

Predicting Pair Synchrony from Individual Measures of Rhythmic Entrainment Performance

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INTRODUCTION

- Synchrony is a key component of our interpersonal lives and is linked to increased social connection and positive affect (Basso et al., 2021).
- Pair dancing offers a lens to study synchrony in coordinated behaviors.
- Individual traits that influence how synchronous a group is able to be are not yet well understood. **Do groups benefit from being composed of exclusively skilled individuals? Or does variation in skill level contribute to better synchrony?**

METHODS

Finger Tapping

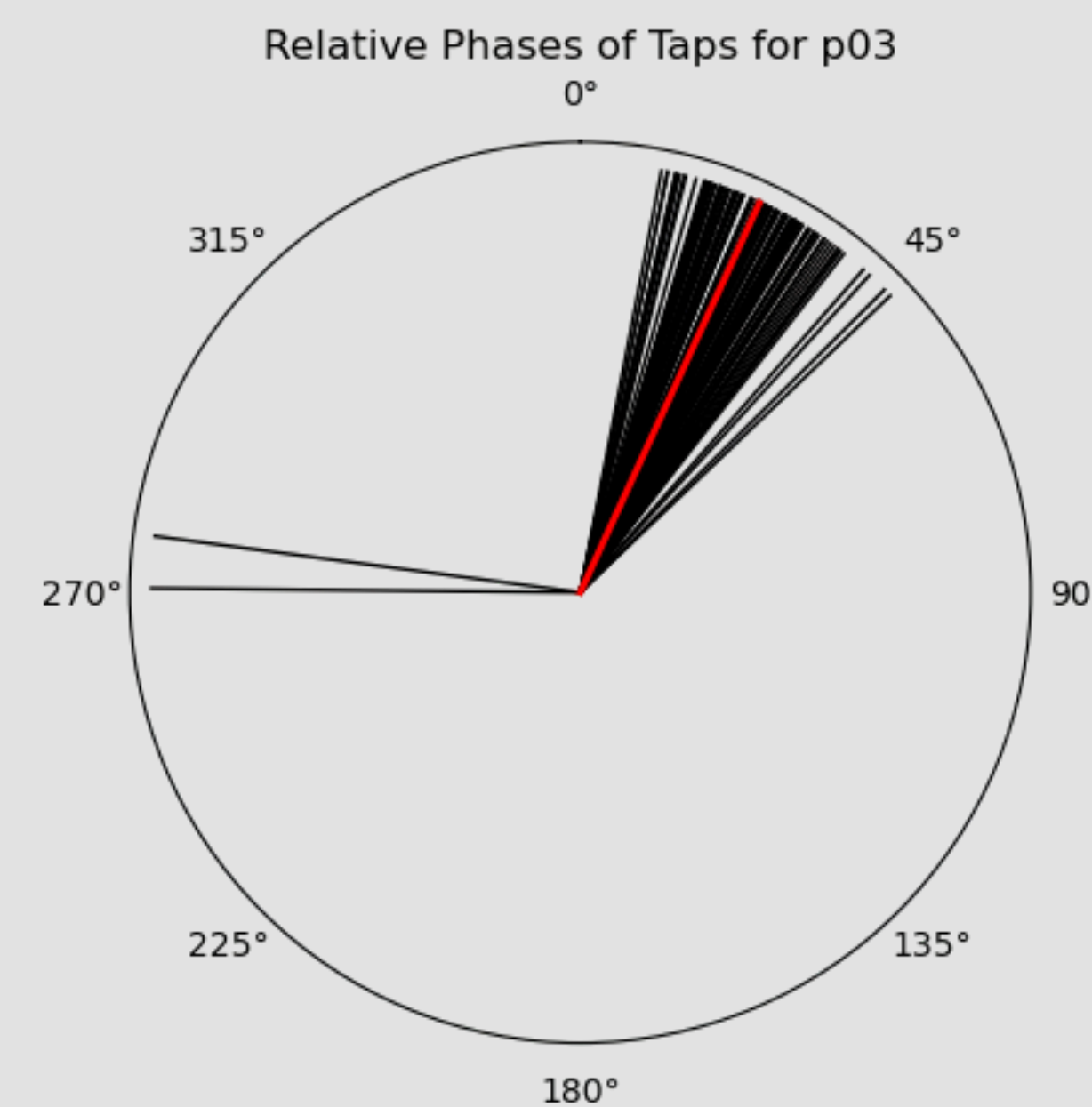
- Participants engaged in three different finger tapping tasks: external metronome entrainment at 100 bpm, at 150bpm, and a no metronome (spontaneous motor tempo) task.
 - three 30 second trials with 10 seconds of rest
 - first trial treated as training, second and third used for analysis

Dance Step Task

- Participants engaged in a simple side step dance task with various conditions relating to the presence of absence of certain cues :
 - **external all cues** - metronome present
 - **mutual all cues** - no metronome, audio cues from tambourines on the ankles of both participants
 - **no audio** - no metronome or tambourines
- Accelerometers on the ankles of the participants were used to measure motion. Pearson cross-correlations of the foot movements were used as a measure of synchrony.

FINGER TAPPING ANALYSIS

Tap times from the finger tapping data were represented using circular statistics (Fisher, 1995) based on common approaches in previous work (Whitton et Jiang, 2024; Iversen et al., 2015).



$$\text{Relative Phase (RP)} = \frac{\text{tap time} - \text{stimulus time}}{\text{interstimulus interval}}$$

Resultant Vector Length (RVL) - A measure of how concentrated the RPs are around a central tendency; a logit transform was performed on this parameter to better see the range in values. A higher logit RVL means the RPs are more concentrated, and tapping performance was thus more consistent.

Mismatched Pairs: RVL difference score in top third relative to other pairs

Good Pairs: not mismatched, pair average RVL greater than overall median

Bad Pairs: not mismatched, pair average RVL less than overall median

RESULTS

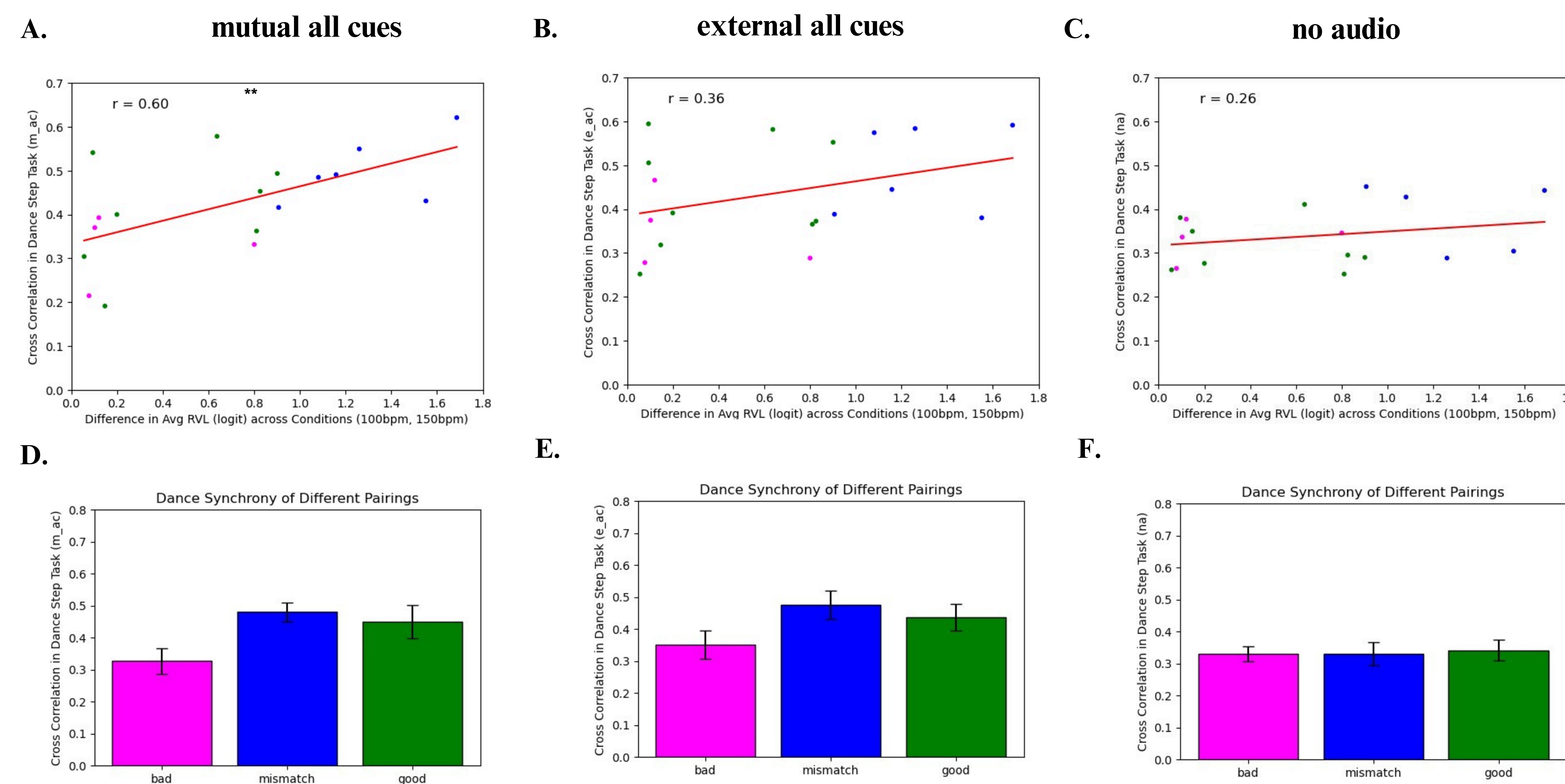


Figure 1. Greater difference scores correlated with better synchrony performance in mutual all cues condition.

(A-C) Linear Regressions examining the correlation between difference in logit RVL across pairs (averaged across bpm conditions) and dance synchrony (cross correlation of vertical foot movement) across three conditions. (D-F) average dance synchrony of pair categories. ** p-value < 0.01

Significant positive correlation between dance synchrony and the difference in consistency performance across a pair

DISCUSSION

Greater differences in consistency performance across partners



Increased pair synchrony

- **WHY?**
 - Many pair dances exhibit a leader-follower structure.
 - Differences in skill level may allow for clearer distinction of roles, assisting in synchrony.
- These findings are in line with the general result that diversity in groups benefits their collective competence when performing tasks (Wooley et al., 2015).
- **Why is the effect not present in external-all cues and no audio?**
 - Synchrony performance in no audio was significantly lower than the other dance step conditions and external all cues may be less reliant on social cues due to the metronome.
- **Looking ahead:** Assessing if leader-follower dynamics emerge in dance step task when dyads/groups have mixed skill levels.



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