

Telepathic recording: structural convergence in isolated musical improvisation

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Abstract

We report a case of structural convergence emerging in temporally isolated musical improvisation. Two musicians performed three simultaneous recording sessions without any real-time communication, each lasting approximately 20 minutes and conducted in geographically distant locations. Despite the absence of interaction, the recordings exhibit consistent alignment across multiple levels, including dynamics, rhythmic structure, coordinated pauses, and convergent pitch regions. We interpret these observations as evidence of shared internal predictive models developed through prior collaboration, rather than direct information exchange. All raw recordings are provided to support reproducibility and independent evaluation.

Key words: Musical improvisation — inter-personal synchrony — entrainment — predictive models

1 Introduction

Musical improvisation is commonly understood as a highly interactive process, relying on real-time communication, shared timing, and continuous mutual adaptation between performers. Previous studies have demonstrated that musicians engaged in joint performance exhibit various forms of interpersonal synchrony, including temporal alignment, dynamic coordination, and shared structural development [1, 2].

Such coordination is often interpreted within the broader framework of joint action and shared predictive models [3, 4].

In this work, we investigate a limiting case of such interaction: simultaneous improvisation without any real-time communication. Two performers, previously engaged in long-term collaborative practice but physically separated and without recent joint performance, recorded independent improvisations under controlled temporal conditions. The aim of the experiment is not to demonstrate anomalous phenomena, but to document and analyze the extent to which structural convergence may emerge in the absence of direct interaction.

We focus on identifying recurrent patterns across recordings, including alignment of dynamic contours, rhythmic structures, pauses, and pitch regions, and discuss these observations in the context of shared internal models and predictive processing in musical interaction.

2 Methods

Simultaneous sound recordings were performed independently in two geographically separated locations (Ghent, Belgium and Moscow, Russia). Three consecutive sessions of approximately 20 minutes each were conducted, with short breaks in between. All recording sessions were conducted on 16 February 2026. Start times were pre-defined and synchronized in Coordinated Universal Time (UTC): 17:30, 18:40, and 19:13 for the first, second, and third sessions, respectively. No real-time synchronization or post hoc temporal alignment was applied beyond matching recording onsets. The duration of each session (approximately 20 minutes) was agreed upon in advance. However, the decision to stop recording was not externally enforced and was instead left to each participant, based on their subjective sense of completion of the improvisation. Communication between participants

was limited strictly to prior agreement on recording start times and instrument selection. No real-time interaction or feedback occurred during the sessions.

Instrumentation varied across sessions: bass guitar and drums were used in the first and third sessions, while electric guitar and saxophone were used in the second session. The string instruments were recorded in Moscow using a Behringer audio interface connected via USB, with recording performed in Nuendo. Drums and saxophone, with occasional use of additional wind instruments, were recorded acoustically in Ghent using an iPhone-based recording application.

No specific tuning or tonal framework was agreed upon in advance. The string instruments were tuned independently, and their tuning was not kept constant during the recordings, resulting in gradual pitch drift over time.

All recordings were made in lossless format (48 kHz, 24-bit). Post-processing was limited to alignment of recording start points. No temporal adjustments, synchronization, or time-stretching were applied. Mixing and editing were performed in Audacity 3.0 and were restricted to combining the independently recorded tracks without further temporal or structural modification.

The analysis presented in this study is based on independently recorded audio tracks obtained without real-time interaction between the participants.

No joint musical activity (including rehearsals, performances, or recording sessions) took place between the participants from 16 April 2022 until the present recordings, ensuring the absence of recent shared practice.

2.1 Operational definition of synchrony

To systematize the analysis, we define several categories of observable synchrony between independently recorded tracks. These categories are based on perceptual criteria accessible to an external listener and do not rely on prior alignment or signal processing.

(i) *Dynamic synchrony*: coincident increases or decreases in amplitude or intensity over comparable time intervals.

(ii) *Rhythmic synchrony*: similarity in temporal density, including transitions between sparse and dense textures, as well as approximate alignment of event timing without a fixed tempo grid.

(iii) *Structural synchrony*: occurrence of analogous large-scale features such as build-ups, breakdowns, and transitions at similar time positions.

(iv) *Pause synchrony*: overlapping moments of silence or near-silence that function as structural boundaries.

(v) *Pitch-region convergence*: tendency of both performers to occupy similar spectral or pitch regions despite the absence of predefined tonality or tuning.

These categories are not mutually exclusive and may co-occur within the same temporal segments.

3 Results

The analysis of the recordings reveals multiple forms of perceptually salient synchrony across independently produced tracks, systematically falling into the categories defined above.

First, dynamic alignment is observed, with simultaneous increases and decreases in intensity occurring at comparable time intervals. These include shared build-ups and releases, suggesting convergence in large-scale temporal structuring. Dynamic synchrony is present in all sessions. Extended amplitude modulations (crescendo and diminuendo patterns) occur over comparable temporal intervals in both recordings, frequently leading to near-simultaneous transitions into lower-intensity states. These modulations are not isolated events but form coherent large-scale envelopes.

Second, rhythmic correspondence emerges despite the absence of a predefined tempo or metrical framework. In several instances, both performers transition between dense and sparse textures in a coordinated manner. Rhythmic synchrony is observed primarily at the level of temporal density, although instances of approximate beat alignment also occur intermittently. Both performers exhibit coordinated transitions between high-density event sequences and sparse textures. These transitions occur within overlapping time windows, indicating convergence in temporal organization without reliance on a shared metrical framework.

Third, coordinated pauses are present across sessions. Moments of silence or near-silence occur at overlapping time points, often functioning as structural boundaries within the improvisations. Pause synchrony constitutes one of the most unambiguous forms of alignment.

Finally, convergence in pitch organization is observed. Despite independently determined tuning that was not kept constant over time, and the absence of harmonic planning, both performers exhibit tendencies toward similar pitch regions, with occasional instances of exact pitch matches, including sustained simultaneous tones over perceptually salient durations. These observations recur within the session involving pitch-bearing instruments, indicating that the effect is not limited to isolated coincidences.

Structural synchrony is evident at longer time scales. Distinct sections characterized by gradual build-up followed by abrupt reduction in activity are present in both recordings at approximately corresponding time positions. These structures define comparable segmentation of the improvisations.

In several cases, multiple forms of synchrony co-occur. Transitions from dense, high-intensity passages to sparse textures are accompanied by simultaneous amplitude reduction, emergence of pauses, shifts in pitch region, and, in some instances, exact pitch alignment, including sustained

simultaneous tones. These combined features produce clearly segmented structures that align across recordings.

The recurrence of these features across multiple sessions suggests that the observed synchrony is systematic rather than coincidental.

The segmented recordings were assembled into an accompanying album as an alternative presentation of the material.

4 Discussion

The observed convergence does not require the assumption of direct information transfer between participants. Instead, it can be interpreted in terms of shared internal models developed through prior collaborative experience, consistent with frameworks of joint action and predictive processing [3, 4].

Musicians who have performed together extensively may develop similar expectations regarding form, tension, and temporal evolution. Such anticipatory coordination has been previously discussed in the context of ensemble performance and interpersonal synchrony [1].

The persistence of such convergence is particularly notable given the absence of recent joint practice and the physical separation of participants. This suggests that shared musical representations may remain stable over extended periods and can be reactivated without rehearsal.

We emphasize that the present study is not intended to provide statistical proof of synchrony, but rather to document a reproducible artistic phenomenon supported by openly available raw data.

Future work may include quantitative analysis of temporal alignment and spectral similarity, as well as controlled variations of experimental conditions.

Data Availability

The data underlying this study are available from the repository¹. The data consist of the original recordings without segmentation or post-processing. The segmented recordings were assembled into an accompanying album, which is available on Bandcamp².

References

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¹<https://zenodo.org/records/19385018>

²<https://derfinger.bandcamp.com/album/telepathie>