

The geometry of interpersonal synchrony in human dance

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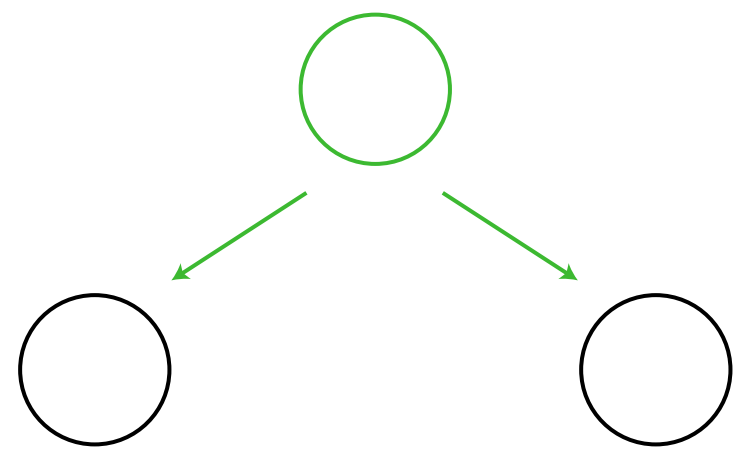
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Introduction

Social synchrony is widely observed across many animal taxa¹⁻⁷. Multiple non-exclusive explanations have been put forward for its emergence^{3,8-11}:

Account #1: Shared external input

Account #2: Interpersonal adaptation

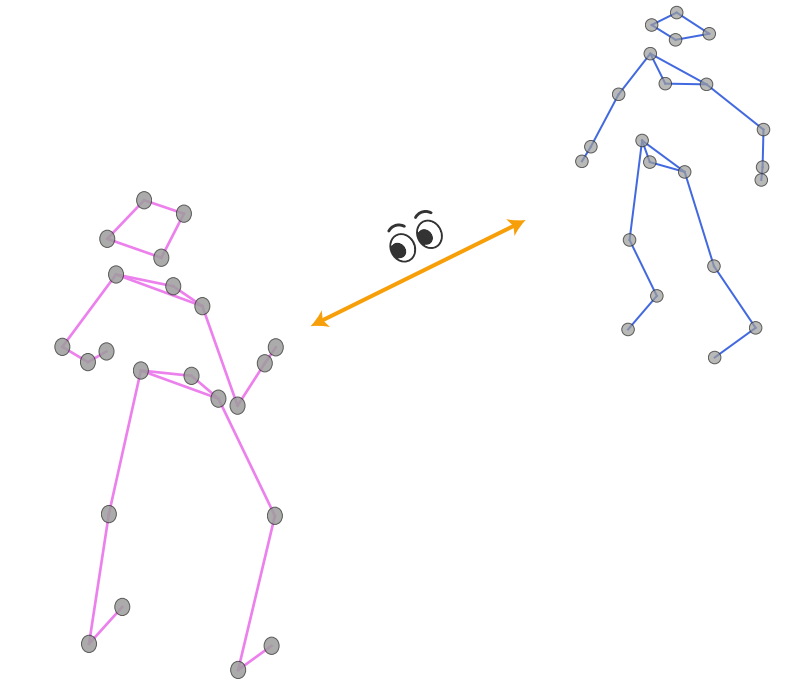
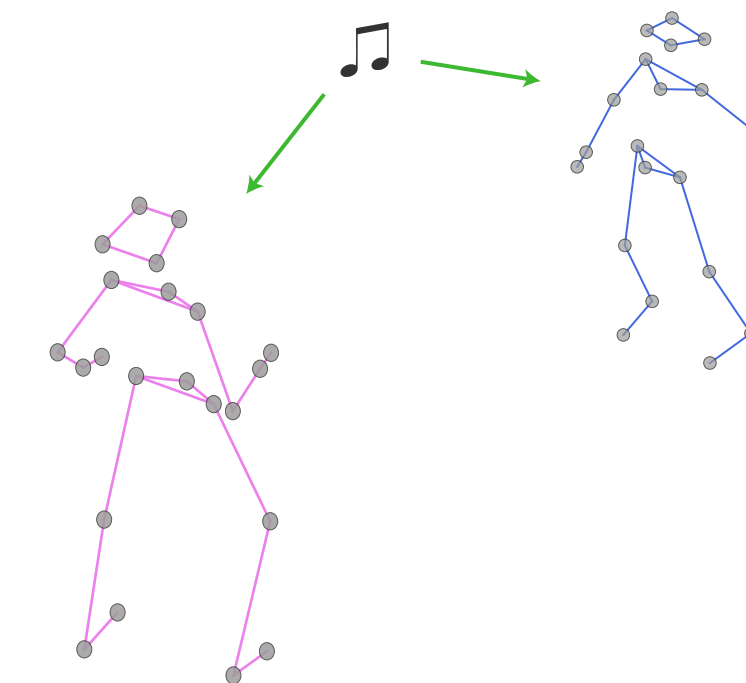


Research question

Collective dance – ancient and universal^{12,13} – could be explained by either account. We studied the interplay between:

Music-driven synchrony

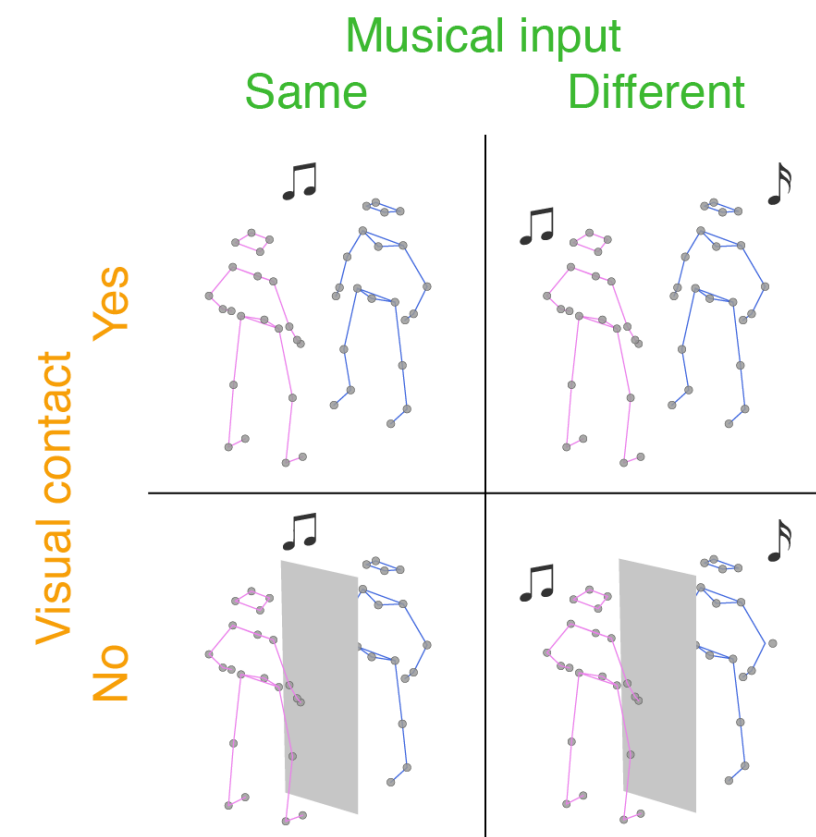
Partner-driven synchrony



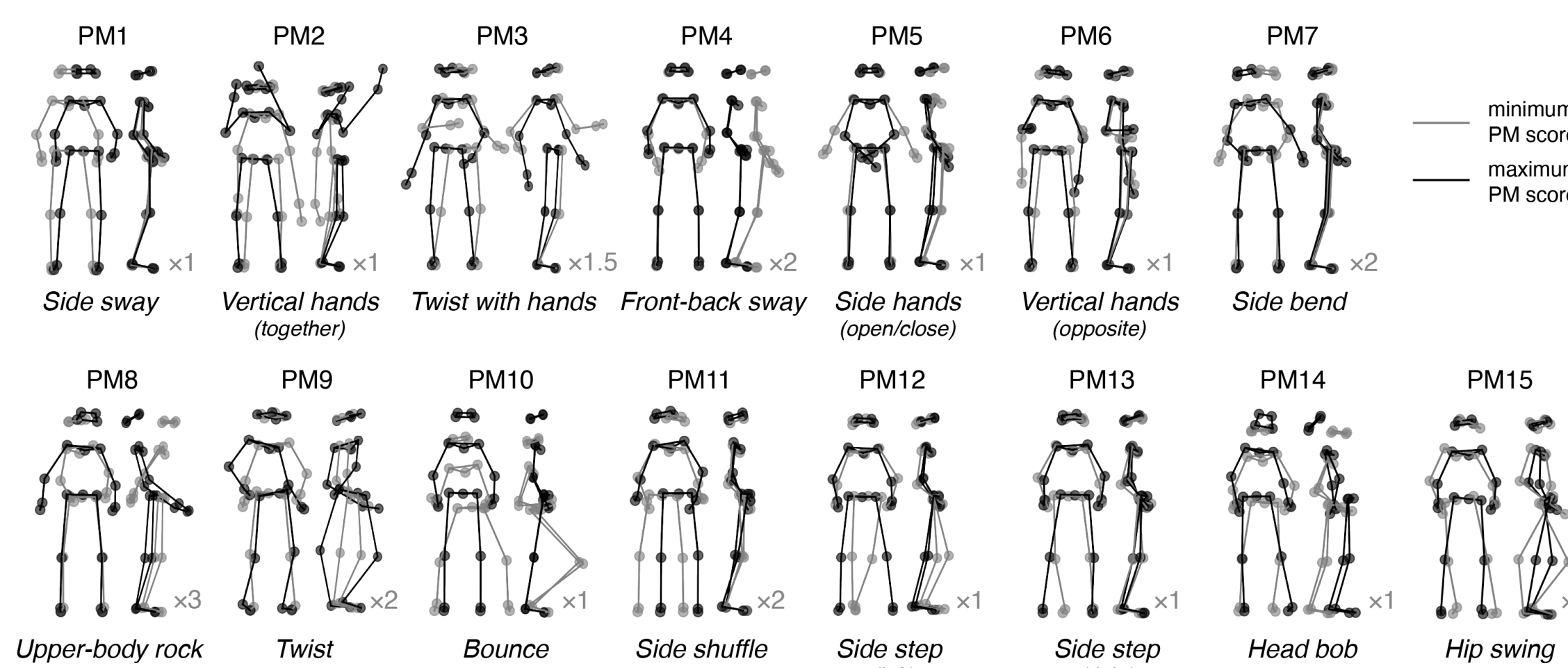
Methods

A Experimental design

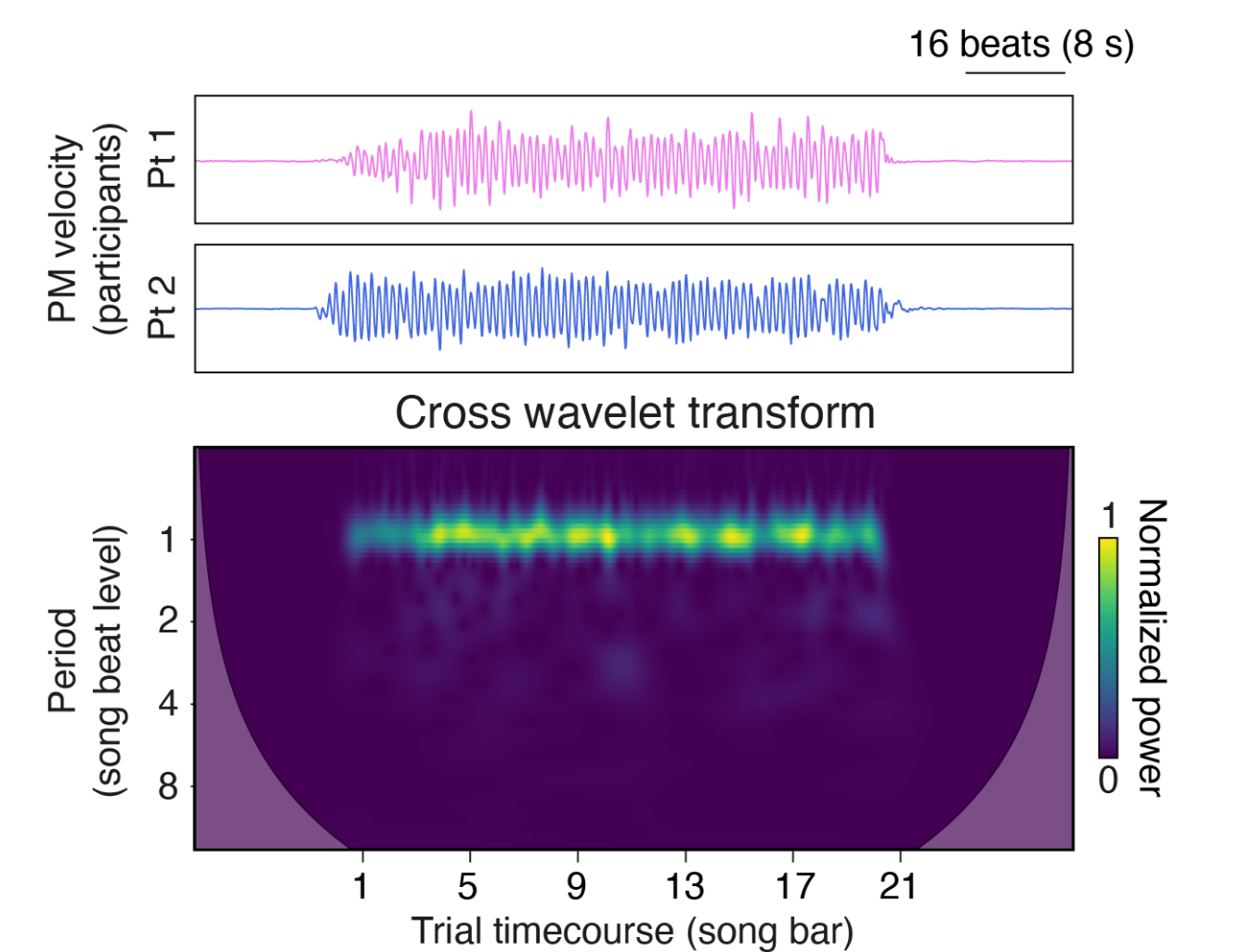
- 3D full-body kinematics (Vicon)
- 70 (non-trained) participants (35 dyads)
- 2x2 factorial design:
 - o Musical input: Same / Different
 - o Visual contact: Yes / No
- 8 famous songs adapted for the study
- Instructions: “enjoy the music” - “allowed to dance”



B Principal movements (PMs) of the 70 dancing participants



C Interpersonal movement synchrony

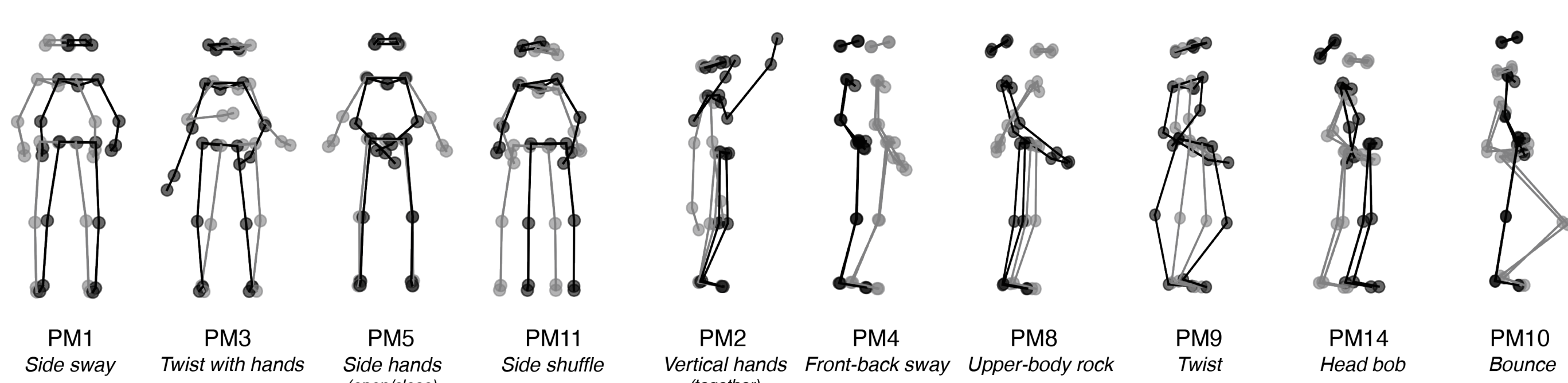


Results

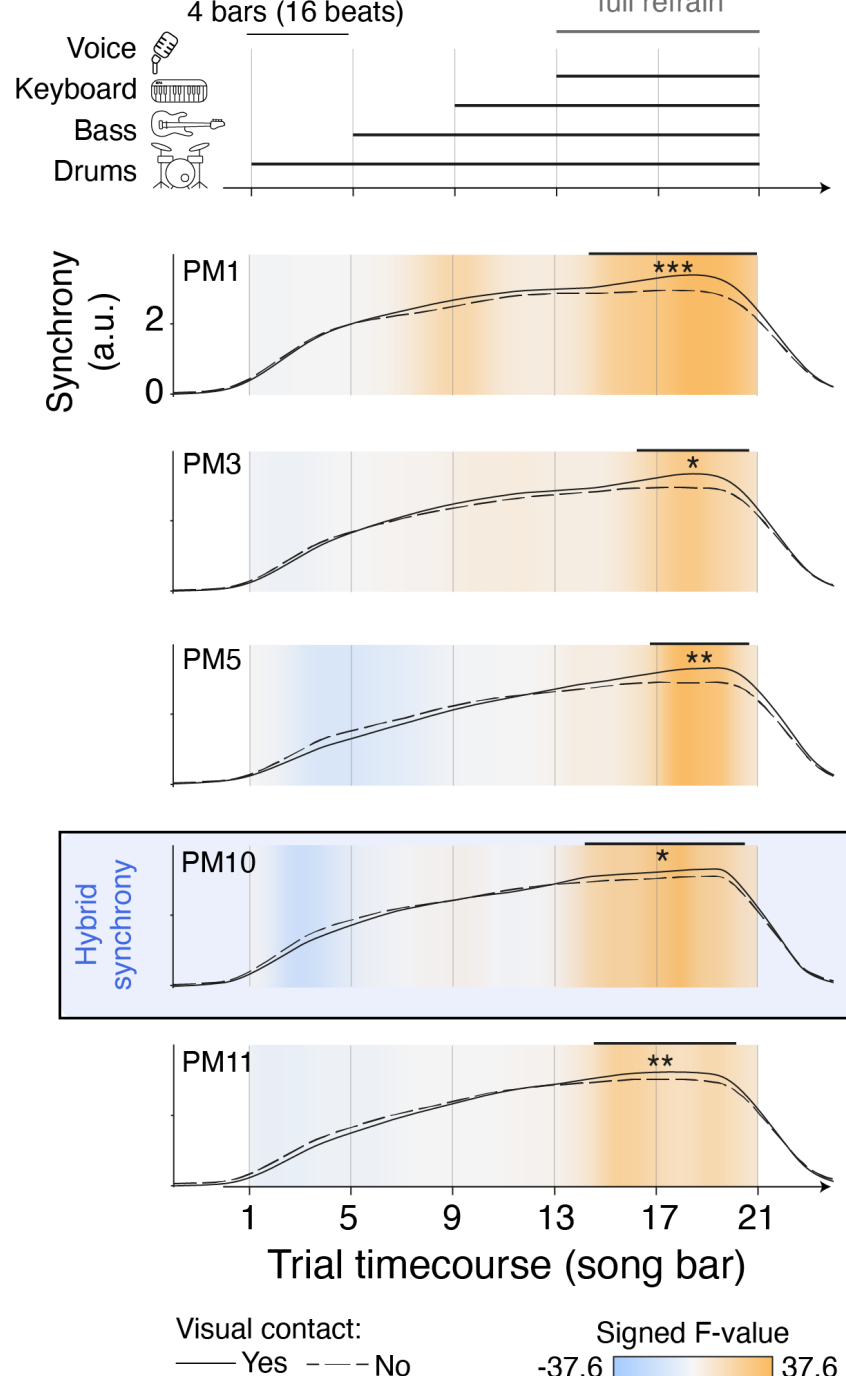
1. Simultaneous music- and partner-driven synchronies unfold **independently**

2. This independence relies on a spatial, **geometric organization**

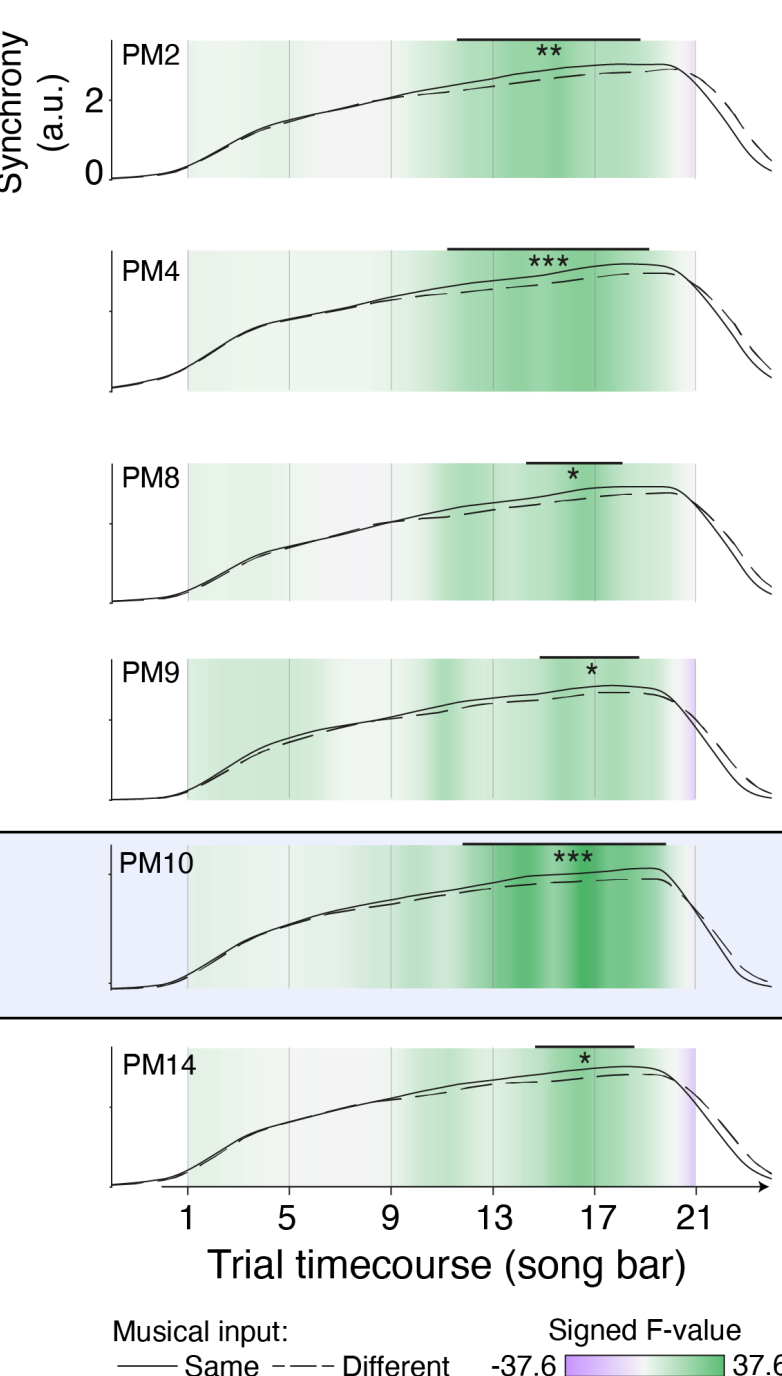
A Principal movements underlying interpersonal synchrony



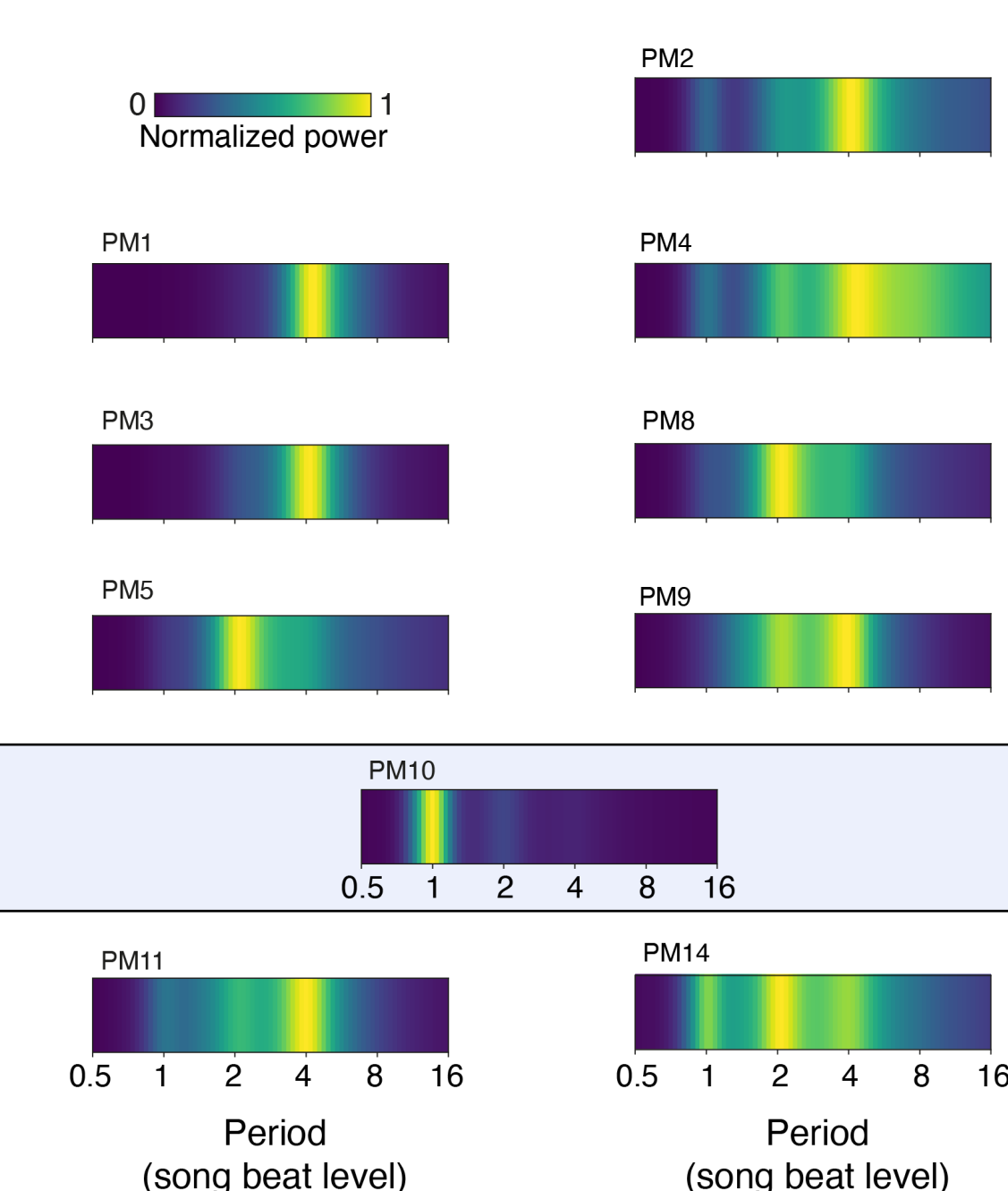
B Partner-driven synchrony



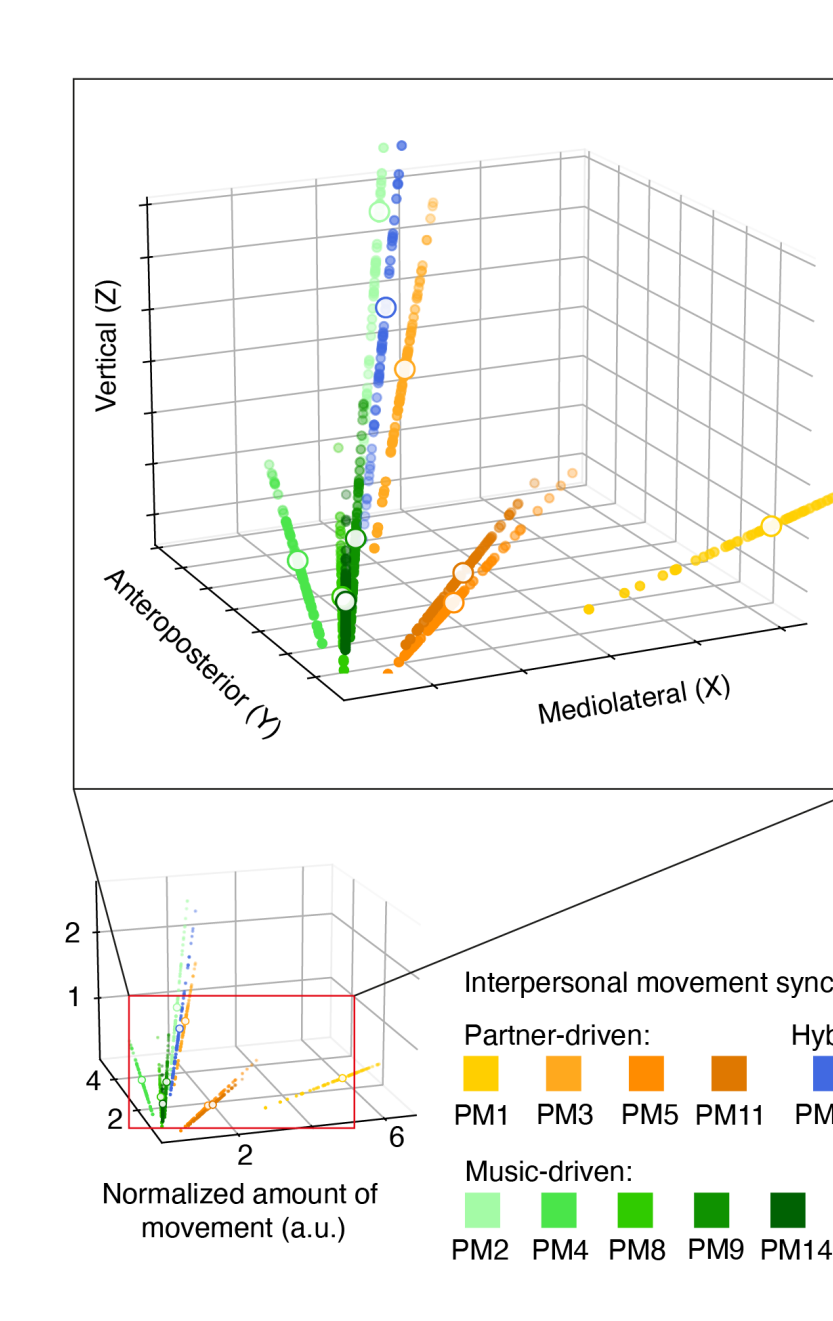
C Music-driven synchrony



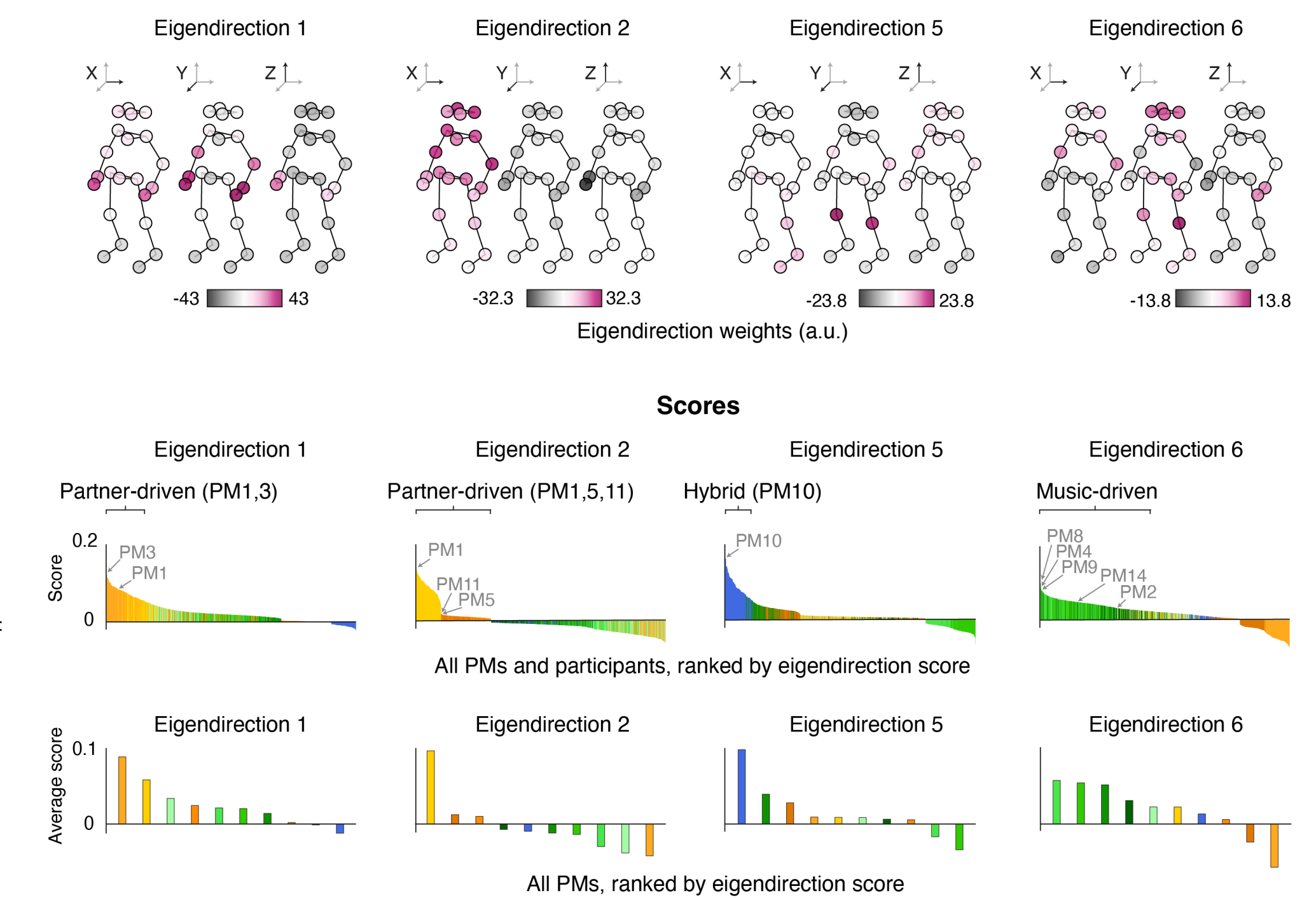
D Periodicities of synchrony



A 3D directions (averaged across body parts)



B Eigendirections



3. Bounce movements operate as a **supramodal pace setter** of synchronization

Conclusion

Data-driven method to extract motor primitives from complex and naturalistic kinematics.
Orthogonal music-driven and partner-driven synchronies.
A geometric organization of social synchrony.
Bounce as a supramodal pace setter.

Applications in dance and other ecological experimental contexts.
Not one, but multiple independent synchronies can occur simultaneously in dance.
Explains how music- and partner-driven synchronies can occur independently.
Might explain observations made in infancy and other species^{14,15}.

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