

Introduction

Recent research on synchrony has uncovered correlations of physiological variables across musical partners [1, 2]. There is furthermore some evidence that physiological correlations can predict subjective feelings of ‘connectedness’ [3].

However, causal links remain vague. While physiological synchrony may be a mechanism that enables musical coordination or engenders appreciation, the fact that existing studies ask musicians to perform composed music suggests other possible explanations, such as synchrony arising as interpretations of a shared visual input, and/or entrainment to a particular musical feature (e.g., rhythm) [4].

European ‘free improvised’ music is a tradition that prioritizes feelings of connection between performers, while being entirely improvised with minimal pre-agreement over musical parameters (rhythm, tonality, etc.) [5].

In this study, we measure skin conductance and heart rate of duos during a session of free improvisation, before asking them to rate their subjective feelings of connectedness and aesthetic value. The subsequent results allow us to compare physiological and psychological synchrony side-by-side with spontaneous musical features.

Though we would still be unable to determine whether physiological synchrony is truly a mechanism that enables musical coordination or engenders appreciation, we are able to study whether a shared visual input and a ‘regular’ rhythm are necessary for physiological synchrony to arise.

Aims

We aim to study **1. physiological synchrony in the skin conductance and heart rate of free-improvising duos** as well as **2. synchrony in their ratings of aesthetic value and connectedness** while viewing their own performance. We ask **3. whether ratings of aesthetic value and connectedness relate to physiological synchrony**.

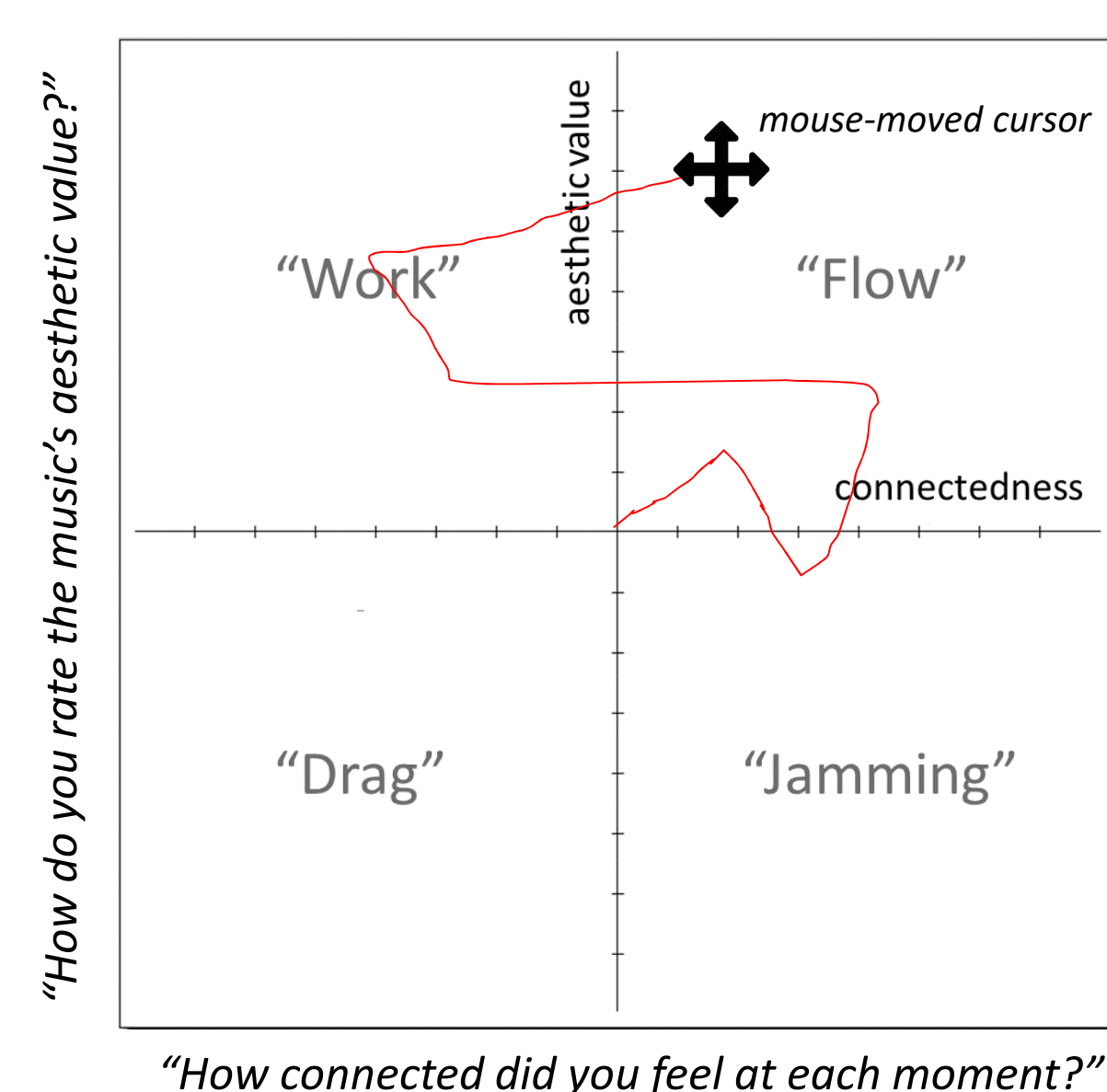
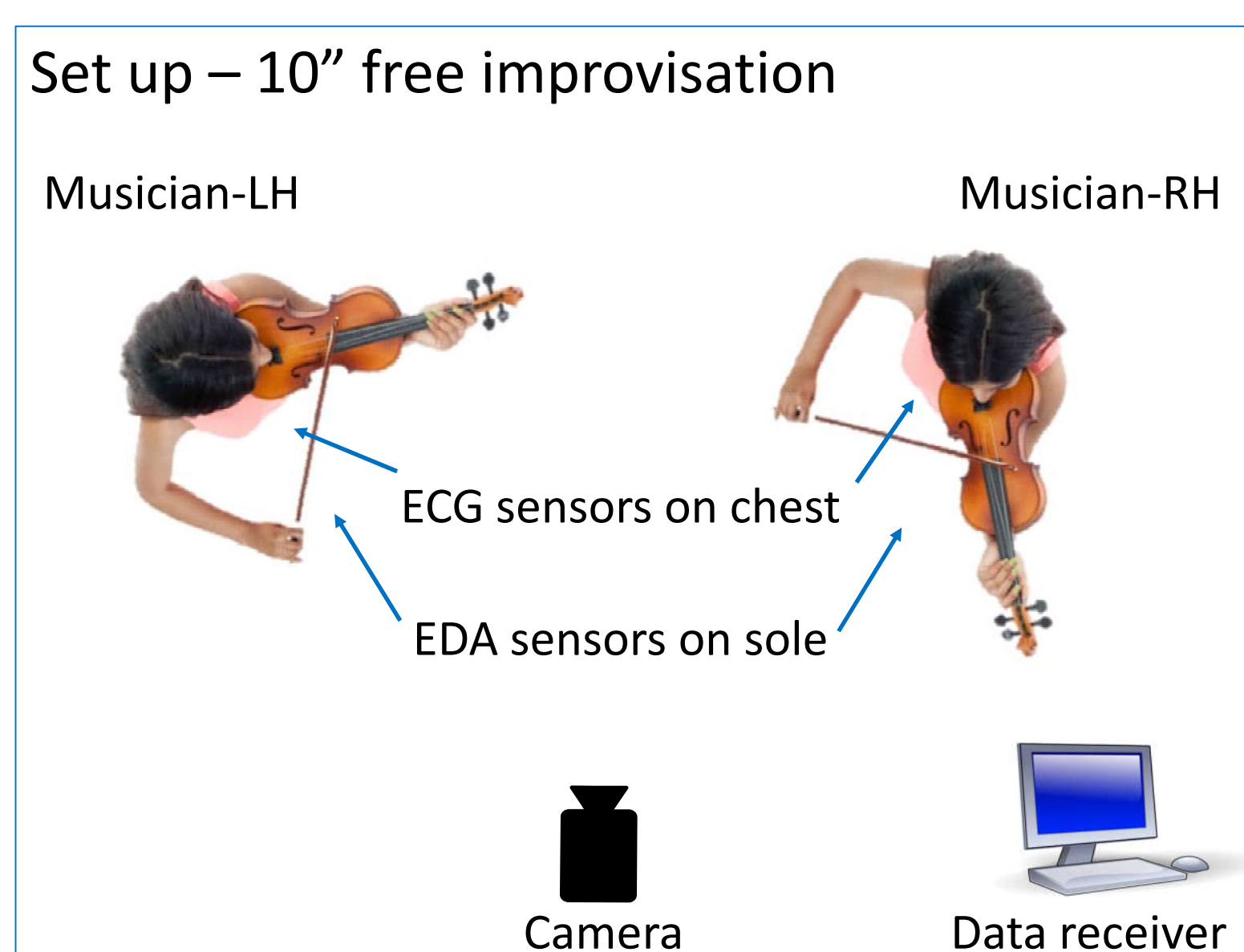
Methods

Participants:

- 15 experienced improvising musicians
 - 7 female, 6 male, 2 non-binary
 - $M_{Age} = 46.8$ years, $SD_{Age} = 11.3$ years
 - $M_{Experience\ Improvising} = 24.0$ years, $SD_{Experience\ Improvising} = 14.1$ years
- 13 dyads in varied combinations, no two musicians played together in more than one dyad
- 8 participants recruited at an improvisation workshop in Berlin, performed as volunteers in a laboratory space at the event
- 7 recruited from a Vienna-based professional improvisors collective, performed in a university laboratory, compensated with a small honorarium.

Procedure:

- Familiarization with physiological data collection procedure
- Free improvisation while wearing electrocardiogram (ECG) and electrodermal activity (EDA) sensors
- Viewing of own performance and concurrent rating of aesthetic value and connectedness



Data processing:

1. Is there synchrony in physiology?

- Raw EDA data → baselined EDA data → cross-correlated EDA data ~ “EDA synchrony”
- Raw RR data → interpolated BPM data → cross-correlated BPM data ~ “BPM synchrony”

2. Is there synchrony in psychological ratings?

- Raw connectedness data → z-scored connectedness data → smoothed connectedness data → cross-correlated connectedness data ~ “connectedness ratings synchrony”
- Raw aesthetic value data → z-scored aesthetic value data → smoothed aesthetic value data → cross-correlated aesthetic value data ~ “aesthetic value ratings synchrony”

3. Do free-improvising musicians’ perceptions of connectedness and aesthetic value relate to physiological synchrony?

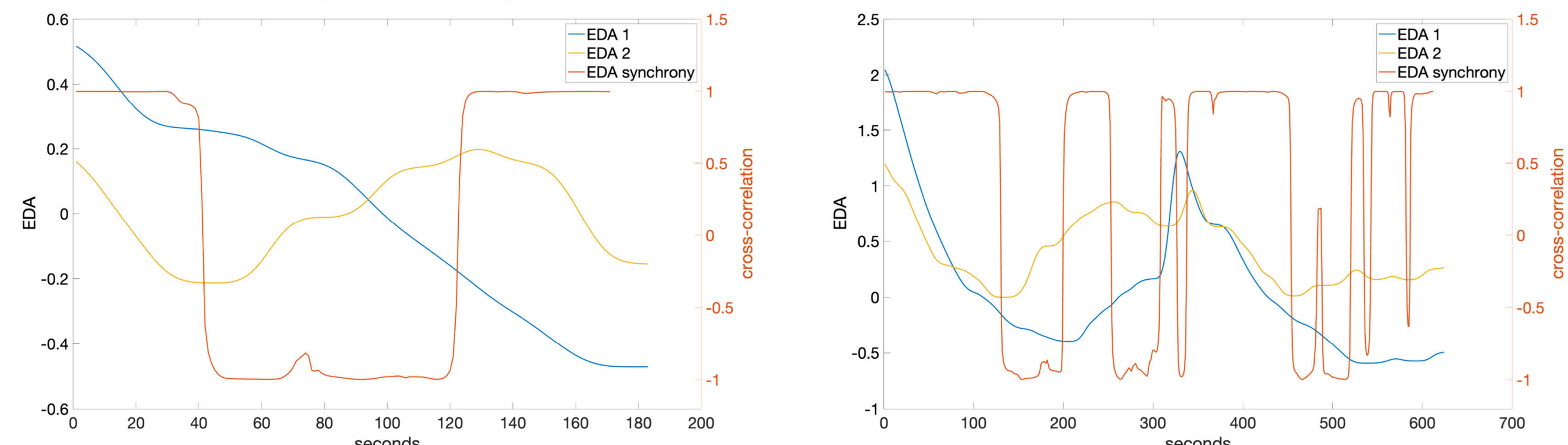
- Cross-correlation of physiological synchrony and smoothed psychological ratings

Results

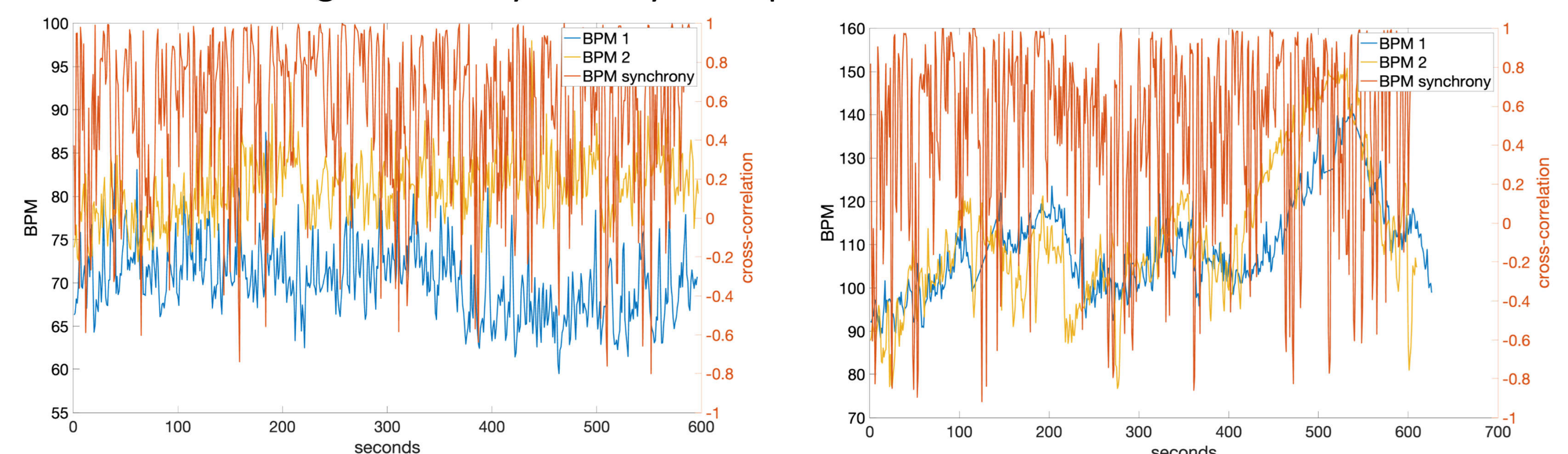
We found examples for lower and higher synchrony across our sample. Lower synchrony examples are shown in the left column and higher synchrony examples are shown in the right column of figures below.

1. Is there synchrony in physiology?

• Lower and higher EDA synchrony examples

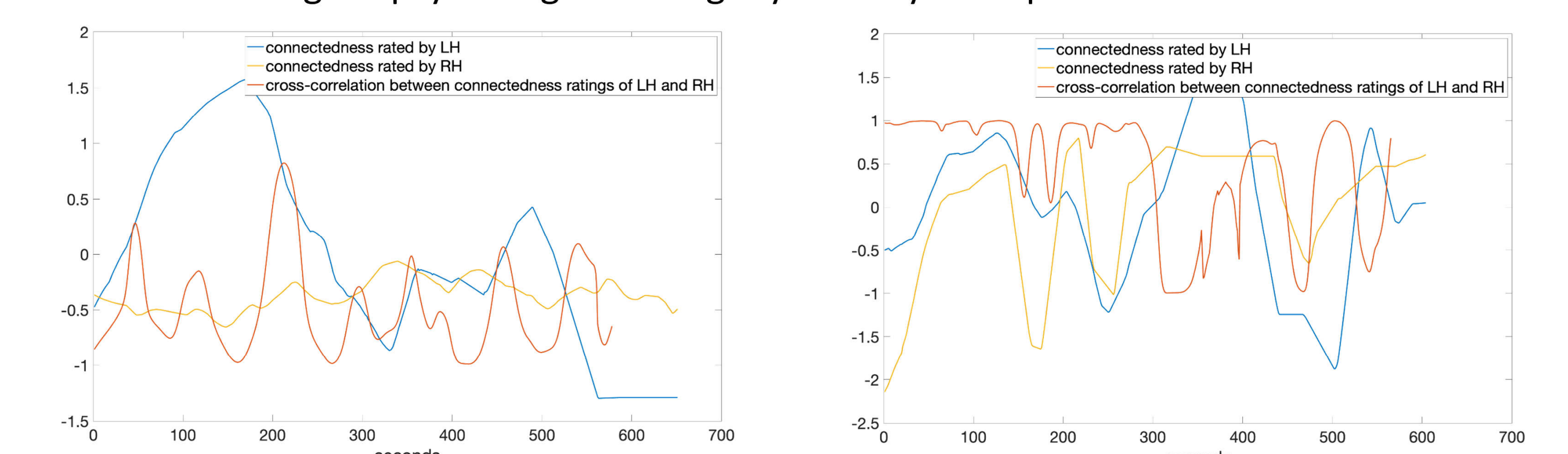


• Lower and higher BPM synchrony examples

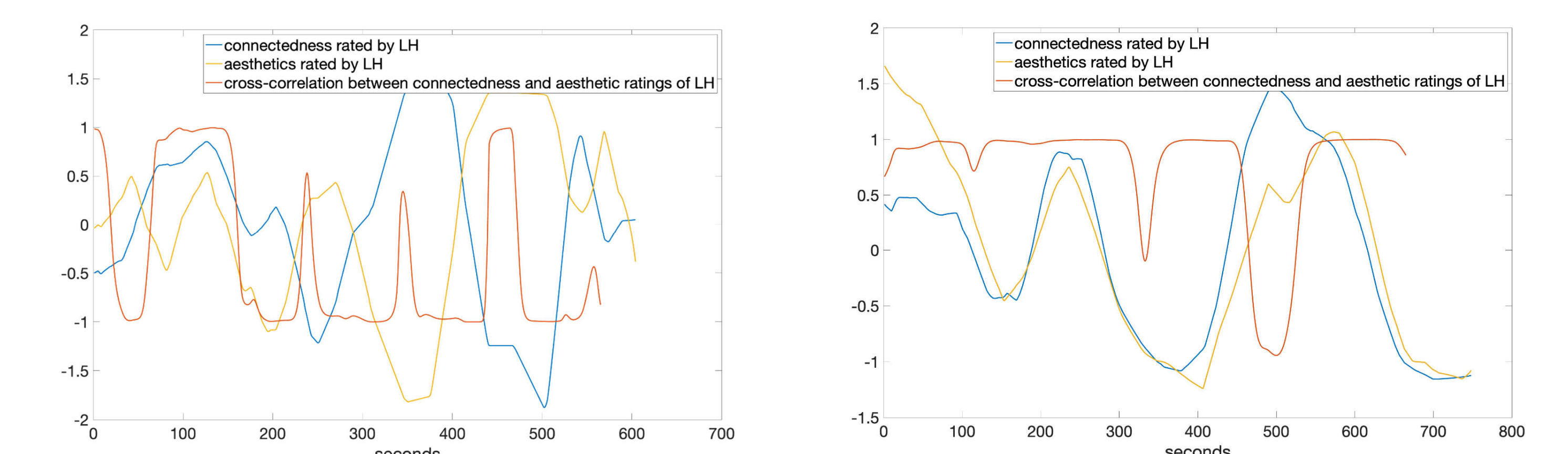


2. Is their synchrony in psychological ratings?

• Lower and higher psychological ratings synchrony examples

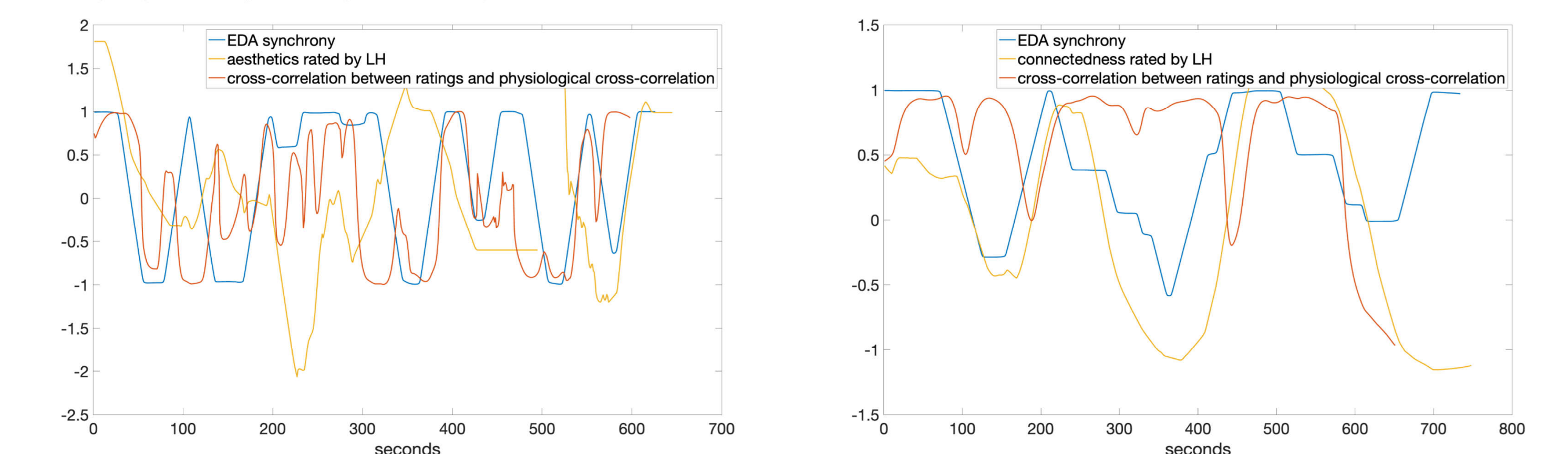


• Examples of low and high correspondence between aesthetic value and connectedness



3. Do free-improvising musicians’ perceptions of connectedness and aesthetic value relate to physiological synchrony?

• Examples of lower and higher cross-correlation between psychological ratings and physiological synchrony



Discussion

Results indicate that only some dyads show physiological and/or psychological synchrony. In turn, only some of the musicians’ perceptions of connectedness and/or aesthetic value relate to physiological synchrony with their improvising partner.

A major difficulty in conducting these studies is the choice of parameters during data processing, as different types of data have different types of temporal resolution. In the next step of our project, we will relate our data to acoustic properties of the improvised music. Here, we are specifically interested in whether rhythmic regularity relates to physiological and/or psychological synchrony [4]. We will further explore whether duo characteristics, e.g., their experience playing together influences synchrony.

References

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