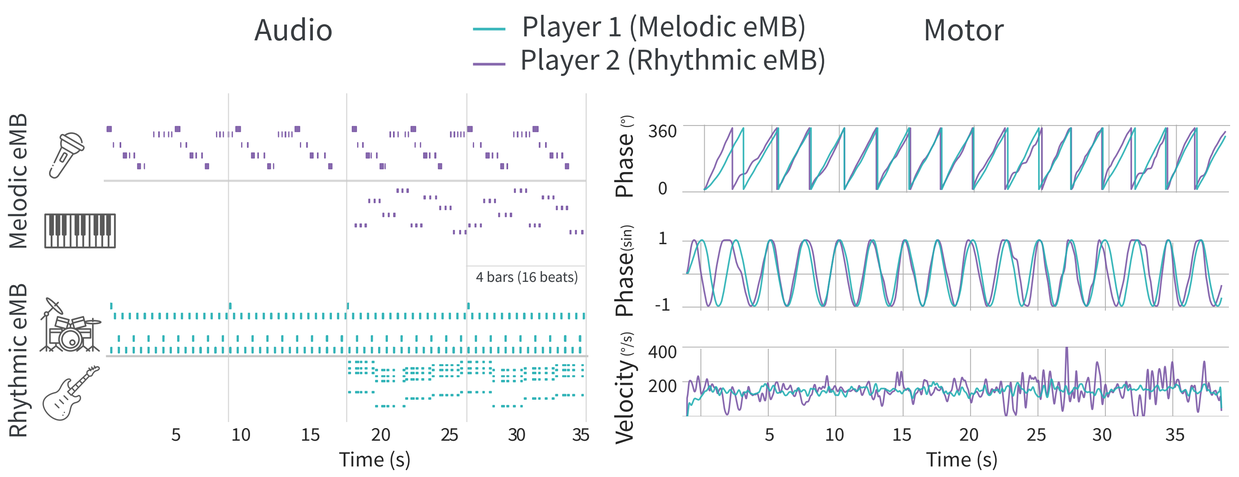


32 trials (4 different familiar songs)

Experiment 1: eMB
35 dyads (mixed levels of training)

Experiment 2: eMB, VICON, eye tracking
20 dyads (non-musicians, <2 yrs)
20 dyads (musicians, >8 yrs)

eMusic Box Output

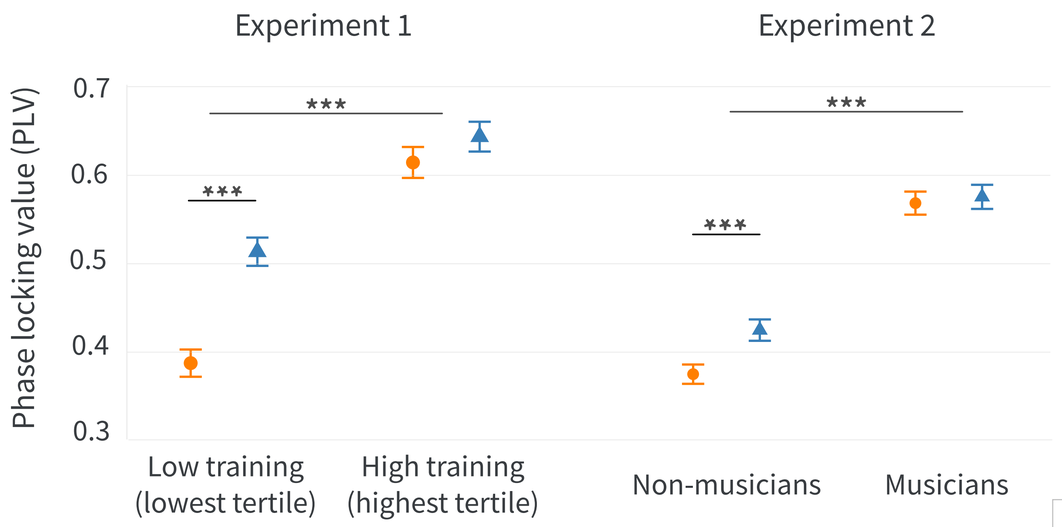


Scan to view trial video of experiment 1

Example of audio and motor output from a representative trial: *audio* refers to the outputted multitrack MIDI file, while *motor* refers to the phase of rotary movements and their corresponding computed velocity.

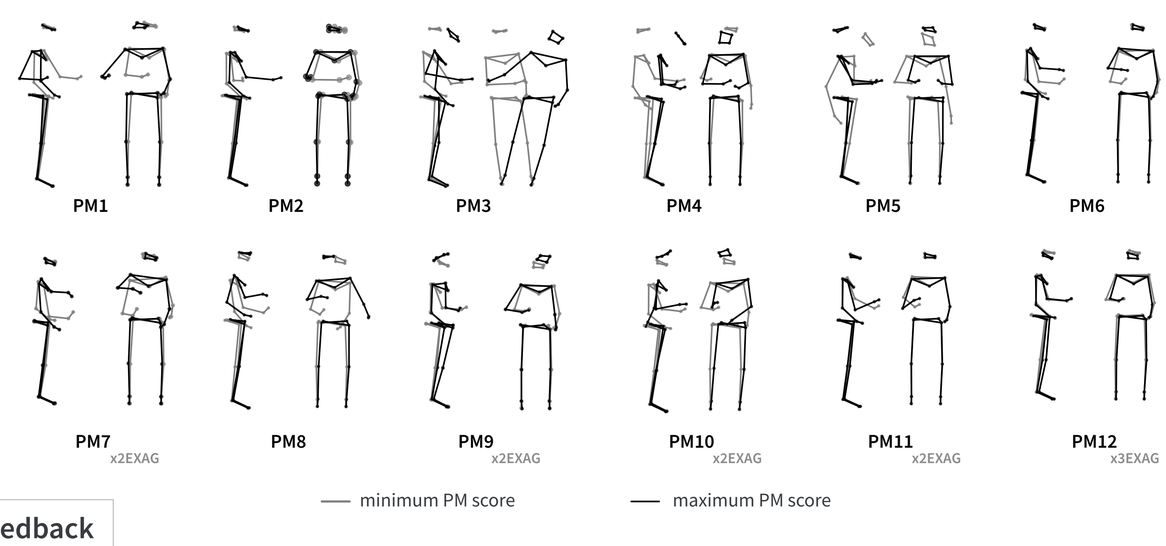
Results

Interpersonal synchronization (eMB data)

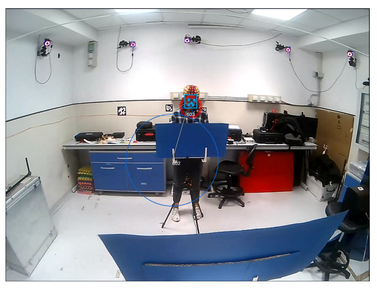


Split based on eye tracking data

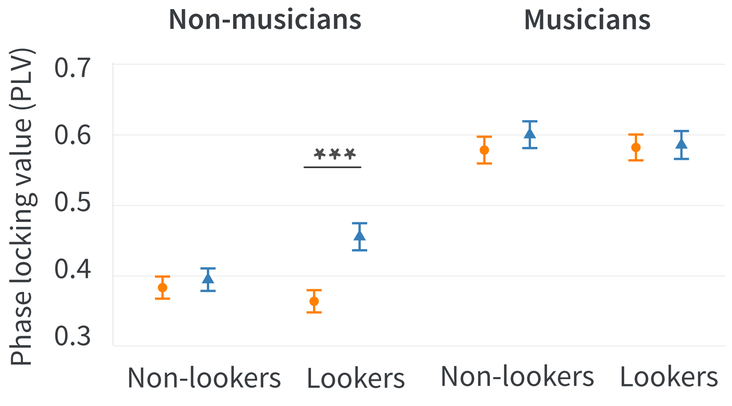
Principal Movements (PMs)

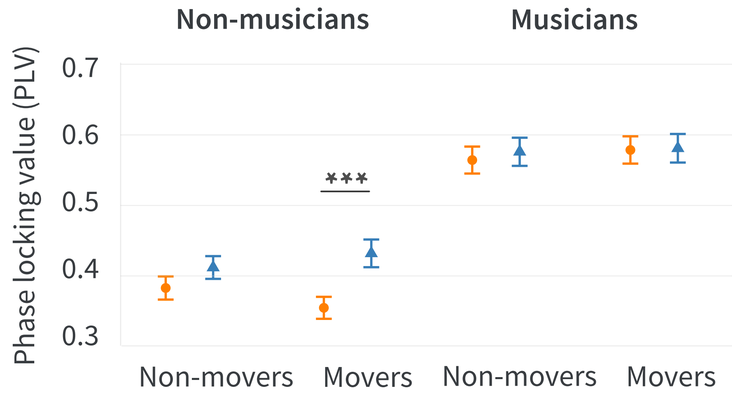


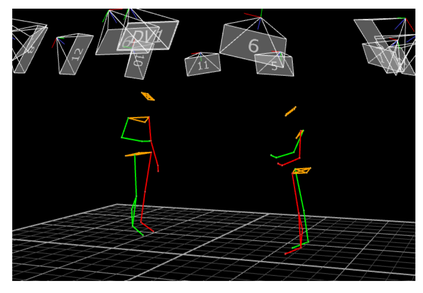
Split based on displacement of the PMs



Face detection within each participant's field of view.







3D full-body kinematics
12 PMs explain 95% of variance

Statistical analysis: Linear Mixed Effect modelling. Error bars represent standard error (SE). Significance levels: p < 0.001 (***).

Conclusion

Across two experiments, we show that **non-musically trained** participants achieve higher joint music synchrony when they can see each other. This suggests that the perception of ancillary movements during joint music making facilitates synchronization. We further show 1) that the effect of **visual feedback** on synchronization accuracy depends on the amount of time participants spent **looking towards each other** and 2) that participants who **produce more ancillary body movements** also achieve higher synchronization. The fact that synchronization through ancillary movements is observable in non-musically trained participants suggests that these individuals might rely on both auditory and visual feedback to achieve interpersonal synchronization. Conversely, **musically-trained** participants seem to only rely on **auditory feedback** during joint music making to achieve interpersonal synchronization, at least in the context of this task.

References

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