

The Sound of Teaching Music 2 🎵

Expert Pianists' Performance Modulations for Novices

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Progress Workshop 2020

Teaching

1. Adults intensively engage in instructed teaching (Tomasello, 2016, Whiten, 2017)
2. Infant-directed speech and action (e.g., Wang 2018, Brand et al., 2002)
 - Slower demonstration
 - Exaggeration (e.g., high pitch, larger contour, larger trajectory)
3. These modulations are supposed to shift novices' attention to relevant information for learning (e.g., Csibra & Gergely, 2009)
4. Not only grabbing one's attention but also **highlighting relevant properties of action** to be learnt (e.g., Schaik et al., 2019, Ho et al., 2016)



From *what* to do to *how* to do

- Executing actions in the correct order is not sufficient to master a skill (e.g., artistic expression)
- Artistic expression plays a vital role in musical expertise (Juslin, 2003, Sloboda, 2000)
 - Individual differences (uniqueness)
 - Emotional communication
- Such expression is created by subtle sound modulations
 - Novices may have difficulty to acquire expertise by a mere observation (Lombao et al., 2017)
- Can experts **modulate and highlight specific properties of sound** in order to teach musical expression?

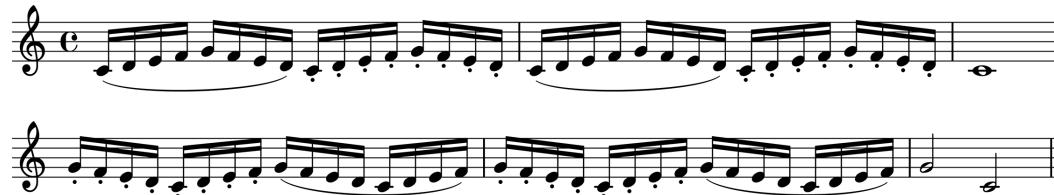


Previous study

Participants were asked to **teach** (e.g., in a lesson) or **perform** (e.g., in a concert) a piece expressively

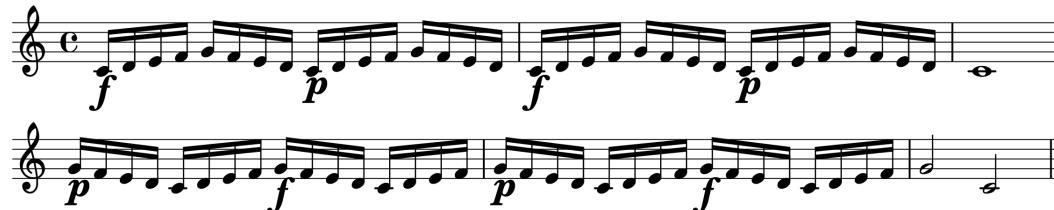
III Articulation (smoothness)

- Legato - connected sound / Staccato - separated sound



III Dynamics (loudness)

- Forte - loud sound / Piano - soft sound

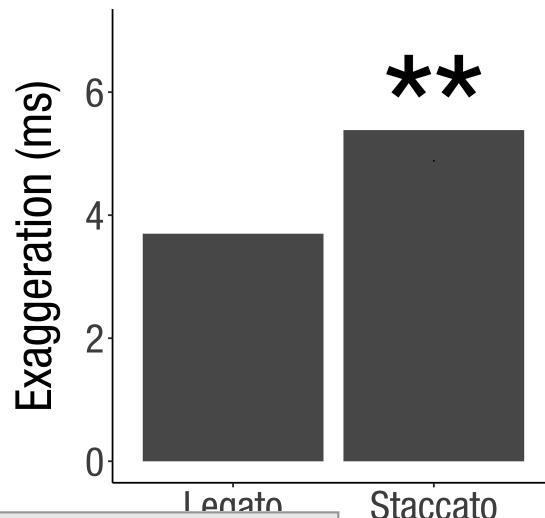


Previous study

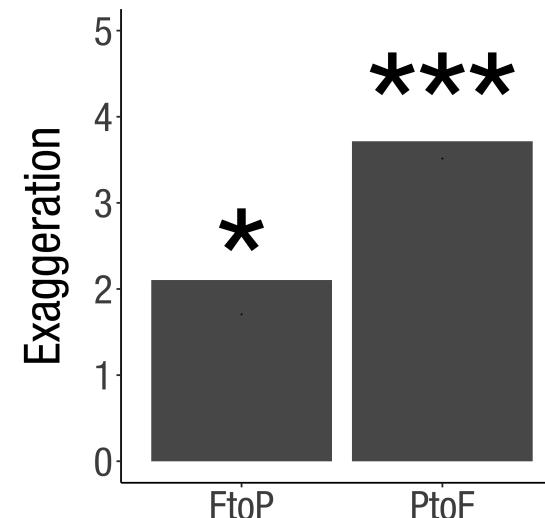
Findings

1. Experts played slower when teaching articulation (but not dynamics)
2. Experts exaggerated only relevant properties of sound for teaching purposes
 - Difference between teaching and performing

2.1 Teaching Articulation



2.2 Teaching Dynamics



Current study

★ Are experts able to pick up and highlight relevant properties of sound in a complex piece of music?

- Study 1: C-major scale - *non-expressive*
- Study 2: Sonatina (Western classical music) piece - *expressive*

Predictions

- Expert pianists will play slower for both techniques or only for articulation
- Expert pianists will exaggerate only relevant properties of sound for teaching purposes

In particular,

- For articulation, longer legato and shorter staccato
- For dynamics, louder forte and softer piano
- For dynamics, a larger contrast between forte and piano

Methods

Participants

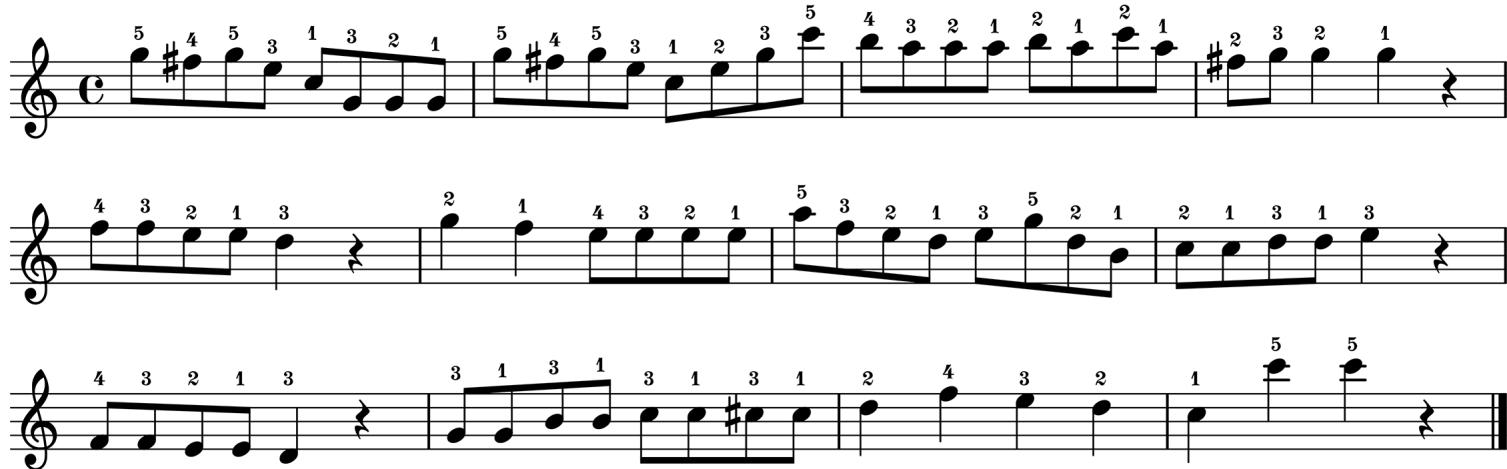
- 21 expert pianists
(1 participant was excluded due to insufficient motor skills)
 - studying piano performance/teaching at a music school or
 - already had a degree in piano performance/teaching
- 15.7 years of playing ($SD = 5.7$)



Apparatus

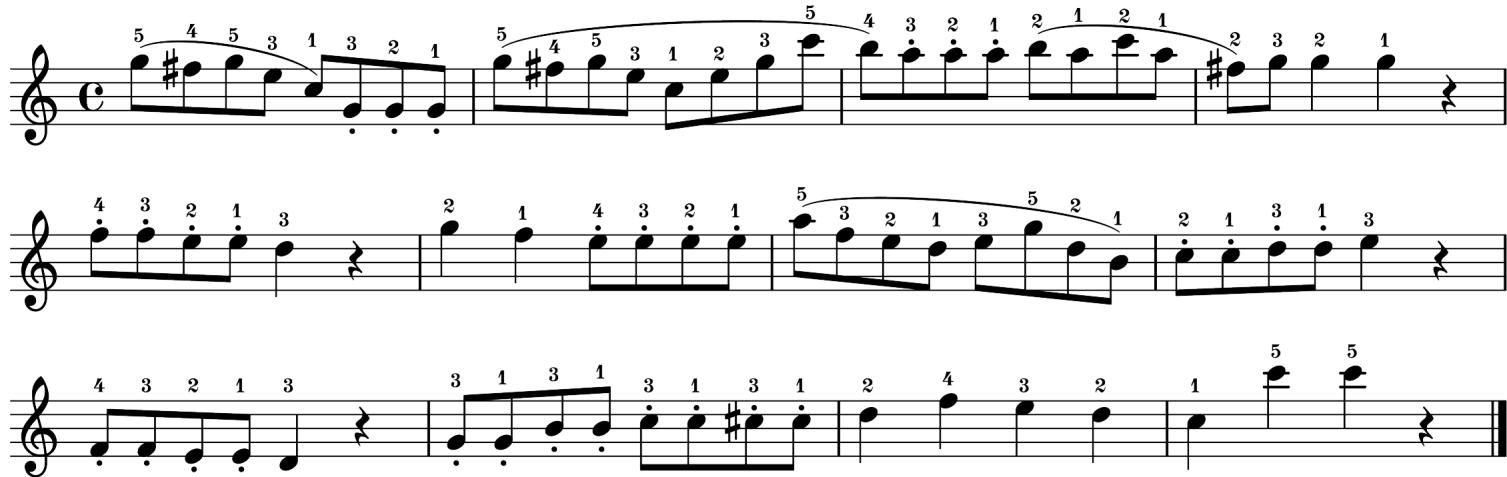
- A weighted Yamaha MIDI piano
- Auditory feedback from a headphone
- Sheet music was presented on a monitor in front of the participants

Stimuli (Practice)



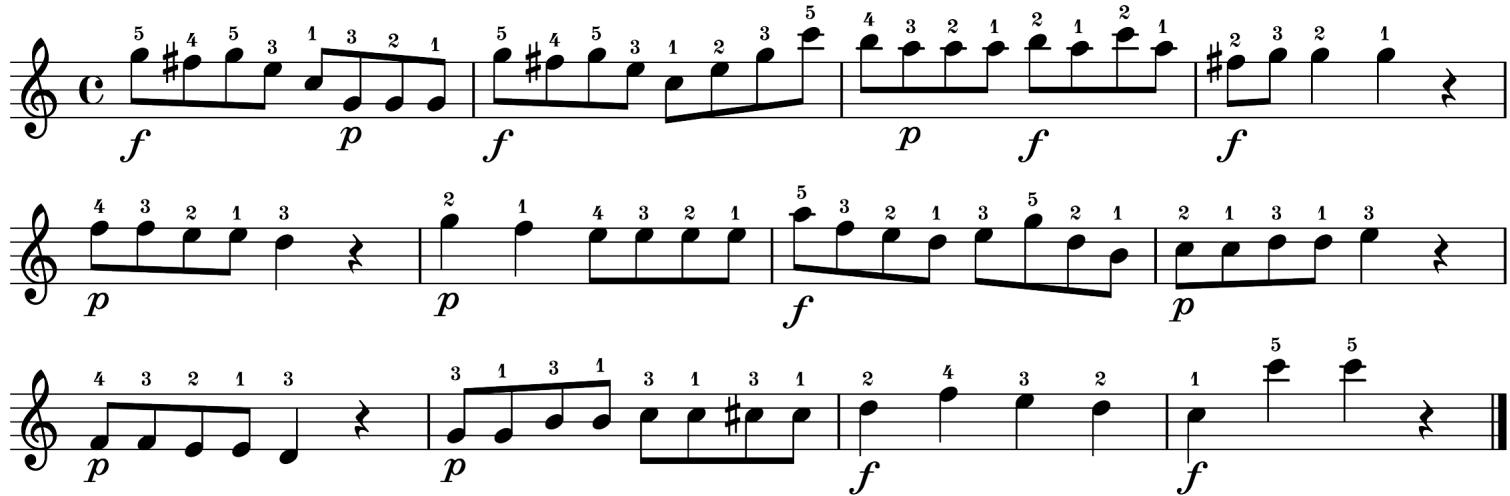
- Based on Clementi's Sonatina Op.36 (No.3)
- 3 options for a tempo (100, 110, 120 bpm)
- Participants memorised the piece (without expressions)
- Only the right hand was used to play

Stimuli (Articulation)



- Legato: smooth and connected sound (slur)
- Staccato: short and separated sound (dotted)

Stimuli (Dynamics)



- Forte: loud sound
- Piano: soft sound

Design

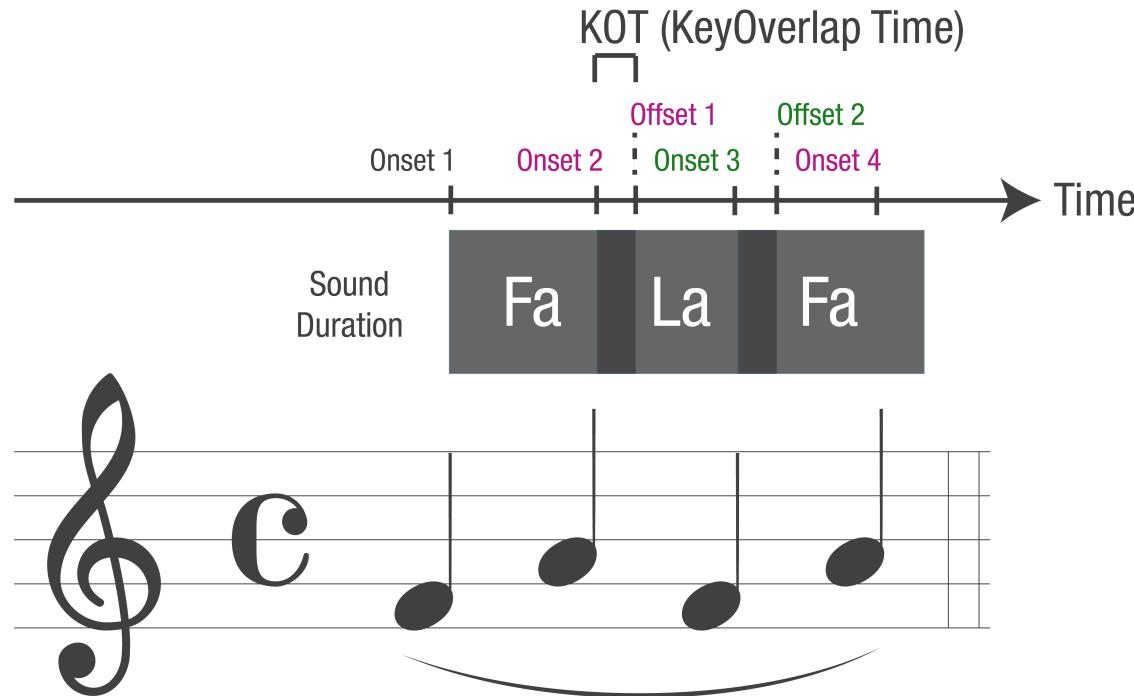
Independent variables (within-subjects)

- Condition (teaching vs. performing)
 - Teaching: to play the excerpt of music as if they were *teaching it to students*. Students are trying to learn **how to perform the piece expressively by listening to participants' performance**
 - Performing: to play the excerpt of music as if they were *performing it to an audience* and **perform the piece expressively with participants' interpretation**
- Technique (articulation vs. dynamics)
 - Subcomponent (legato/staccato or forte/piano) was used for analysing each technique

The orders of the conditions and the techniques were counterbalanced across the participants.

Dependent variables

- IOIs (InterOnset Intervals): to measure a **tempo** of a performance
 - normalised IOIs = IOIs/preferred tempo
- KV (key velocity): to measure **dynamics** (tone intensity)
- KOR (KeyOverlap Ratio): to measure **articulation** (smoothness)
 - $KOR = KOT / \text{mean IOI}$



Results (IOIs)

Articulation

- Participants played **more slowly** in the teaching condition [$M = 0.97, SD = 0.05$] than in the performing condition [$M = 0.95, SD = 0.04$] while playing the piece with articulation ($t(19) = 2.47, p = 0.02$, Cohen's $d = 0.27$)

Dynamics

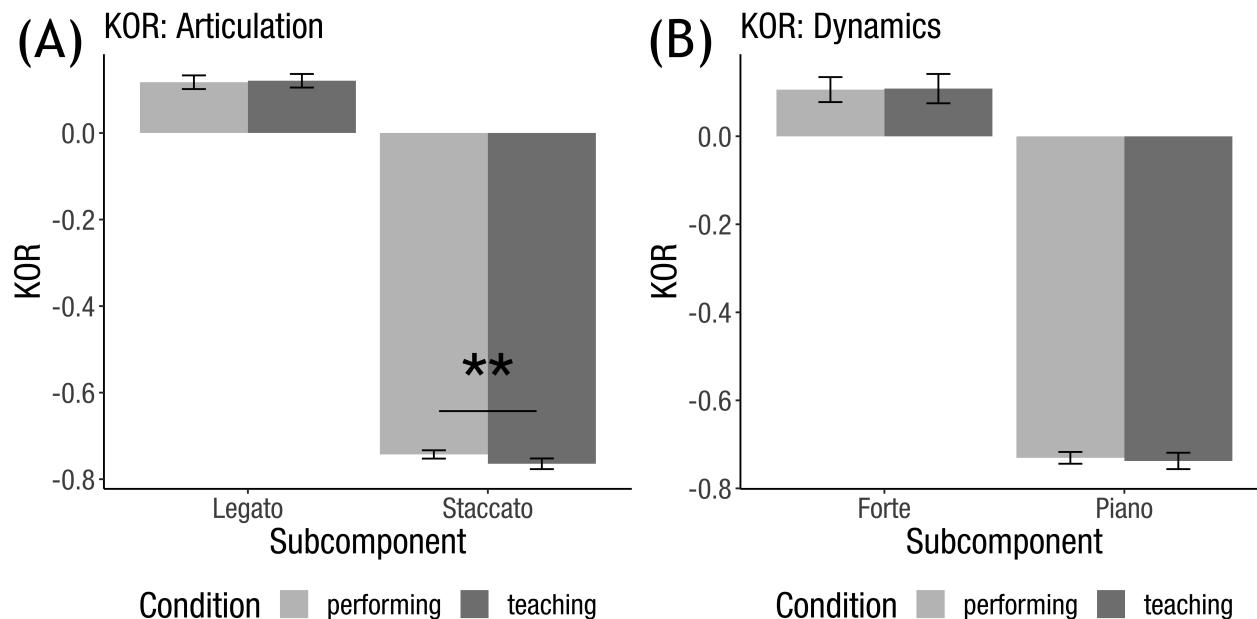
- There was **no significant difference** between the teaching [$M = 0.96, SD = 0.05$] and the performing condition [$M = 0.96, SD = 0.04$] while playing the piece with dynamics ($t(19) = 0.21, p = 0.84$, Cohen's $d = 0.02$).

- ★ Participants played slower only when teaching articulation (not dynamics)
- ★ Replicated our previous finding for IOIs!

KOR - Articulation

(A) Participants produced **shorter staccato** while teaching articulation
(interaction: $F(1,19) = 8.79, p = 0.008, \eta^2_G = 0.01$)

(B) Participants did not modulate articulation while teaching dynamics
(interaction: $F(1,19) = 0.32, p = 0.58, \eta^2_G < 0.001$)

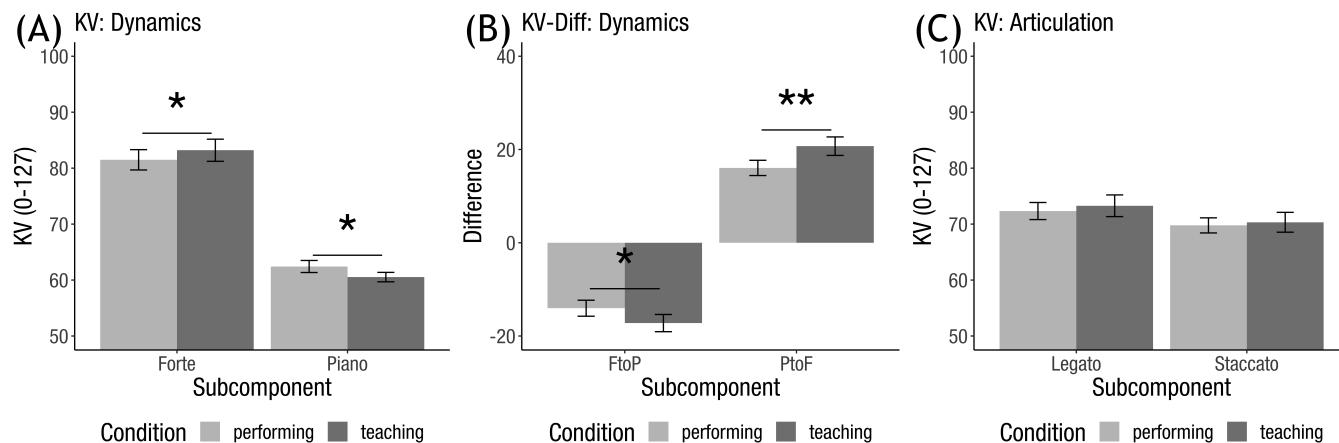


KV - Dynamics

(A) Participants produced **louder forte** and **softer piano** when teaching dynamics (interaction: $F(1,19) = 6.12, p = 0.02, \eta^2_G = 0.018$)

(B) Participants made **a larger contrast between forte and piano** when teaching dynamics (interaction: $F(1,19) = 9.2, p = 0.007, \eta^2_G = 0.06$)

(C) Participants did not modulate dynamics while teaching articulation (interaction: $F(1,19) = 0.17, p = 0.69, \eta^2_G < 0.001$)



⭐ Replicated our previous finding for dynamics!

Discussion

⭐ We replicated our previous findings with the naturalistic piece of music!

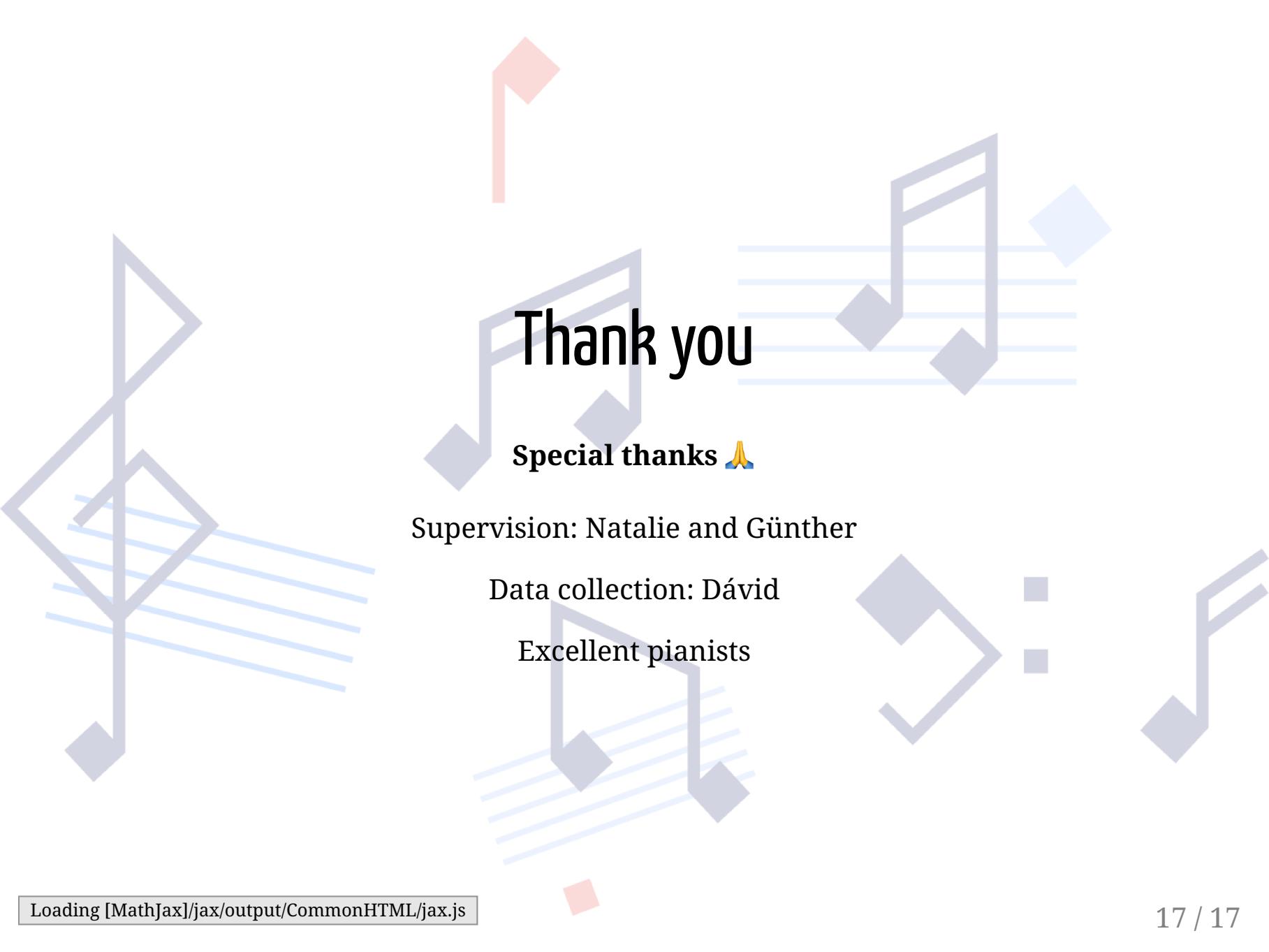
Limitations

- There was no actual student in front of participants
- Experts will adapt their performance depending on the level of students (e.g., Okazaki et al., 2019)

Next experiment



We plan to run an experiment where pianists listen to a number of students' performances first and then are asked to teach expressive techniques based on what they heard.



A decorative background featuring large, stylized grey musical notes on light blue staff lines. A single red arrow points upwards from the bottom center. In the top right corner, there's a cluster of grey musical notes and a small blue square.

Thank you

Special thanks 🙏

Supervision: Natalie and Günther

Data collection: Dávid

Excellent pianists