Joint Action and Music Research

Social Cognition @ BME

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Outline

1. Joint Action - acting together

Investigating **real-time** social interactions

2. Music - unique human cultures

How does studying music help to understand social interactions?

3. My research: teaching expertise

How has social learning contributed to cultural transmission?

1. Joint Action

acting together

What is Joint Action (JA)?

- A variety of **real-time** communication and coordination in our daily life.
- Is studying individuals enough to understand social interactions?

Working definitions

- ...any form of social interaction whereby **two or more individuals coordinate their actions in space and time** to bring about a change in the environment (Sebanz et al., 2006)
- SCA (Shared Cooperative Activity) involves mutual responsiveness—of intention and in action—in the service of appropriately stable, interlocking, reflexive, and **mutually noncoerced intentions in favor of the joint activity** (Bratman, 1992)
- ...there is in fact a range of **different levels of 'joint'** behaviour (Milward & Carpenter, 2018)

Comparison between individual and joint performances

- Do people behave differently when they are doing the same task with or without a partner?
- One of the well-established psychological effects: **Simon effect**

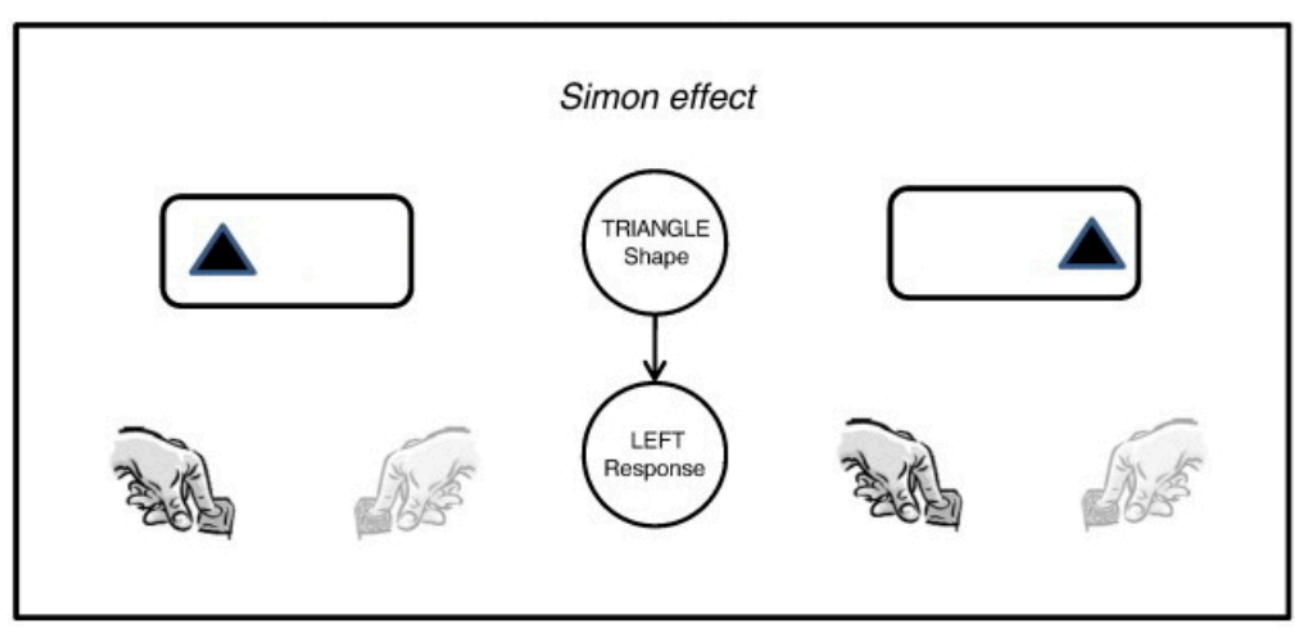


figure: http://sylvankornblum.com/the-simon-task/, experiment: https://www.psytoolkit.org/experiment-library/simon.html

Social Simon effect?

- How can we make the Simon task so that two people (not one) can perform together?

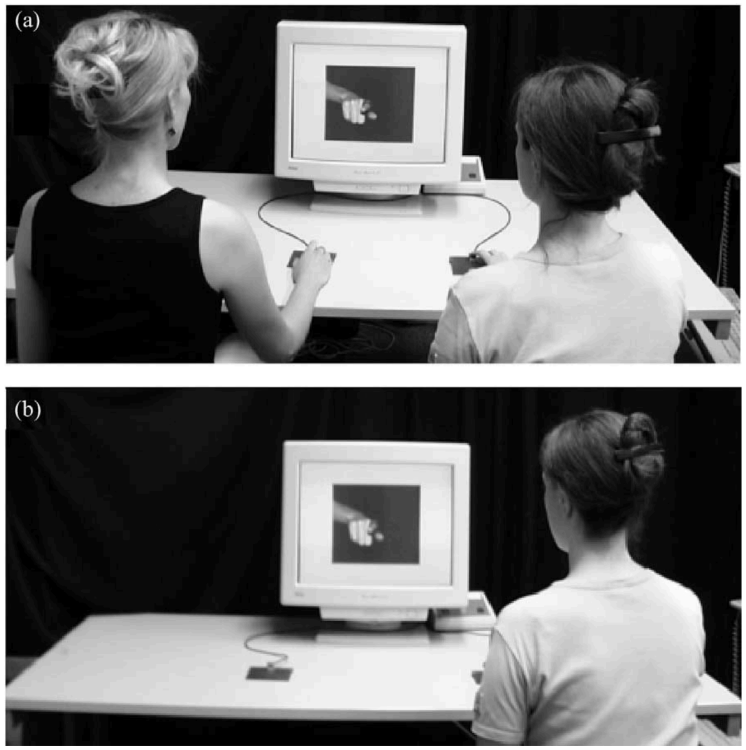


Fig. 1 Setting in the joint go-nogo task (a), and in the individual go-nogo task (b)

- What you have to do is only to respond to one stimulus (e.g., if a triangle, press the right button)
  - essentially this turns to be a go/no-go task
- a) Joint condition: you perform the task **with** your partner
- b) Individual condition: you perform the task **without** your partner

Representing others' actions: just like one's own? Sebanz et al., 2003

People are affected by their partner

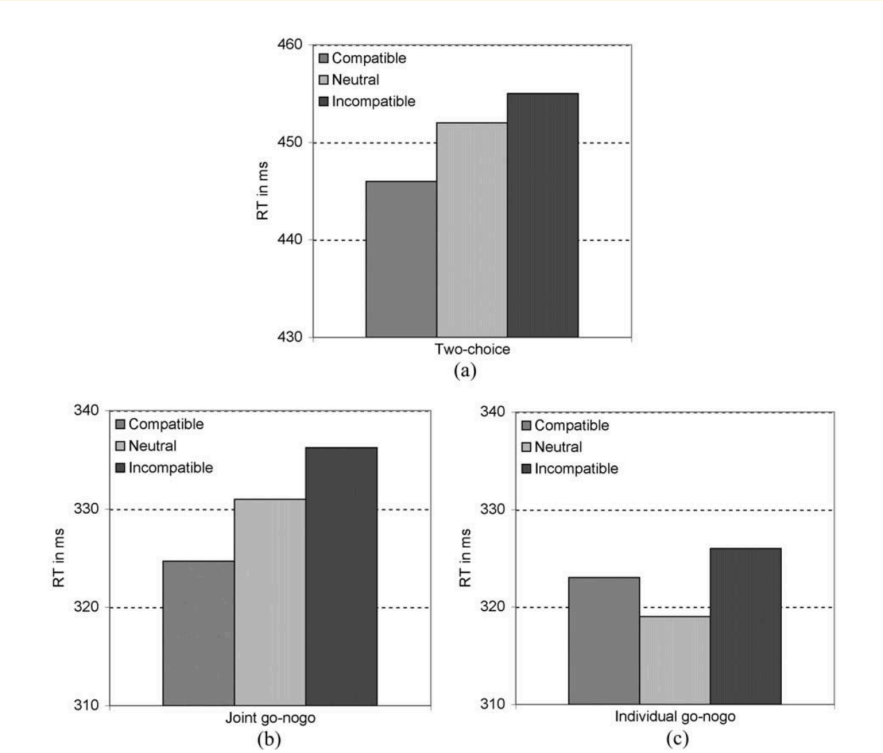


Fig. 2. Mean RTs on compatible, neutral, and incompatible trials in the two-choice condition (a), the joint go-nogo condition (b), and the individual go-nogo condition (c). Mean RTs in the two-choice condition were 446 ms (SD = 40 ms), 452 ms (SD = 40 ms), and 455 ms (SD = 43 ms), in the joint go-nogo condition 325 ms (SD = 32 ms), 331 ms (SD = 32 ms), and 336 ms (SD = 32 ms), and in the individual go-nogo condition 323 ms (SD = 32 ms), 319 ms (SD = 30 ms), and 326 ms (SD = 28 ms).

- Essentially one individual **always** needed to respond to one stimulus regardless of the conditions.
- Compatibility Effect (CE) = Difference between Compatible and Incompatible conditions
- **CE in Joint condition > CE in Individual condition**

Representing others' actions: just like one's own? Sebanz et al., 2003

Other findings

- Similar findings to Sebanz et al. (2003) using other compatibility tasks (e.g., Atmaca et al., 2011)
- Allocating attention differently when coactors are present (e.g., Böckler et al., 2012; Eskenazi et al., 2012)
- Neurocognitive evidence (e.g., Bekkering et al., 2009)
  - action monitoring
  - action prediction
  - action selection

Why do coactors matter?

- Automatic self-other integration?
- Performing with computers? Beliefs are enough?
- Representing coactors' tasks, or coactors or something else?

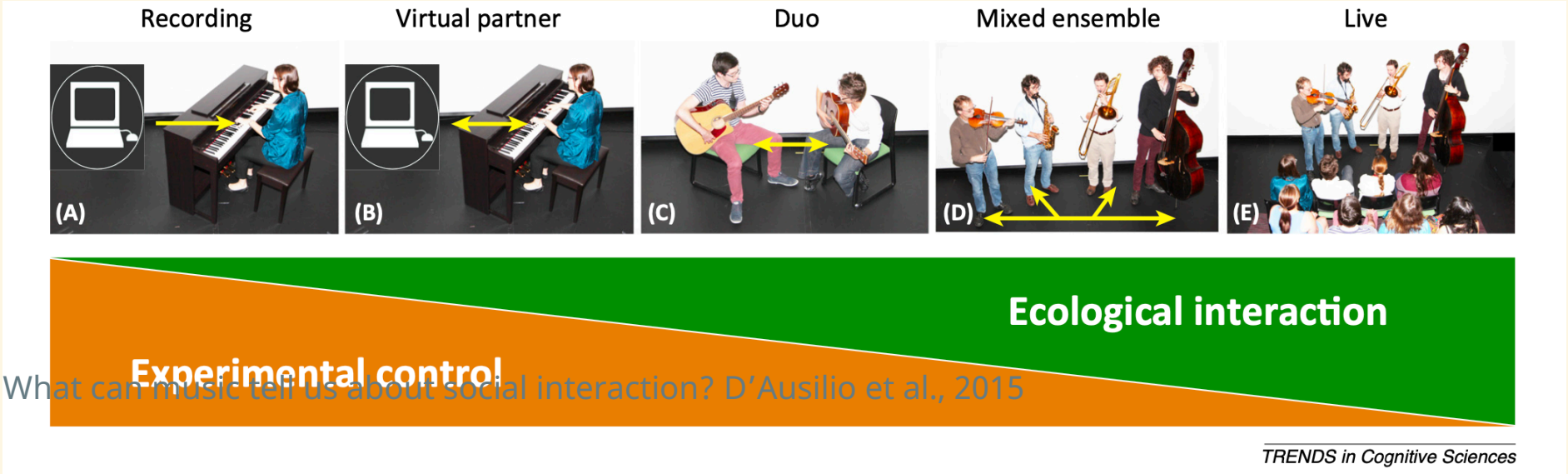
2. Music

unique human cultures

Music as a tool to investigate JA

Why is music useful to study JA?

- A **universal** way of non-verbal communication/coordination
- Multi-level interactivity: from individuals to groups
- Parent-infant synchrony to professional jazz improvisation
- Trade-off between experimental control and ecological validity



What can music tell us about social interaction? D'Ausilio et al., 2015

>> sidenote: is music universal across cultures?

- BBS (Behaviour and Brain Sciences) / one of the forthcoming topics is **the origin of music**

Music as a coevolved system for social bonding

Published online by Cambridge University Press: **20 August 2020**

Patrick E. Savage, Psyche Loui, Bronwyn Tarr, Adena Schachner, Luke Glowacki, Steven Mithen and W. Tecumseh Fitch

Show author details

Origins of music in credible signaling

Published online by Cambridge University Press: **26 August 2020**

Samuel A. Mehr, Max M. Krasnow, Gregory A. Bryant and Edward H. Hagen

Show author details

JA research in music

- **Temporal-auditory** coordination (**real-time** interactions)
  - relatively easier to measure (quantify) compared to sensorimotor coordination (e.g., body sway)
  - written information-flow between performers; namely sheet music!

Various topics

- Parent-infant synchrony
- Prosocial behaviour
- Real-time interpersonal coordination
- Leader-follower relationship
- Interpersonal brain synchrony

What can music tell us about social interaction? D'Ausilio et al., 2015

3. My research

teaching expertise

What am I doing?

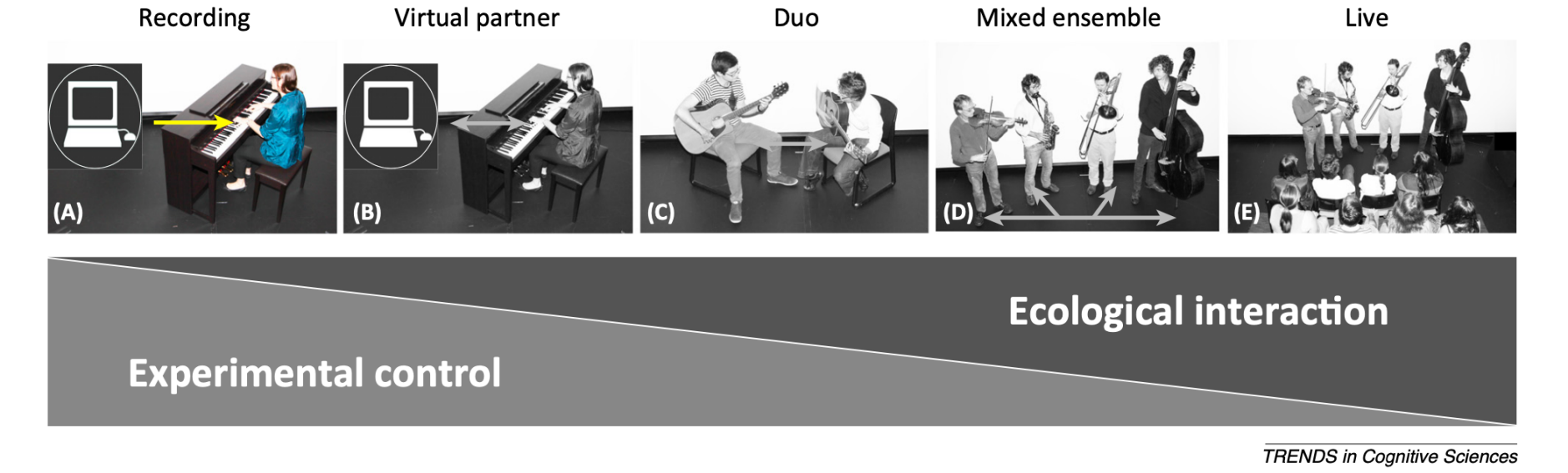
- Many forms of JAs - I am interested in **teaching behaviour**.
  - Knowledge between a teacher and a student is **not equal**.
- Teaching has been supposed to be unique to human beings (Tomasello, 2016; Whiten, 2017)
  - Ostensive signals (e.g., eye contact, pointing, infant-directed speech) alter what novices learn (e.g., Csibra & Gergely, 2009)

Do experts modulate their behaviour for teaching?

- Infant-directed speech and action (e.g., Wang et al., 2018; Brand et al., 2002)
- Slow and exaggerated performance
  - to attract novices
  - to show relevance to novices
  - any performance which is deviated from the optimal one is fine?

Teaching musical expressive techniques

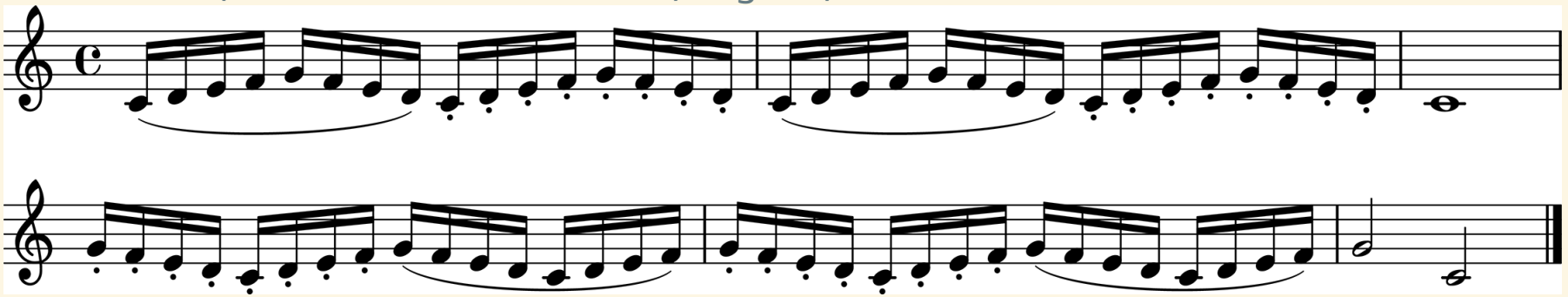
- How about teaching expertise where subtle modulation is crucial to acquiring skills?



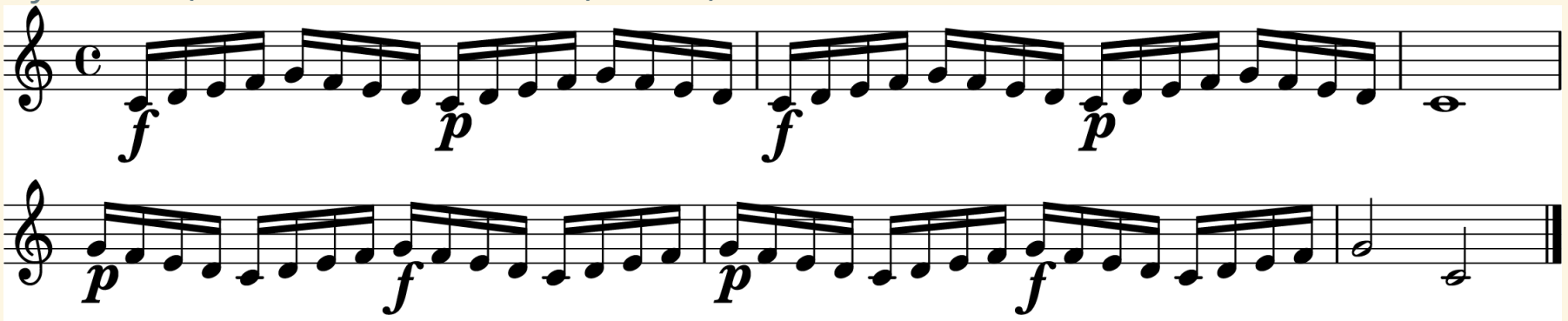
- Currently doing (A) - very controlled (non-interactive) experiments

Teaching musical expressive techniques

- Articulation (the smoothness of sound) Legato / Staccato



- Dynamics (the loudness of sound) Forte / Piano



Experiment

- Recruited expert pianists (more than 10 years experience in piano)
- Asked to perform one piece with either articulation and dynamics in the following conditions

Teaching condition

Perform the piece with a designated expressive technique to teach it to students (**as a teacher**).

Performing condition

Perform the piece with a designated expressive technique to perform your best to an audience (**as a performer**)

Experiment

Design (within-subjects)

- Condition: Teaching vs Performing
- Technique: Articulation vs Dynamics

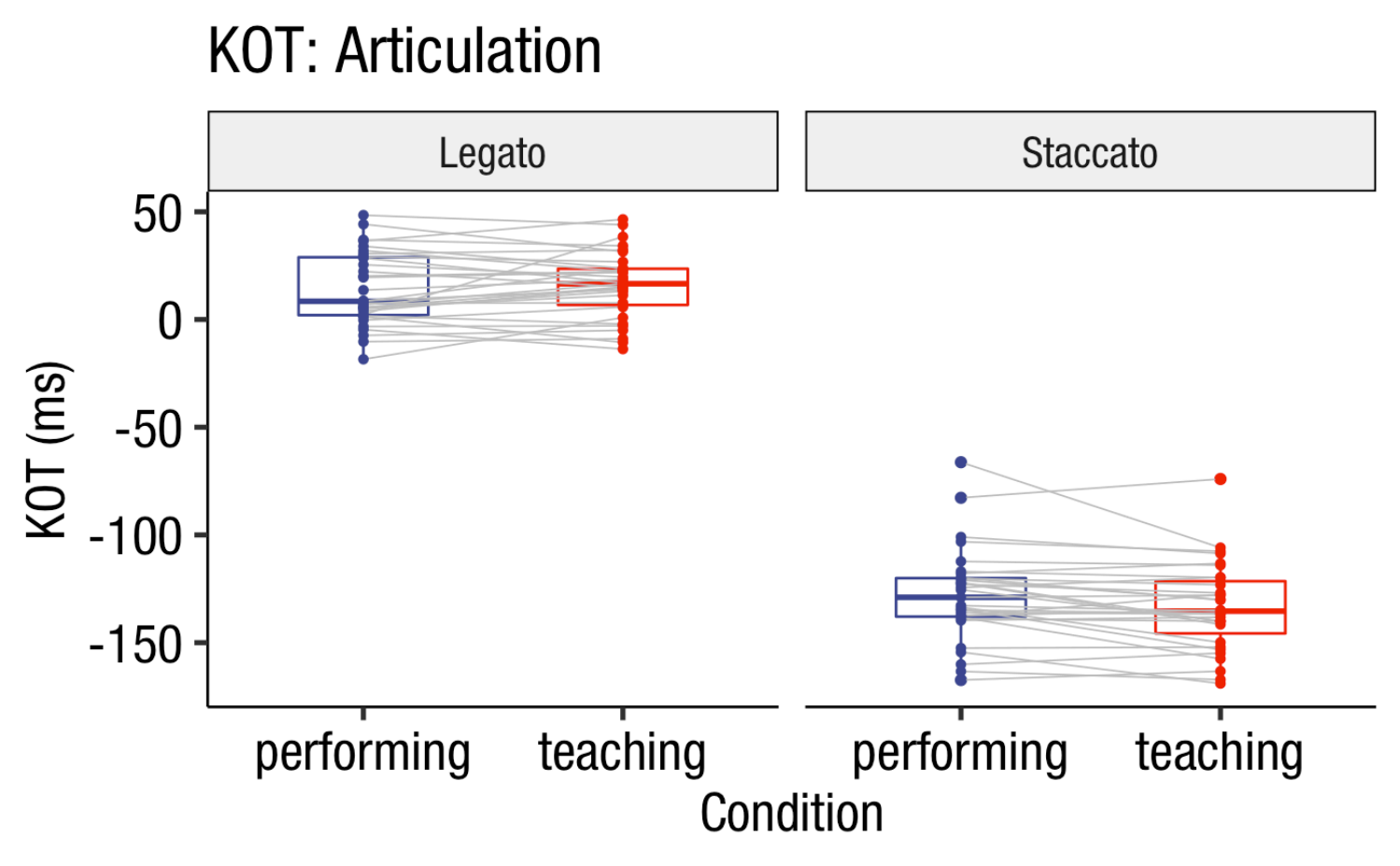
Hypotheses

- Experts will highlight the most relevant feature of the expressive technique they are going to teach.
  - exaggerate articulation (= **longer** legato and **shorter** staccato) when teaching
  - exaggerate dynamics (= **louder** forte and **softer** piano) when teaching

How to quantify musical performance?

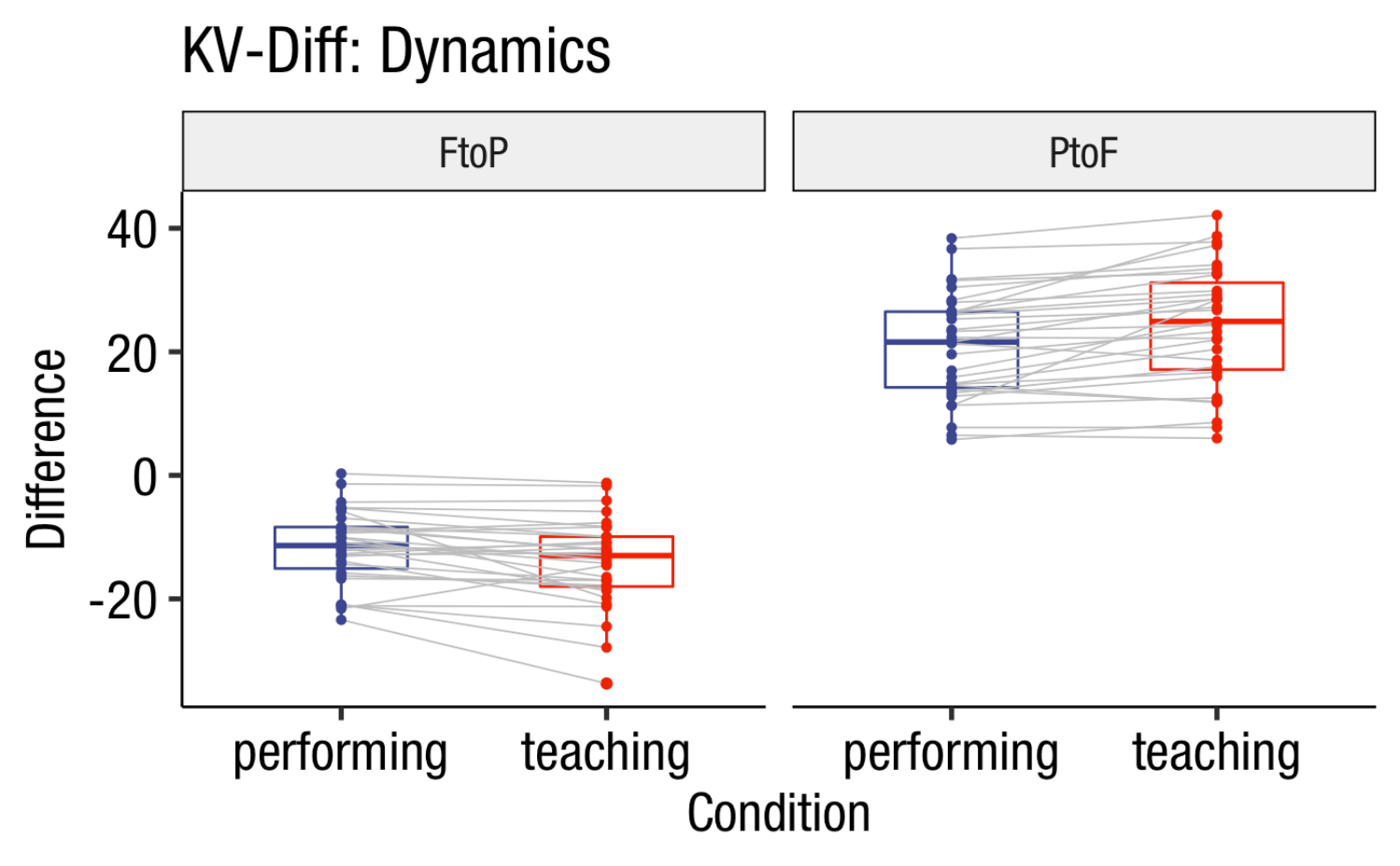
- From discrete to continuous measures
  - finger-tapping/drumming, keyboards: discrete
  - string, wind instruments etc.: continuous (more complex)
- MIDI data
  - **M**usical **I**nstrument **D**igital **I**nterface
  - timestamp of each onset / offset
  - pitch
  - velocity (loudness)
  - similar to reaction times (RTs) in Psychological Research

Results (teaching articulation)



- Participants highlighted staccato (= produced **shorter** staccato for teaching)

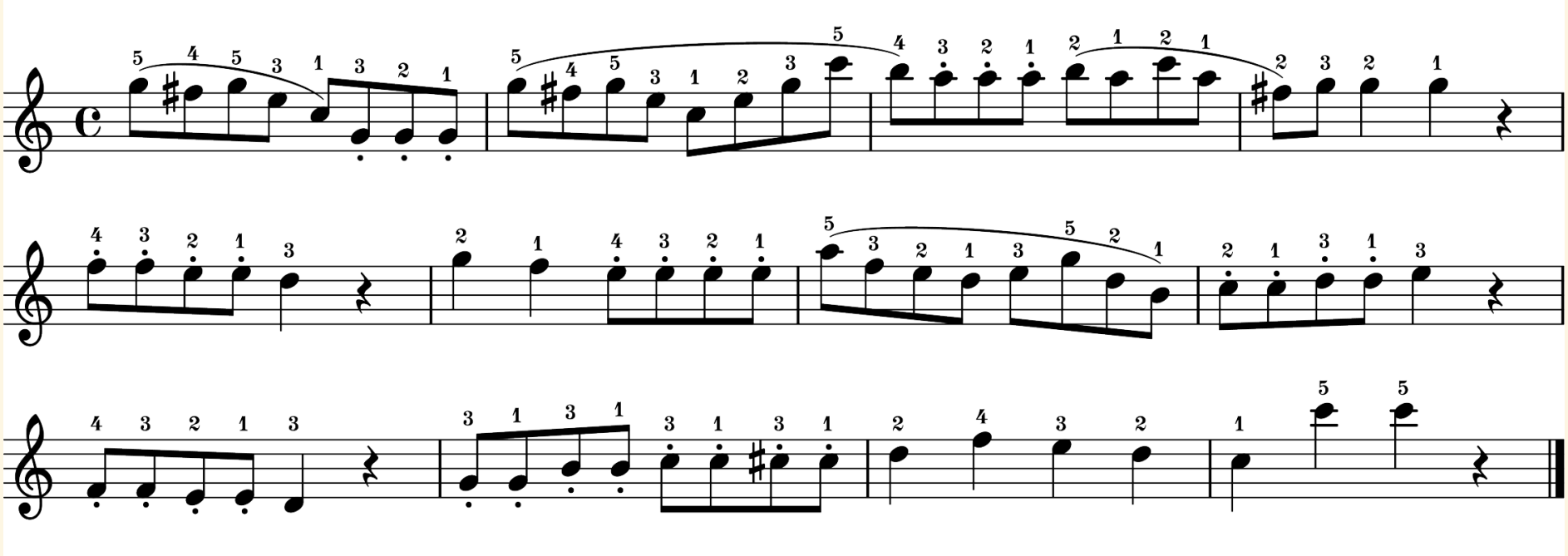
Results (teaching dynamics)



- Participants made a **larger** contrast between forte and piano for teaching

Replicated with a more naturalistic piece

- Clementi: Sonatina in C major, op. 36 no. 3 (modified)



Discussion

- Expert pianists successfully modulated their performances for teaching.
  - especially highlighting **the most relevant aspect** of the technique to be taught
  - not only overall exaggeration but also focusing on particular points (**fine-tuned** exaggeration)

Limitations

- Imaginary situation
  - Do they behave in the same way if they are in front of actual students?
- Lack of students' information
- Can students notice such exaggeration (because they are too subtle)?

Current study

- Looking at perceptual abilities of musicians and non-musicians for such modulation.

SOMBY Lab at CEU (Vienna)

SOcial **M**ind and **B**od**Y** Lab

- Principle Investigators: Natalie Sebanz and Günther Knoblich


- *Topics*: Joint planning, coordination, and commitment / Communication and teaching in joint action / Joint attention, perspective taking etc.
- *Methodologies*: Classical behavioural studies, motion tracking, eye tracking, EEG, musical equipments (e.g., keyboards, drum pads) etc.
- *Website*: https://somby.ceu.edu/

Any question?

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Key references

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