

Composer's Note

SOLO // DUET: A multisignal solo performance for piano, biodata, Max/MSP, pedalboard, and generative visual score

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Abstract

SOLO // DUET is a multisignal solo performance for piano, biodata, and generative visuals in which real-time EEG, cardiac, and respiratory signals shape the creation of ten evolving loops and modulate a pedalboard that the performer does not physically interact with. Instead, the pedals are controlled remotely via real-time biosignals through OSC and MIDI. Developed through an iterative reduction from a larger multisignal system which included guitar and eurorack system, the work explores how involuntary physiological rhythms can guide musical structure and timbre. These dynamic internal states produce fleeting contrapuntal gestures through shifting heart-rate-driven loop lengths and dynamic effects changes. The same real-time biodata drives a CPPN-based visual score experienced for the first time on stage, creating a simultaneous dialogue between sound, image, and internal states. This piece extends the methodology of *Temporal Counterpoint* into an intrapersonal setting, revealing how the body's temporal life can function as an active musical voice within a dynamic hybrid performance system.

1. Introduction

SOLO // DUET continues my broader investigation into how internal physiological processes can be utilized as compositional material. In earlier multisignal works of mine, physiological rhythm emerged through interpersonal interaction, placing multiple bodies' temporal characters in proximity with one another, feeding off of and affecting each other. This new piece turns this principle inwards, focusing on the negotiation between and dialogue within voluntary musical gestures and involuntary bodily rhythm within a single performer. This improvisational piece explores how internal temporal counterpoint derived from heart rate, respiratory motion, and neural activity might coexist with instrumental sound as an independent temporal voice, shaping musical behavior without dictating

precise direction. The performance system is designed to foreground this tension, allowing the performer to engage with a sonic environment continually reshaped by their own physiological signals.

2. Background: *Temporal Counterpoint*

Temporal Counterpoint is the compositional methodology guiding this work. It treats real-time physiological signals not as control data or representations of bodily state, but as independent temporal entities that unfold alongside instrumental and improvisational sound. In this approach, bodily processes are allowed to appear in music without translation or metaphor. These dynamic signals function as distinct voices with their own durations, micro-patterns, and temporal personalities. *SOLO // DUET* extends this methodology into an intrapersonal context. Rather than placing multiple unique physiological rhythms in dialogue, the piece explores how a single performer's internal processes can form contrapuntal relationships with their own impromptu intentional gestures. This shift from interpersonal to intrapersonal counterpoint reveals new expressive possibilities, particularly in how involuntary rhythms can destabilize or redirect musical intention and allow for new performance dynamics within a single performer.

3. From Multisignal Ensemble to Refined Solo Instrument

The piece began as a complex multisignal system involving piano, guitar, Eurorack modular synthesis, pedalboard processing, and Max/MSP. Early improvisations explored how multiple instruments and multiple physiological streams could interact, but the density of the system and the 10-minute time limit for the performance obscured the temporal qualities of the biodata itself. Instead of fitting this many performative variables into a 10-minute runtime, much of it was cut to allow for a deeper exploration of the instru-

ments and musical gear on hand. Through iterative experimentation in the studio, the work gradually moved toward this final reduction. Removing the Eurorack system, then the guitar, and finally consolidating the signal flow into a single hybrid instrument revealed a more focused relationship between bodily rhythm and musical gesture. This refinement made audible a guiding principle for the piece as it stands today: cumulative loops driven by real-time BPM produced emergent contrapuntal rhythmic behavior, with loop durations shifting subtly as heart rate changed. These biodata-dictated loop fragments led to the final form of *SOLO // DUET*, in which a single performer engages with a single multisignal pipeline that foregrounds the temporal character of the body, rather than spreading the focus across multiple instrumental voices and processes.

4. System Overview

The final performance system consists of an upright piano routed into Max/MSP, where ten independent loops are created. Each loop has a fixed beat length ranging from 16-88 beats, with each beat treated as a quarter note. Its duration is determined by the performer's real-time heart rate. A timer object governs the start and end of each recording, truncating the buffer automatically. The piano signal also passes through a pedalboard containing Old Blood Noise Endeavors, Umbrella Company, and Chase Bliss devices, all of which are controlled exclusively by biodata via MIDI control changes. Additional pedals are placed within the system for exclusively sonic reasons and are not directly tied to the biodata stream. The performer never touches the pedals during the performance, allowing this pedalboard system to exist semi-autonomously in its application to the incoming piano sounds.

Physiological signals that are used in this include EEG, RMSSD, LF/HF, pNN50, BPM, breathing rate per minute, and individual breath events. The EEG signals are generated by the VIE, Inc "Chill" headset, while the remaining physiological data is generated through custom built devices by engineer George Chernyshov. These are transmitted via OSC into Max/MSP, mapped to musical and timbral parameters, and used to shape both loop formation and pedal modulation. All pedals are controlled via MIDI CC messages, which are translated within Max/MSP. The system is designed to preserve the temporal qualities of the incoming biodata while allowing the performer to respond musically to its unfolding behavior, giving a certain degree of flexibility in their application while retaining their inherently human character.

5. Loop Formation and Temporal Behavior

Each of the ten loops in *SOLO // DUET* is defined by a unique number of beats. As the performer's heart rate fluctuates, the duration of each loop shifts accordingly. These shifting durations create a continually evolving tem-

poral field in which loops drift in and out of phase, producing ephemeral contrapuntal gestures that arise from the body's internal rhythms rather than from deliberate compositional design. The performer plays into this dynamic structure, performing intentional passages in an improvisational manner which become interwoven with involuntary temporal variation. The result is a texture shaped by the interplay between stable harmonic content and unstable temporal behavior, revealing the body's rhythmic personality through the accumulation of disjointed yet directly dictated loops.

6. Pedalboard Modulation

The pedalboard functions as a second layer of biodata-driven transformation. Devices from Old Blood Noise Endeavors, Umbrella Company, and Chase Bliss are modulated through MIDI control changes generated in Max/MSP. Parameters such as delay time, reverb depth, modulation rate, filtering, granular behavior, and textural degradation respond continuously to physiological signals. In the first half of the piece, pedal modulation is subtle, allowing loop formation to dominate the sonic environment. As the performance progresses, biodata presents increasing influence over the pedalboard, creating more pronounced timbral shifts and spectral movement. Because the performer never touches the pedals, all timbral change emerges from internal physiological variation, reinforcing the theme of involuntary gesture shaping musical form. While the compositional planning of this piece exists inherently in the planning and implementation stage, the exact results of these modulations is unknown until the moment they occur.

7. Visual Score

A generative visual score, created in TouchDesigner and utilizing a CPPN network, uses the same biodata as the audio system. It functions both as an externalization of internal states and as a real-time guide for the performer. The visual artist has never heard the piece, and the performer has never seen the visuals prior to performance. This condition creates a simultaneous, unrehearsed interpretation of shared biodata, with sound and image unfolding in parallel without predetermined coordination. The visual score provides rhythmic, textural, and density cues derived from physiological signals, allowing the performer to navigate the evolving structure through a visual representation of their own internal processes.

8. Performance Structure

The piece is structured as a single continuous form with a roughly simple binary form (A-A'). In the first half, the performer generates ten loops whose durations are determined by real-time BPM. These loops accumulate into

a shifting contrapuntal texture shaped by physiological variation. The performance of these loops is intentionally minimal to allow for room to exist between phrases. Due to the acoustic piano being the primary instrument, a mixture of physical sounds from the body of the piano and minimal played notes are utilized throughout. In the second half, the performer improvises in a more upfront manner over the accumulated loops while biodata exerts increasing influence over the pedalboard. The transition from loop formation to improvisation marks a shift from internal-state-led temporal construction to a more active negotiation between voluntary gesture and involuntary modulation. Throughout the piece, the visual score provides a parallel expressive layer that reflects the same physiological signals driving the sound. The performance ends on a collectively thick density in which the border between live performance, looped structure, and effects modulation are indistinguishable.

9. Reflections

SOLO//DUET reveals how involuntary physiological processes can shape musical behavior in ways that are both subtle and structurally significant. The refined system makes audible the temporal personality of the body, allowing internal rhythms to guide form, timbre, and gesture. The simultaneous visual interpretation deepens this sense of internal presence, creating a performance environment in which sound and image respond to the same physiological source. The piece raises questions about the perceptibility of physiological rhythm, the relationship between bodily time and musical intention, and the nature of internal groove in solo performance contexts. These questions continue to guide the development of *Temporal Counterpoint* as an ongoing compositional practice.

10. Conclusion

SOLO//DUET presents a flexible and ever-changing model for intrapersonal *Temporal Counterpoint* in which the performer engages in dialogue with their own internal temporal life. Through BPM-driven loop formation, biodata-controlled pedal modulation, and a generative visual score, the piece demonstrates how physiological rhythm can function as an active musical voice within a dynamic hybrid instrument. The work contributes to ongoing research into embodied temporality, multisignal performance, and the role of involuntary processes in shaping musical form. In the coming months, subsequent performance of this work as well as the expansion of larger instrumentation will further move along this investigation into temporal compositional materials.

11. Author's Profile

Danny HYNDS

Danny Hynds is a Yokohama-based composer and sound artist whose work explores listening, duration, and embodied temporality through electronic performance, installation, and physiological interaction. His practice investigates how internal bodily rhythms and states of attention may coexist alongside musical sound — an approach he describes as *Temporal Counterpoint*. He completed his PhD at the Graduate School of Media Design, Keio University in 2024, and currently serves as Project Assistant Professor in the X-Music Lab at Keio University Shonan Fujisawa Campus. He also works as a Creative Technologist with VIE, Inc., developing performances and installations exploring sound, perception, and embodied interaction. His recent works include *Endogenous Music*, *Biodata Improvisations*, and *Collective Somatic Counterpoint*.

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Shinya Fujii is a drummer and an Associate Professor in the Faculty of Environment and Information Studies at Keio University. He directs the Research Center for Music Science at the Keio University Global Research Institute and is the Principal Investigator of the x-Music Laboratory and the NeuroMusic Laboratory at Keio University SFC. His research interests lie in the neuroscience of music, particularly the neural origin of rhythm and beat perception and production.

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