



How do pianists convey teaching intentions?

**Session: Perceiving and understanding cues
in others' actions**

Atsuko Tominaga / March 28th 2023 @ 65th TeaP



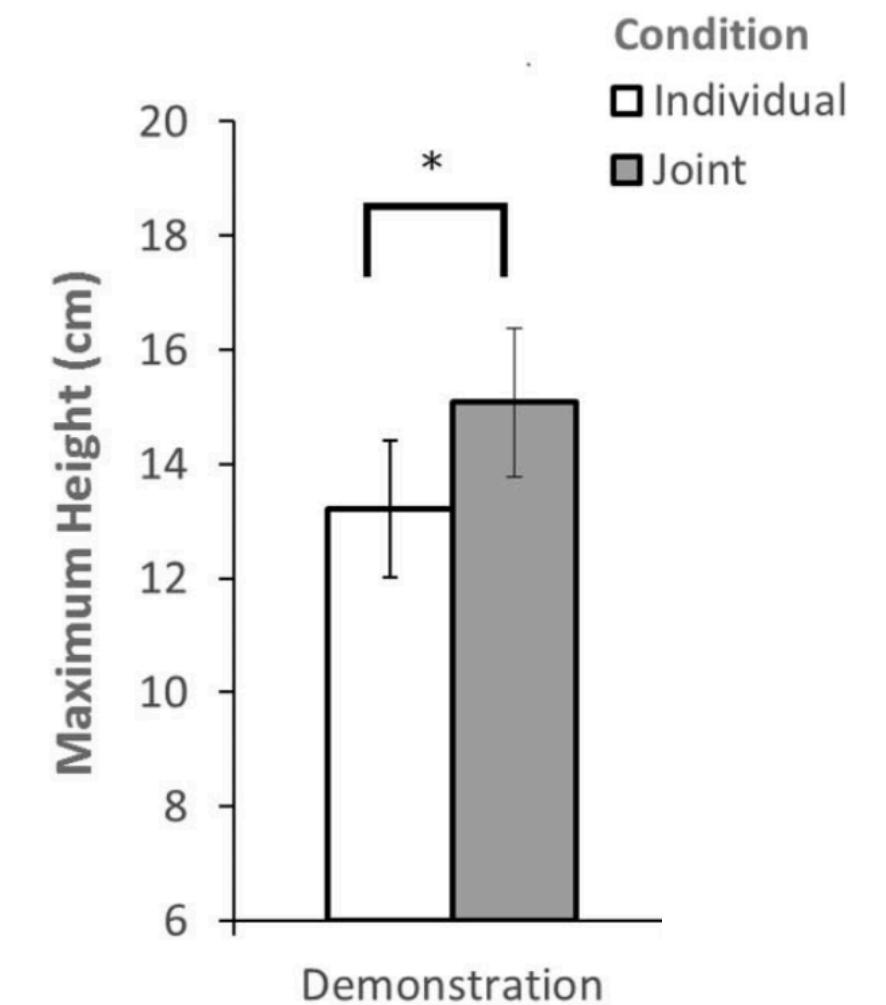
Teaching

Sending pedagogical signals

- People use subtle body movements to convey informative signals to others (Sensorimotor communication: Pezzulo et al, 2013; Pezzulo et al., 2019)
- Infant-directed speech and action (so-called motherese, motionese: Saint-Georges et al., 2013, Brand et al., 2002)
- **Slower and exaggerated demonstration** (for adults too)
(e.g., McEllin et al., 2018, Tominaga et al., 2022)
 - Ostensive cues are considered to attract novices' attention and affect cognitive abilities (Csibra & Gergely, 2009)



Fukuyama et al., 2015



McEllin et al., 2018

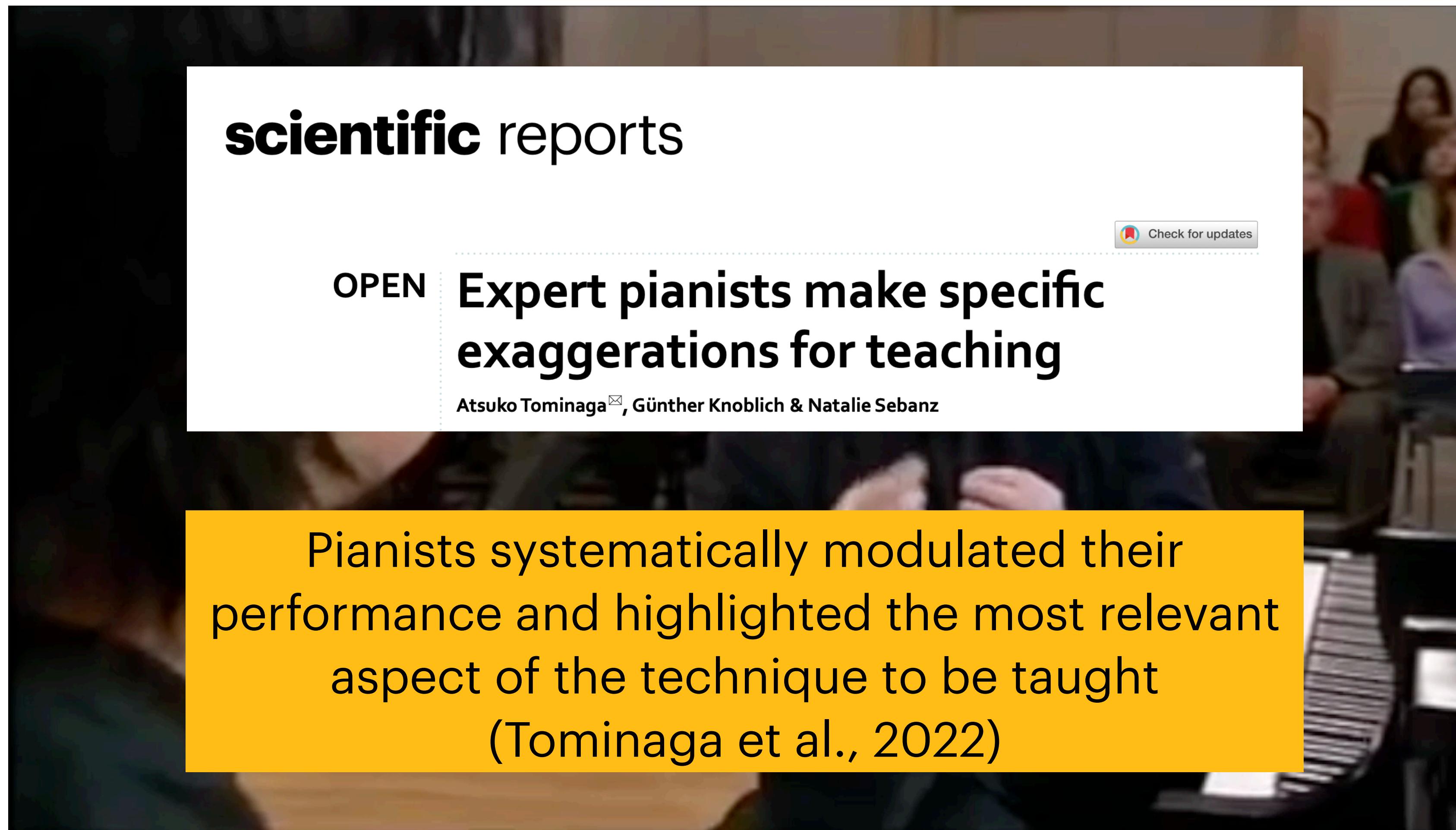
Exaggerated demonstration in music



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How do pianists adapt their demonstration?

Sending specific pedagogical signals for each student

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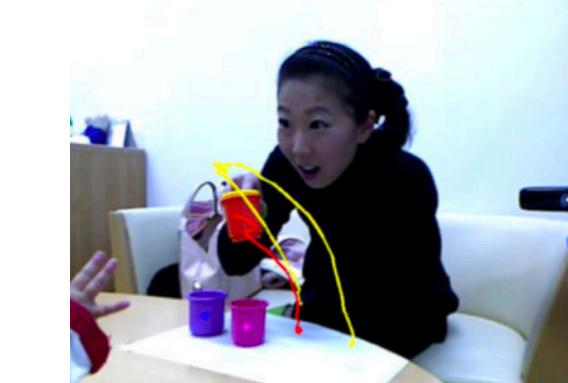
Sending specific pedagogical signals for each student

- Experts regularly **monitor** novices' actions and intervene by **adapting** their behaviour to novices' observed abilities (Mermelshtine, 2017)

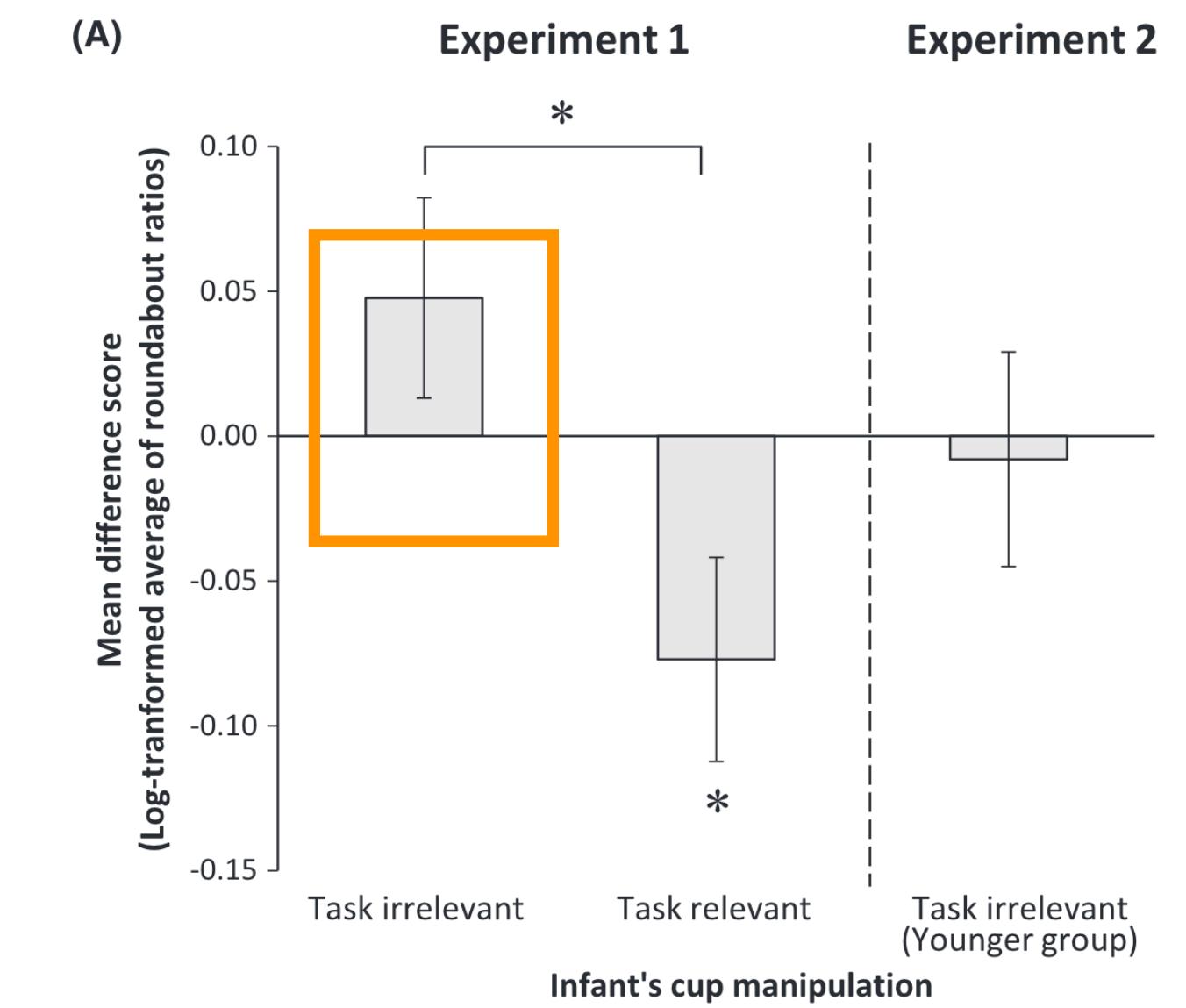
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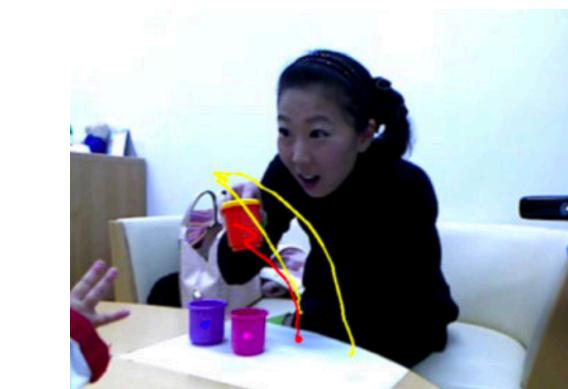
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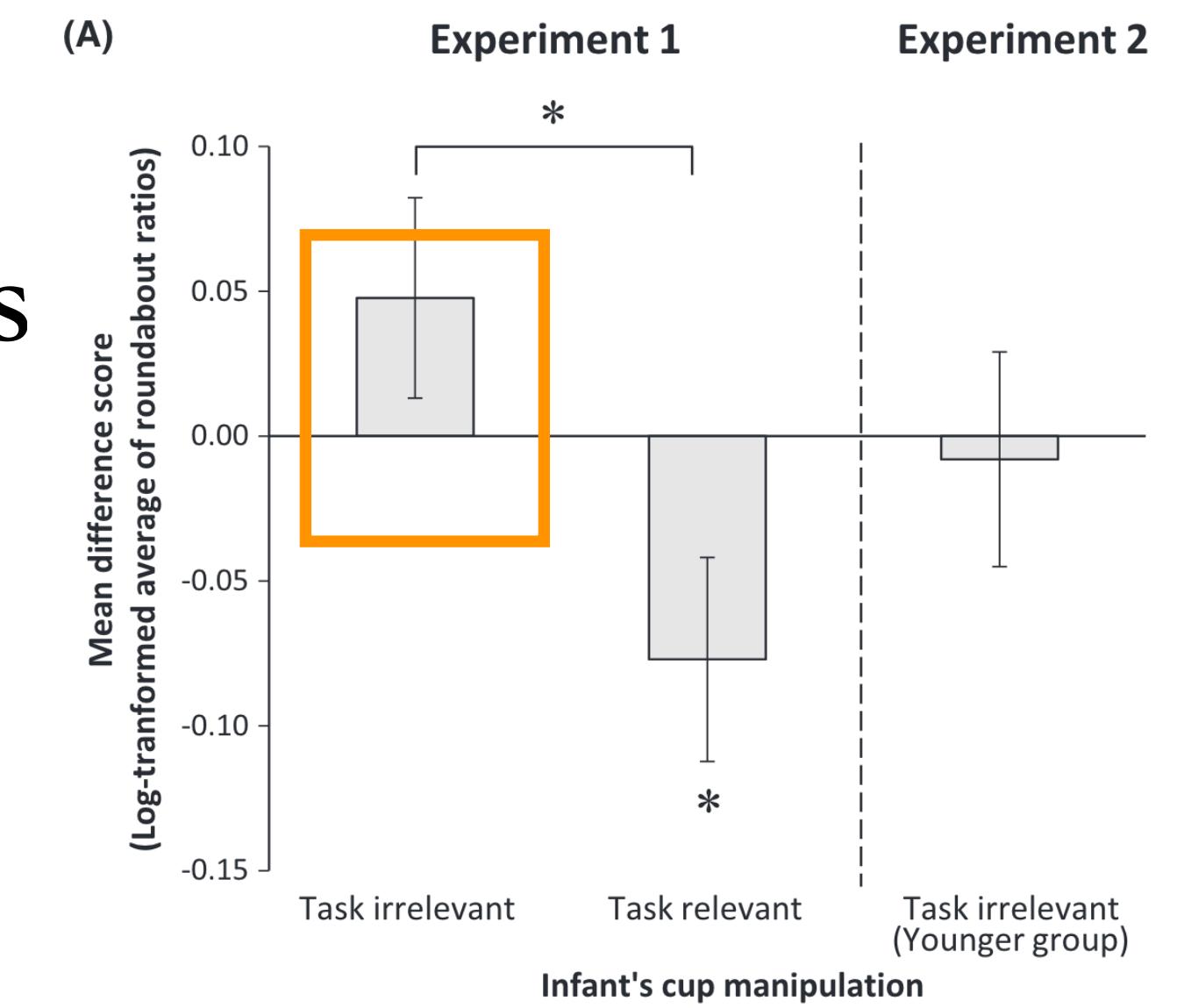
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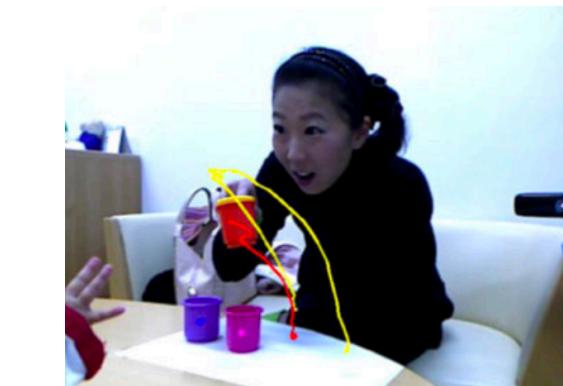
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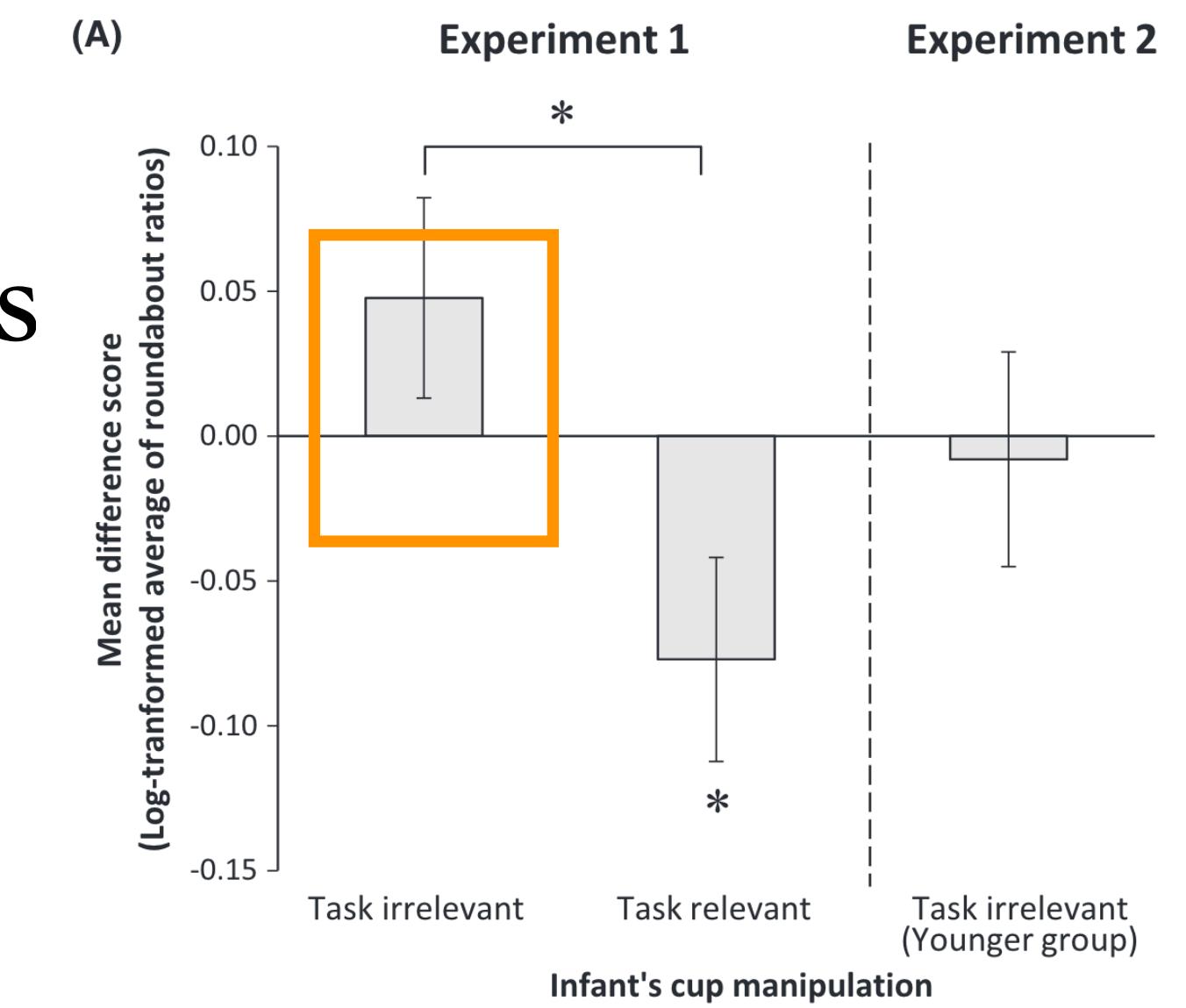
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 - Articulation (Smoothness: legato, staccato)



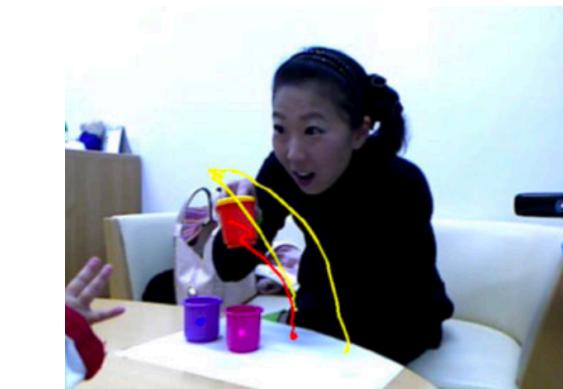
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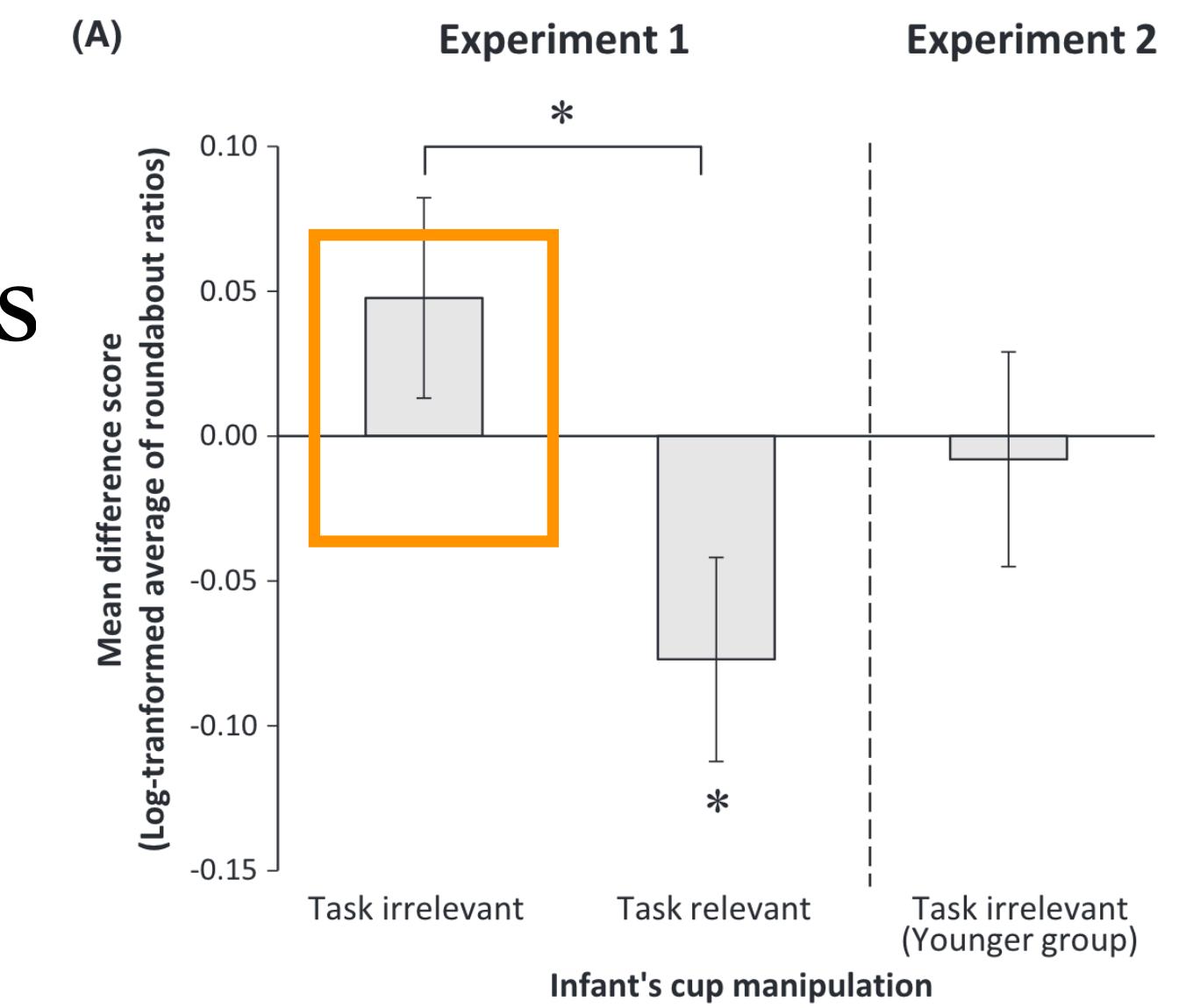
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- Based on Tominaga et al. (2022), we made artificial recordings, which resembled students' demonstrated skills
 - Articulation (Smoothness: legato, staccato)
 - Dynamics (Loudness: forte, piano)



Fukuyama et al., 2015



Predictions

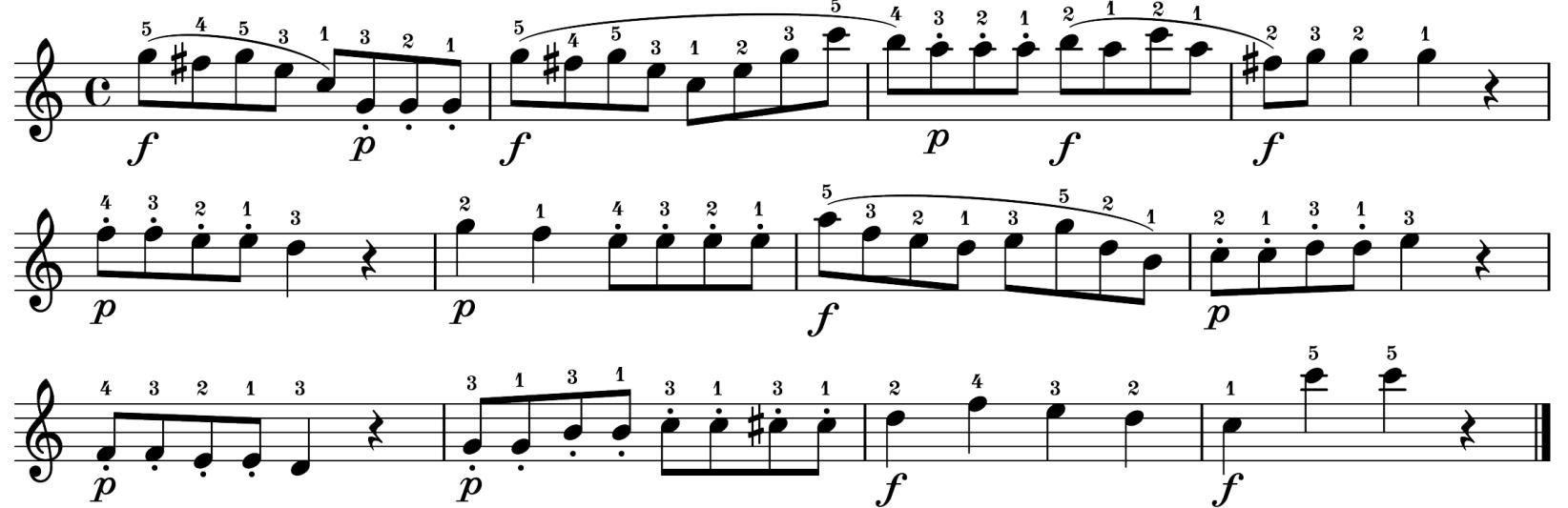
- Expert pianists should **exaggerate relevant aspects of performance more if some techniques are missing**

	Articulation Present	Articulation Absent
Dynamics Present	Do Not Exaggerate	Exaggerate Articulation
Dynamics Absent	Exaggerate Dynamics	Exaggerate Articulation And Dynamics

Stimuli

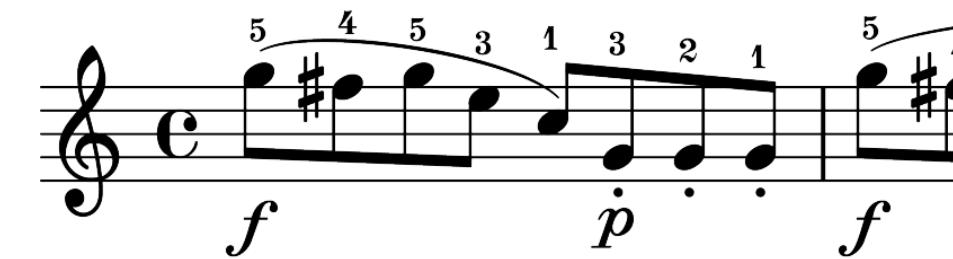
Artificial recordings of students

Ideal performance
(Articulation - Present,
Dynamics - Present)

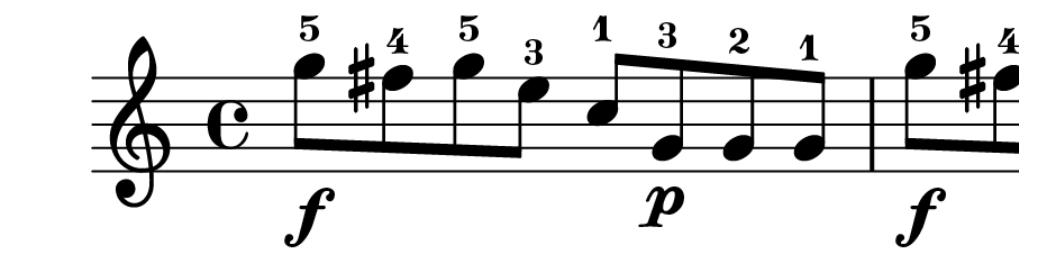


Dynamics
Present

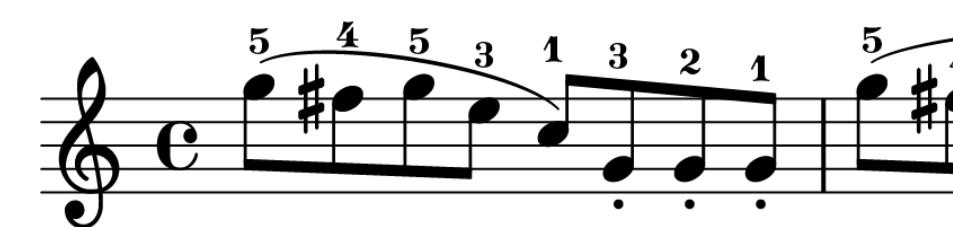
Articulation Present



Articulation Absent



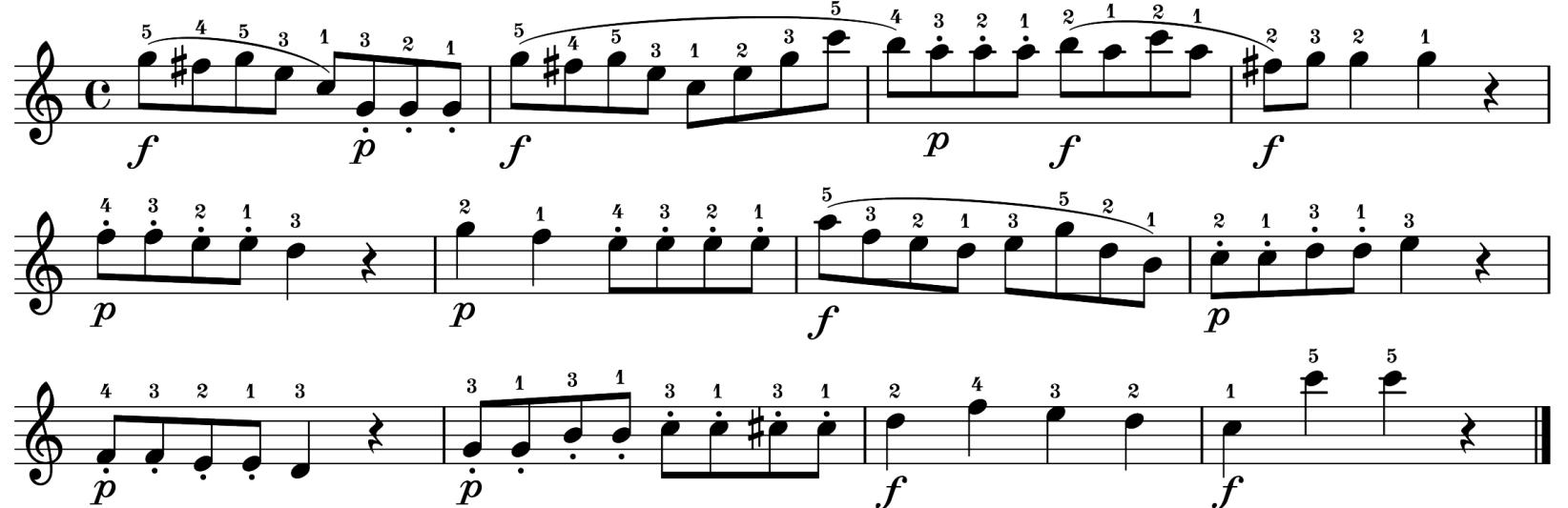
Dynamics
Absent



Stimuli

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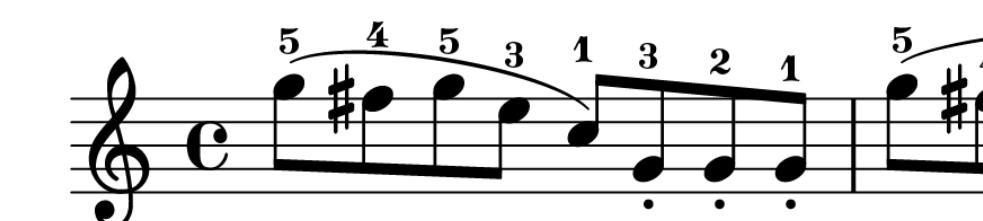
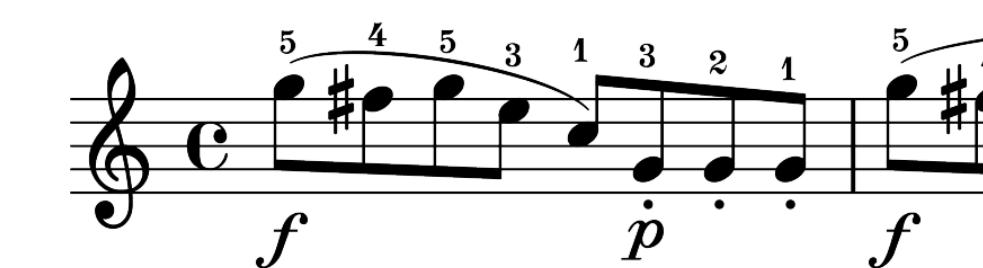
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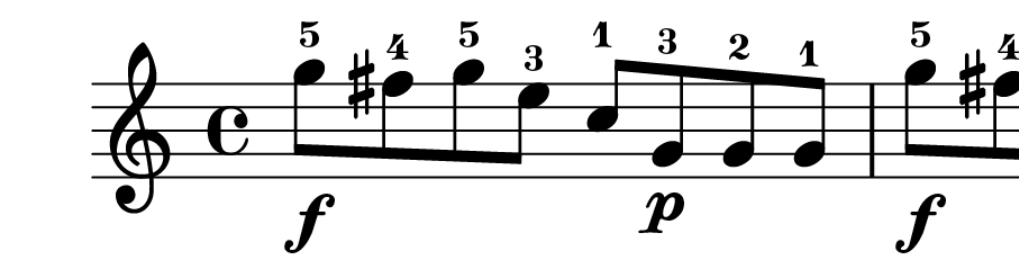
Dynamics
Present

Dynamics
Absent

Articulation Present



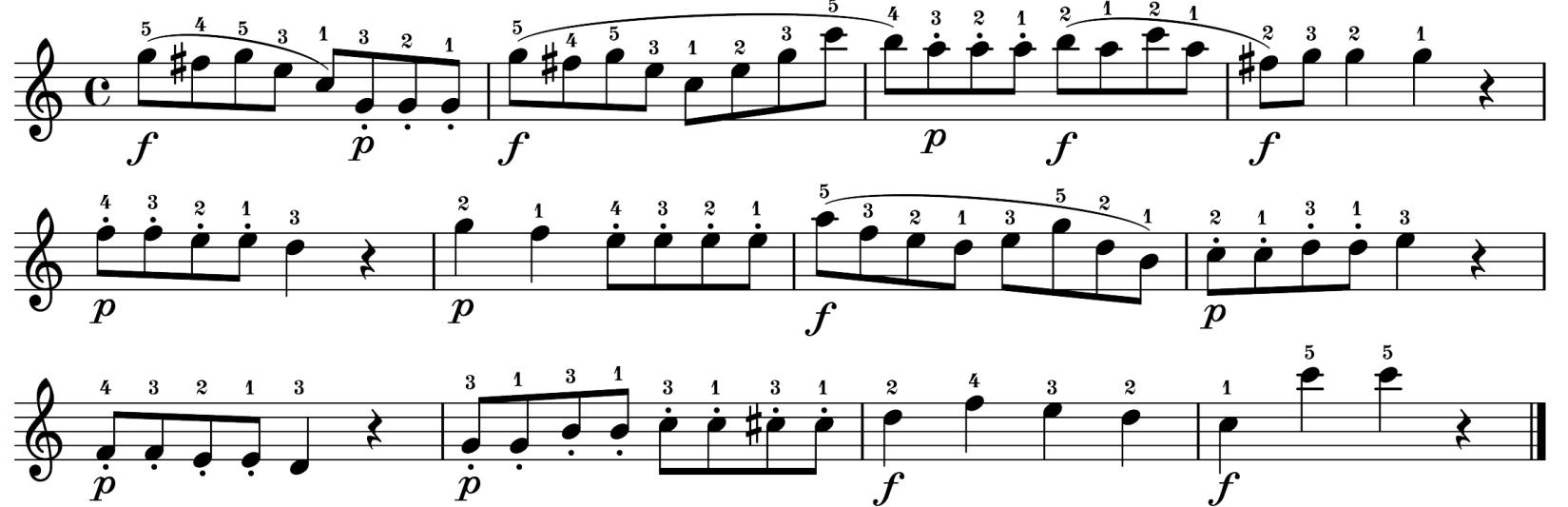
Articulation Absent



Stimuli

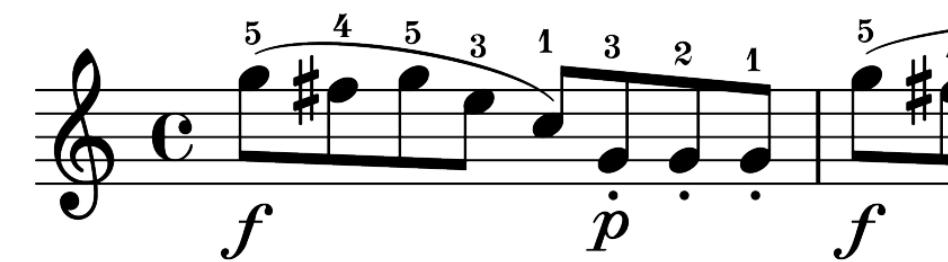
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Ideal performance
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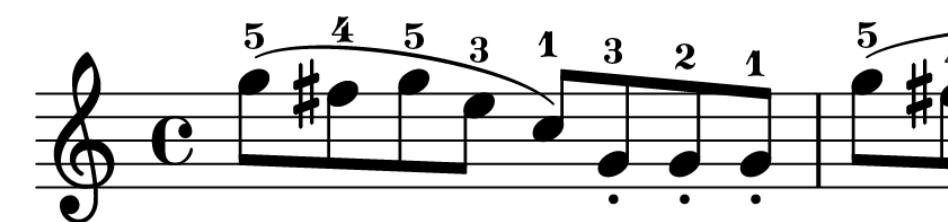
Dynamics
Present

Articulation Present



Dynamics
Absent

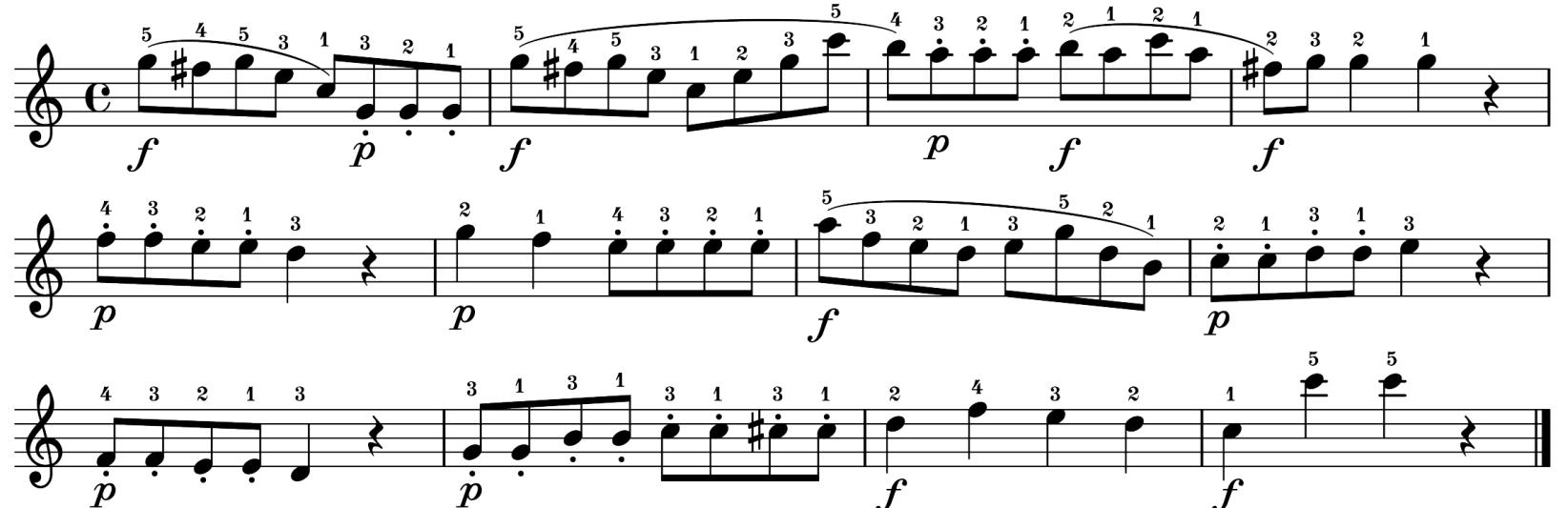
Articulation Absent



Stimuli

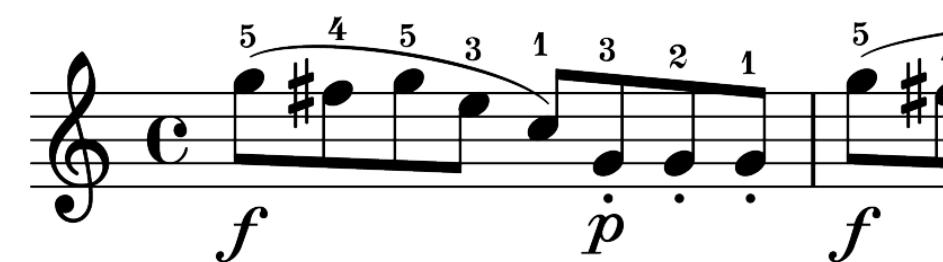
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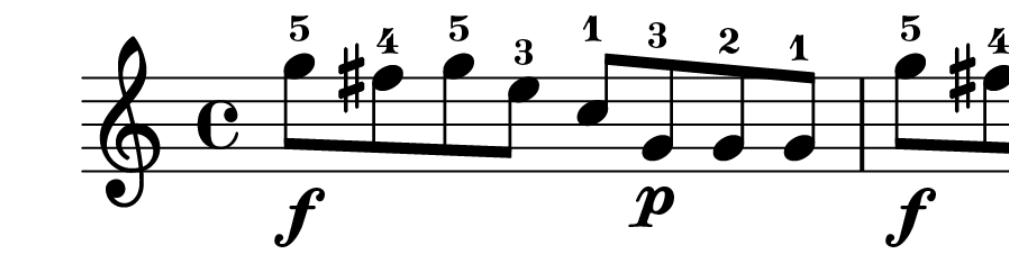


Dynamics
Present

Articulation Present



Articulation Absent



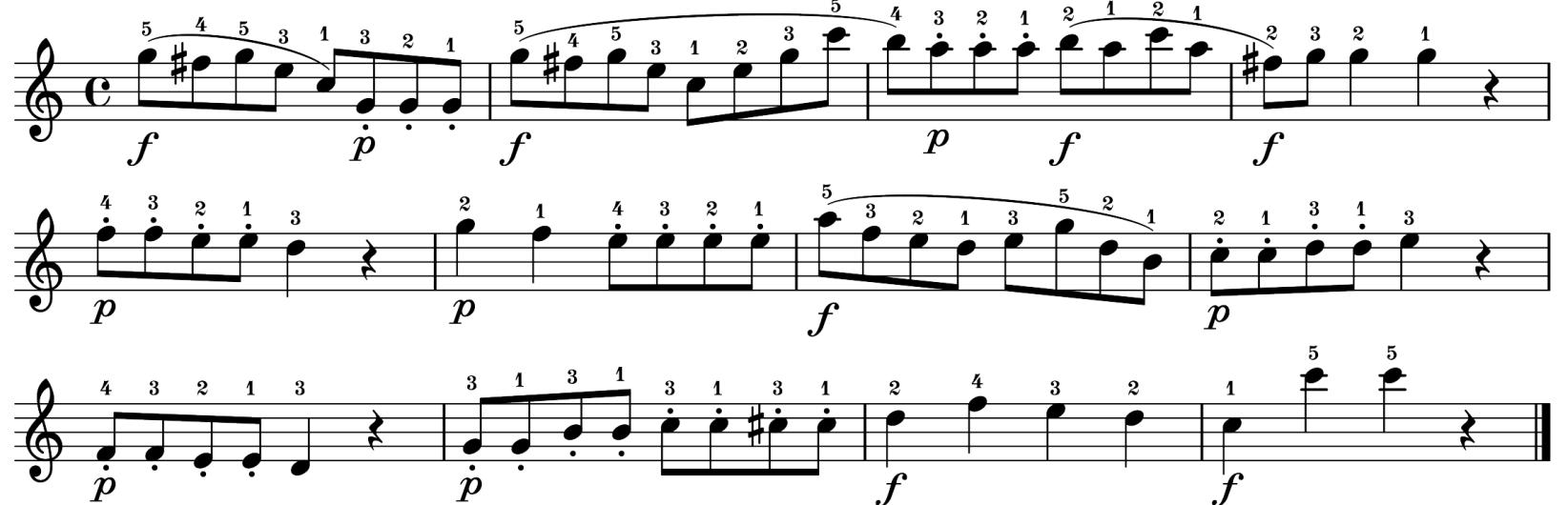
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Stimuli

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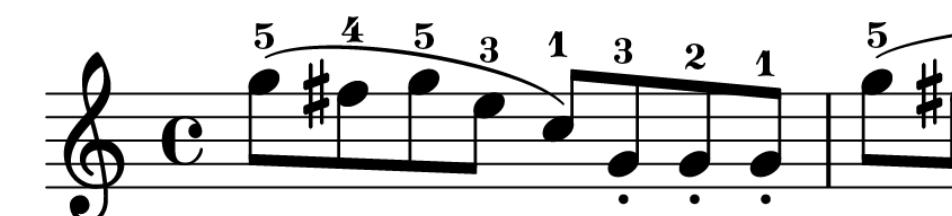
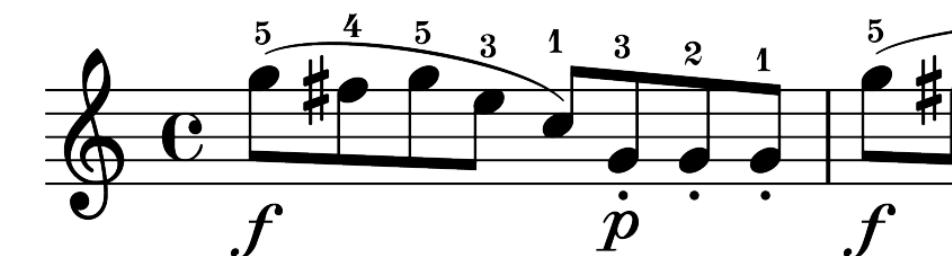
Ideal performance
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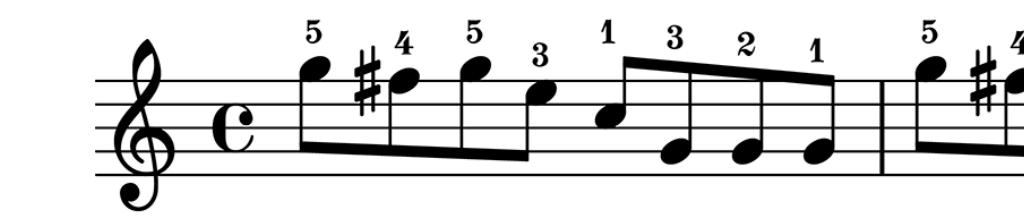
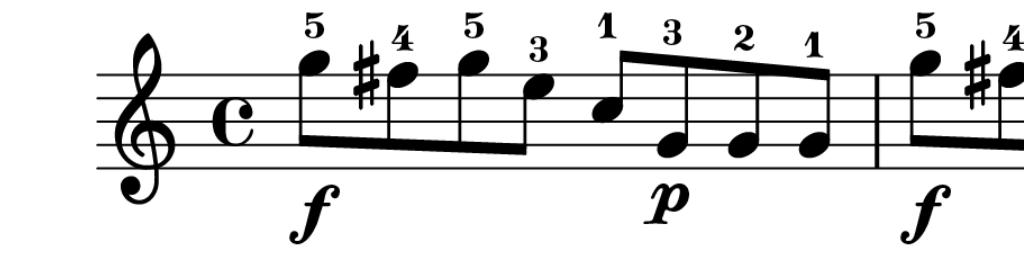
Dynamics
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Dynamics
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Articulation Present



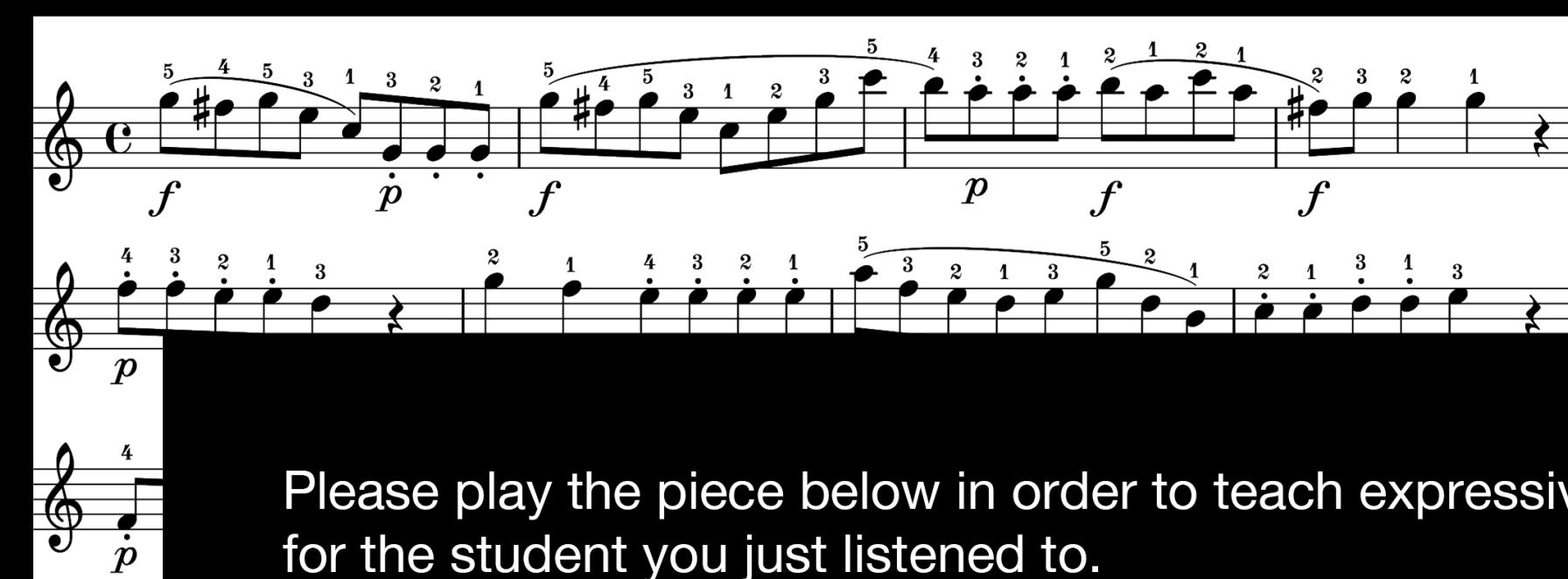
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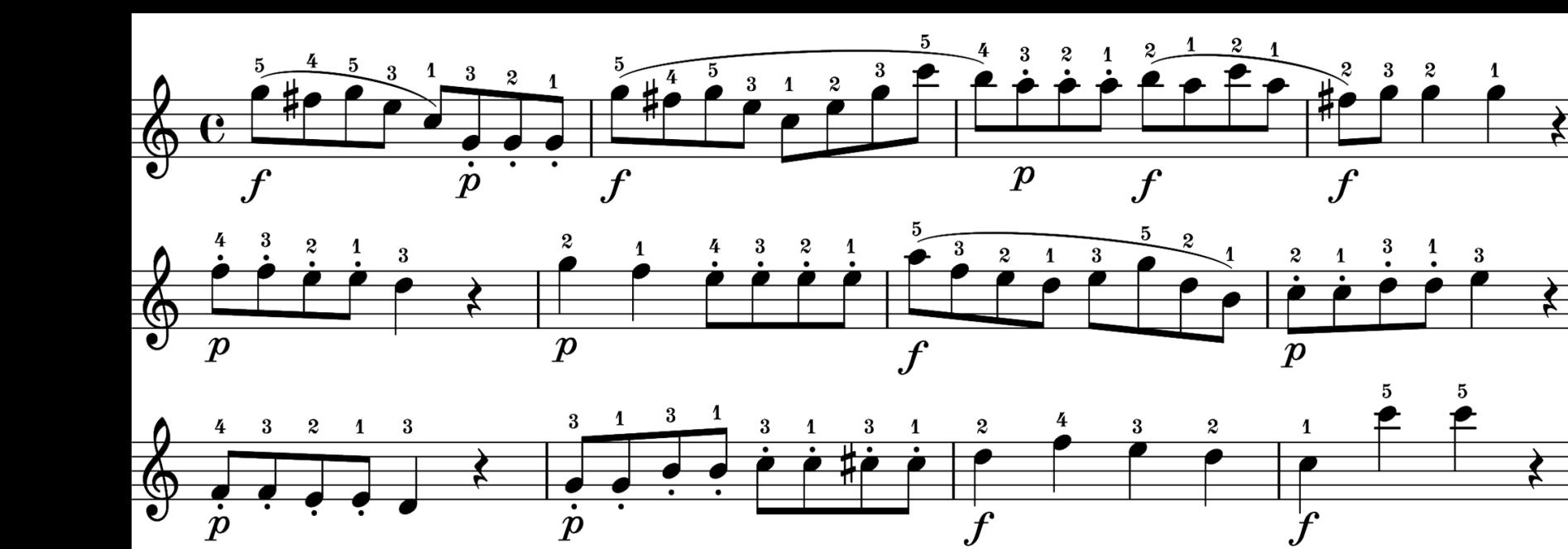
Procedure

- Pianists ($N=20$) listened to a student's performance (recording)
- They were asked to perform the piece specifically for the student
- We quantified pianists' performance in terms of Smoothness (articulation) and Loudness (dynamics)

Please listen carefully to the current recording.



Please play the piece below in order to teach expressive techniques for the student you just listened to.

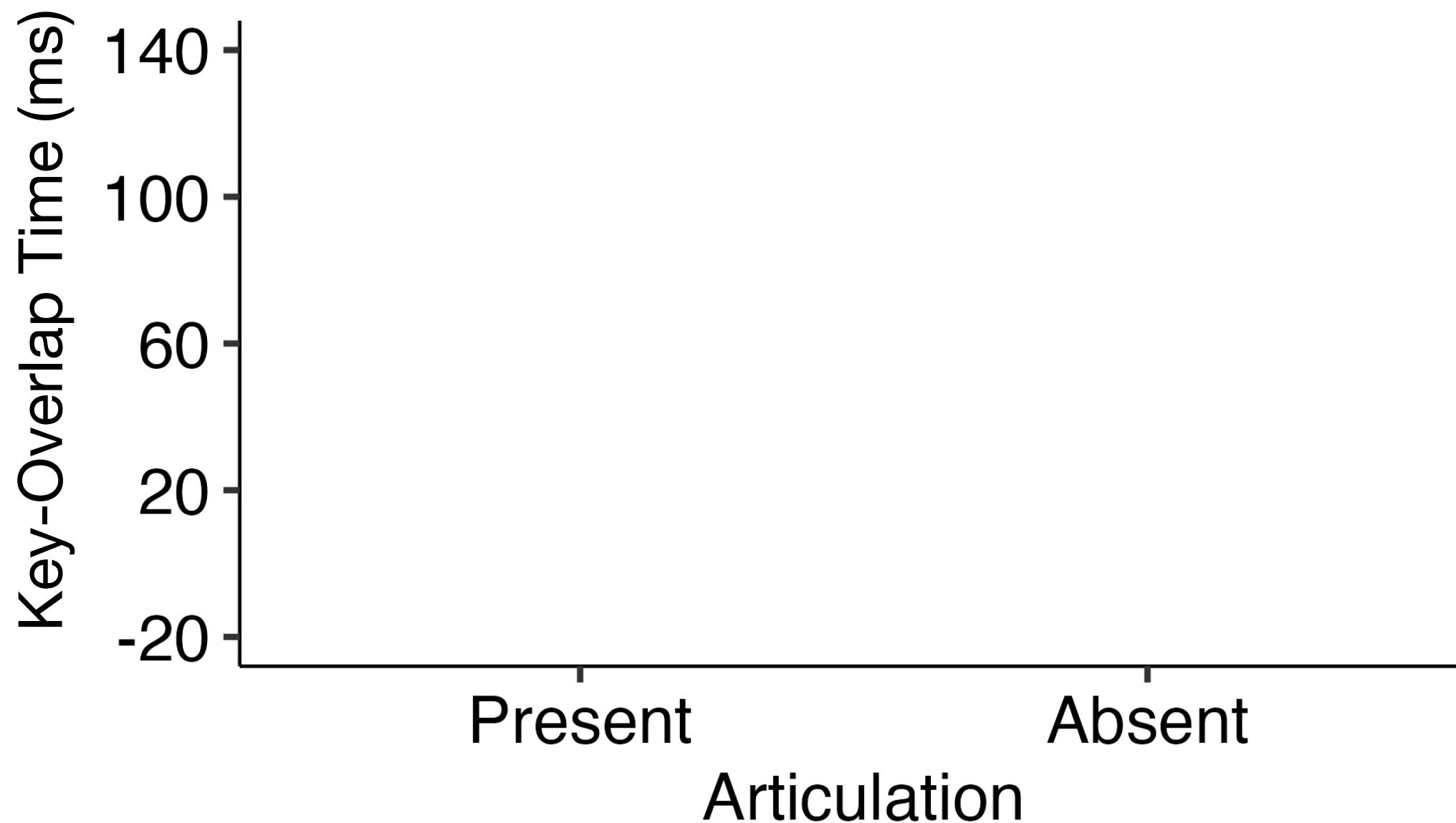


Smoothness Articulation

Key-Overlap Time (ms): Positive - Legato, Negative - Staccato

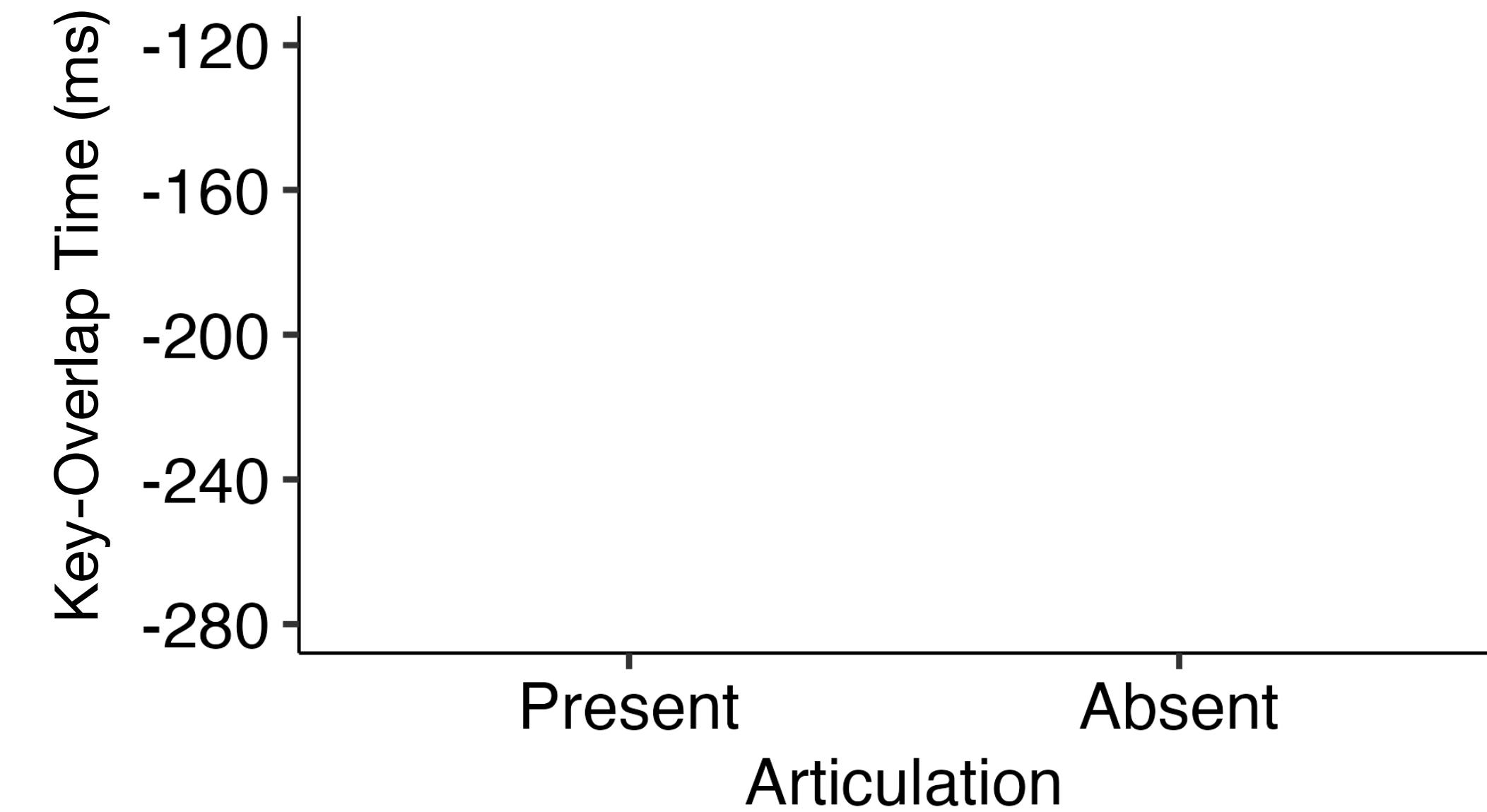
Legato (Smooth sound)

Dynamics  Present  Absent



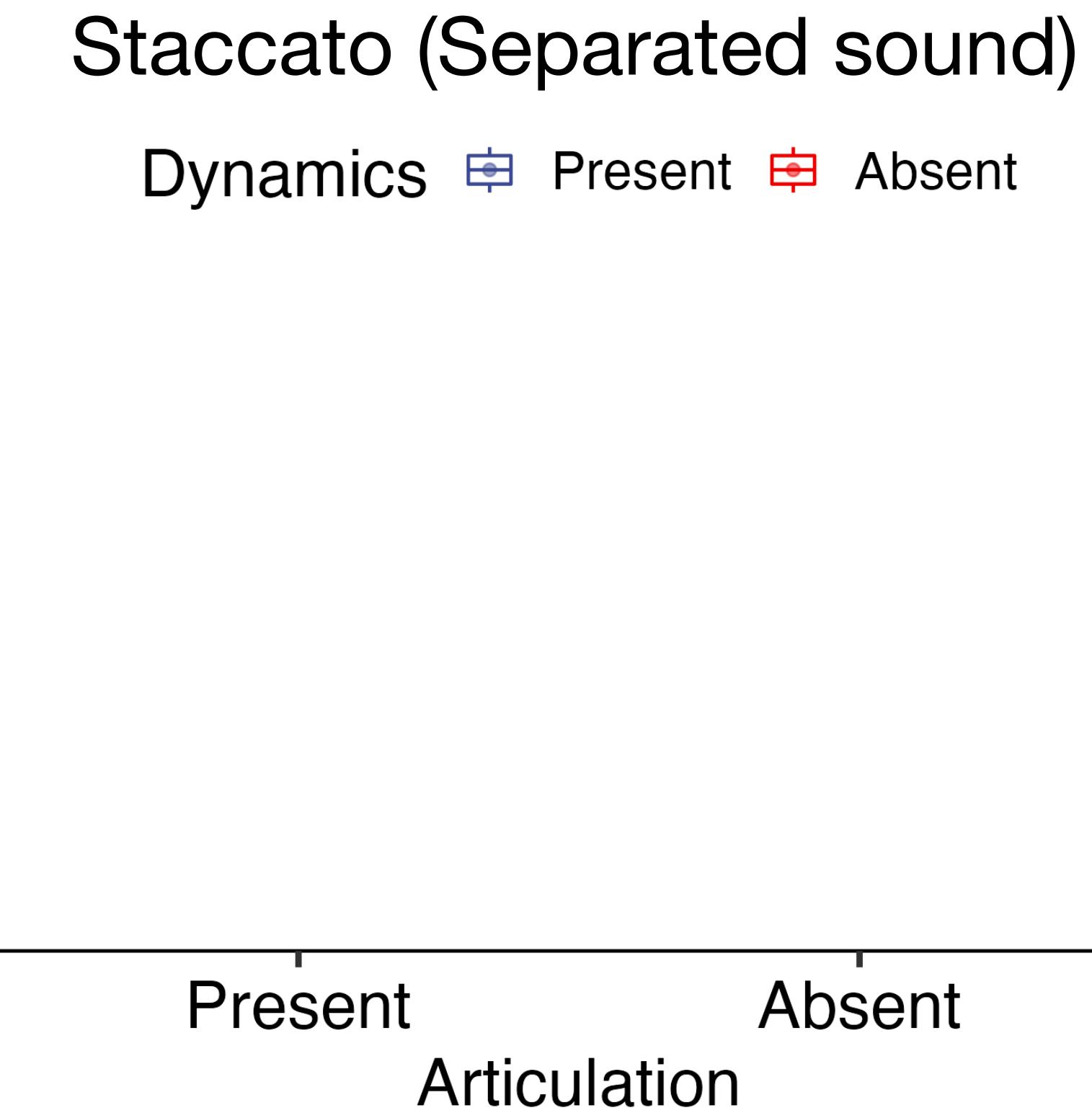
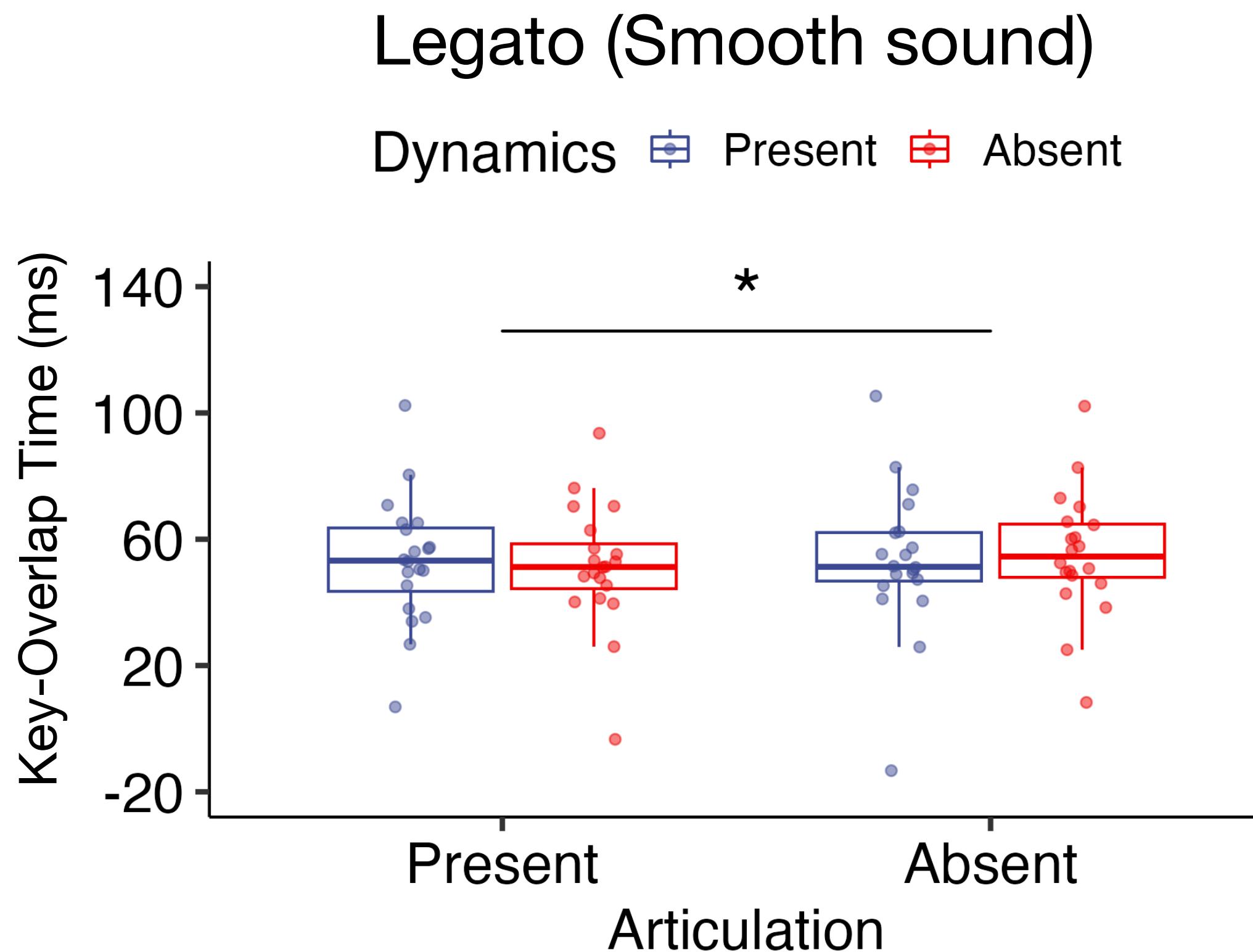
Staccato (Separated sound)

Dynamics  Present  Absent



Smoothness Articulation

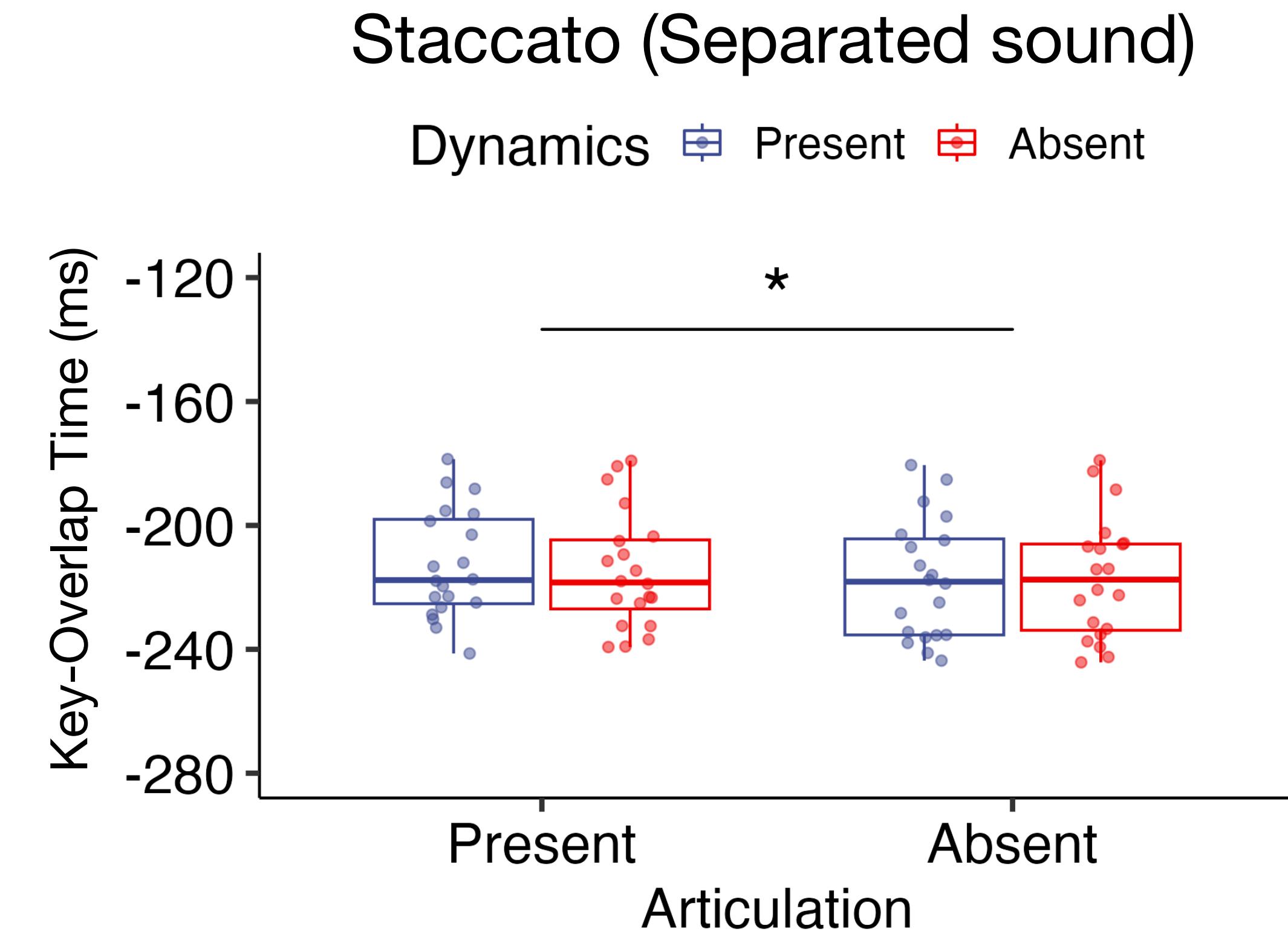
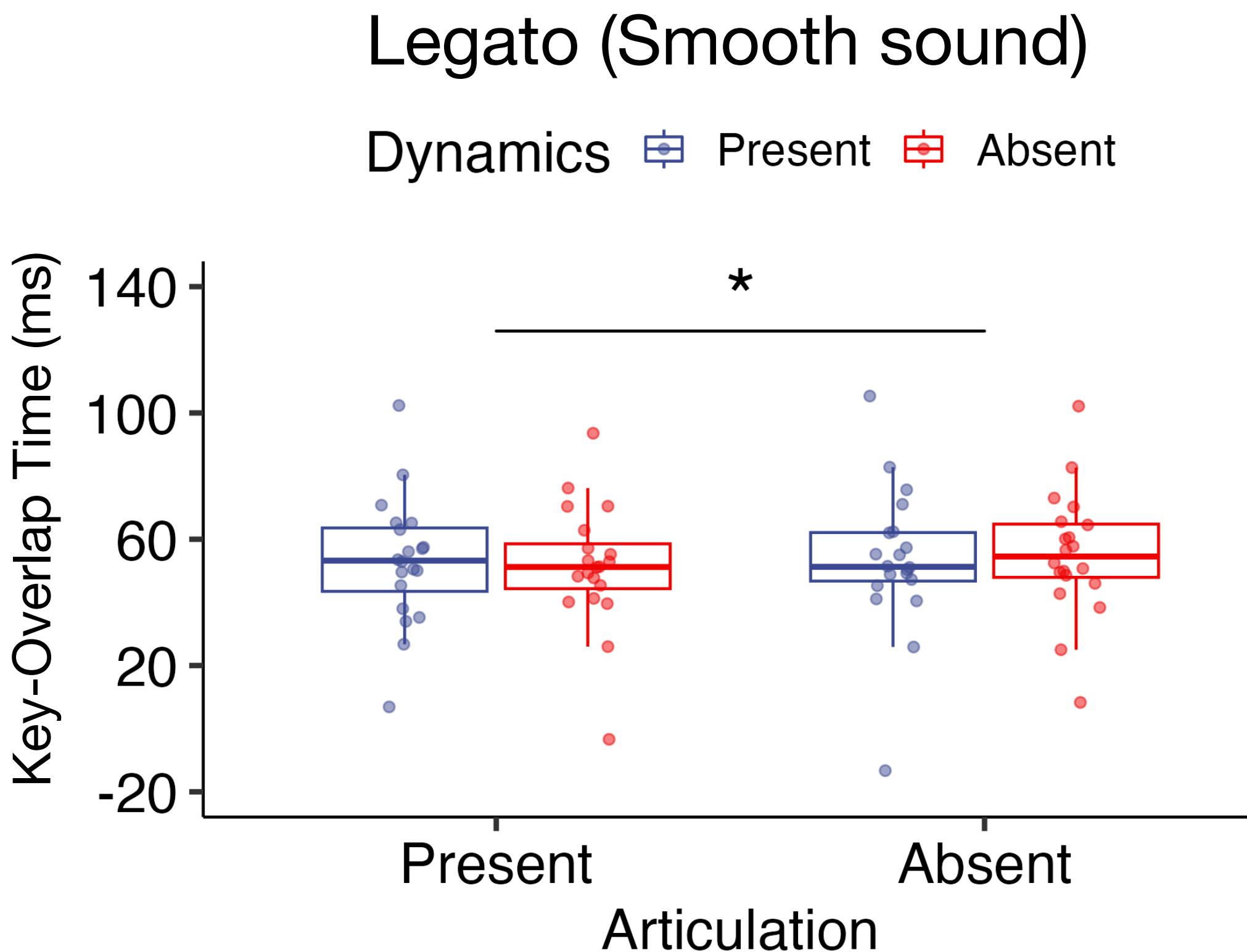
Key-Overlap Time (ms): Positive - Legato, Negative - Staccato



- Longer legato if articulation was not implemented

Smoothness Articulation

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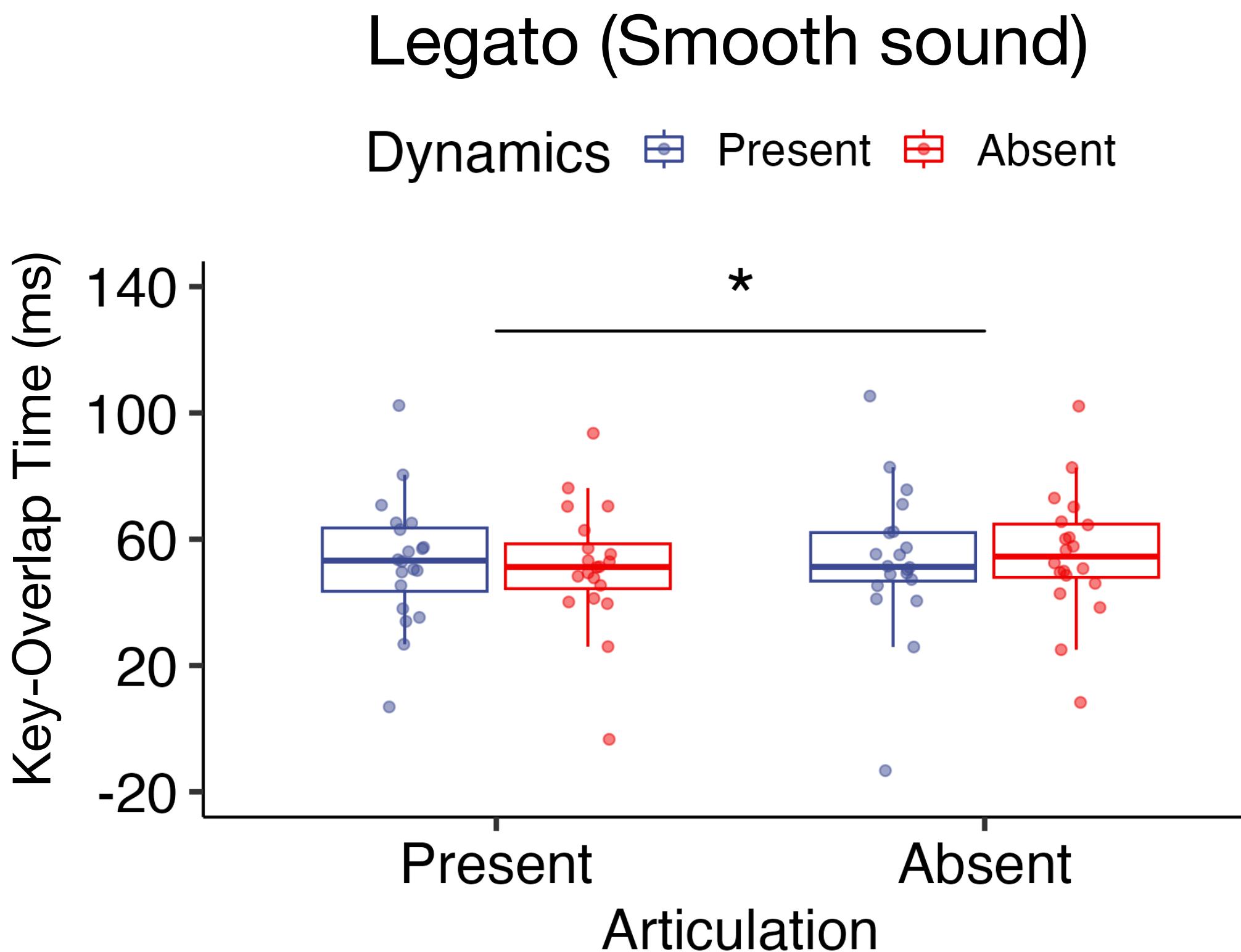


- Longer legato if articulation was not implemented

- Shorter staccato if articulation was not implemented

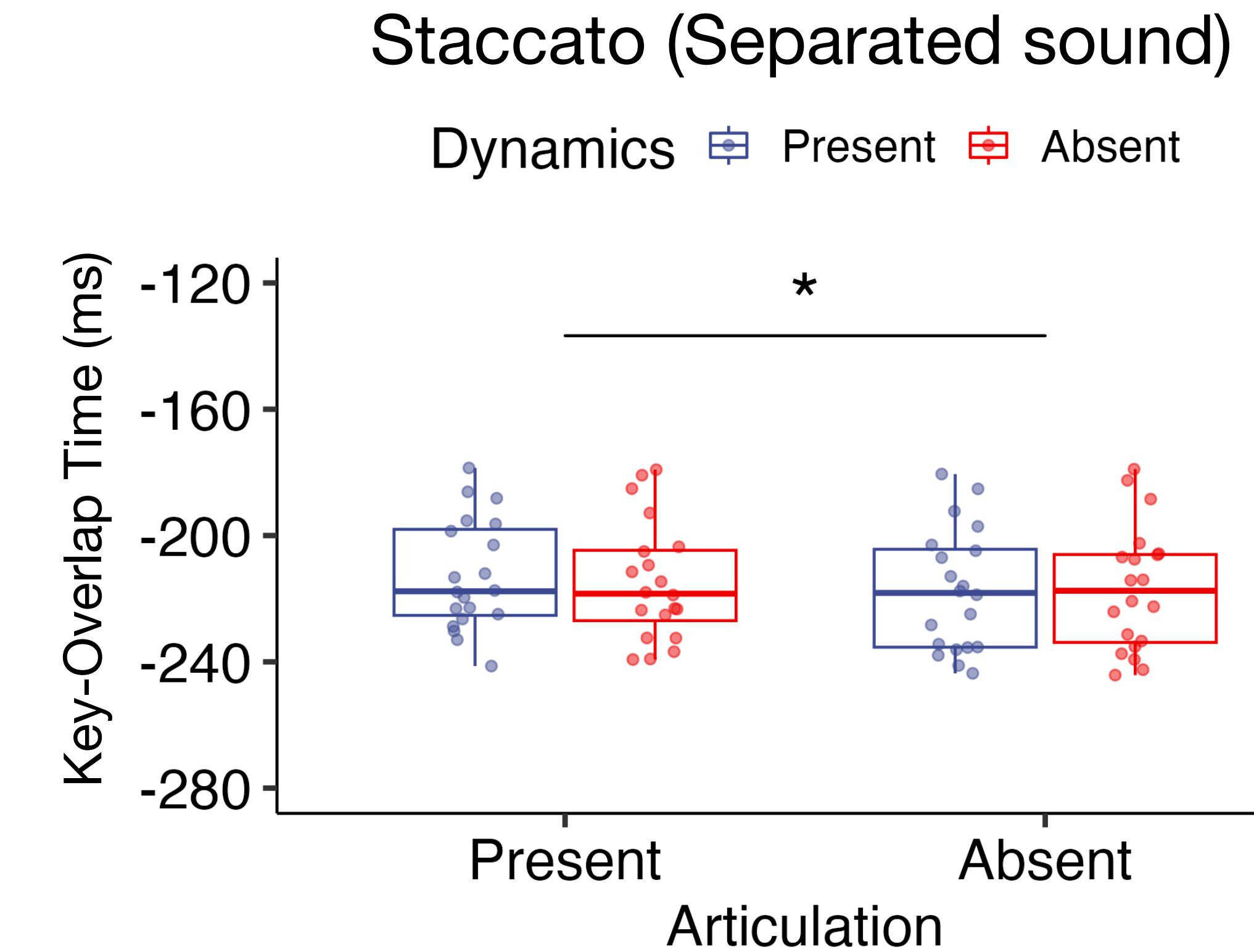
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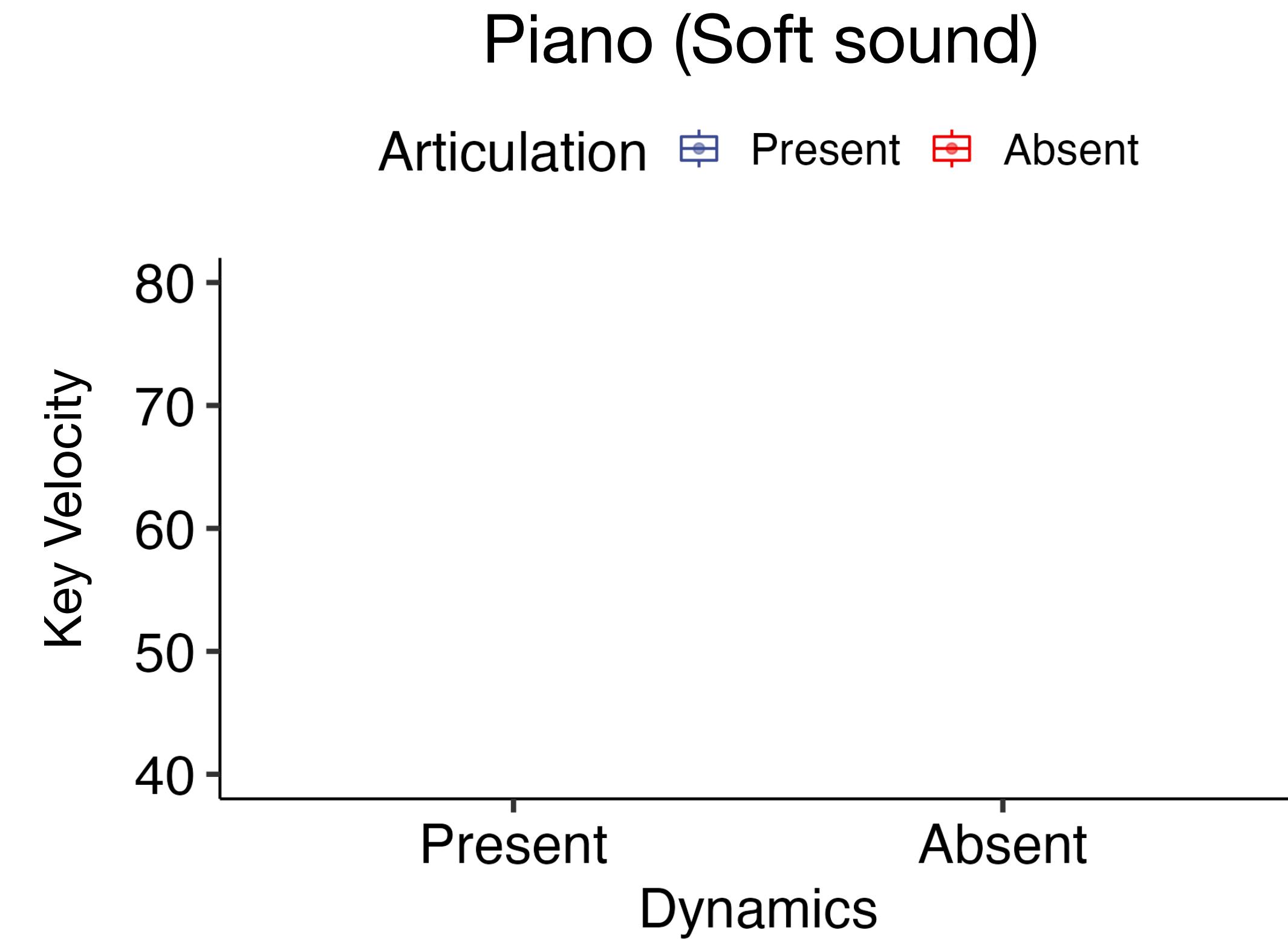
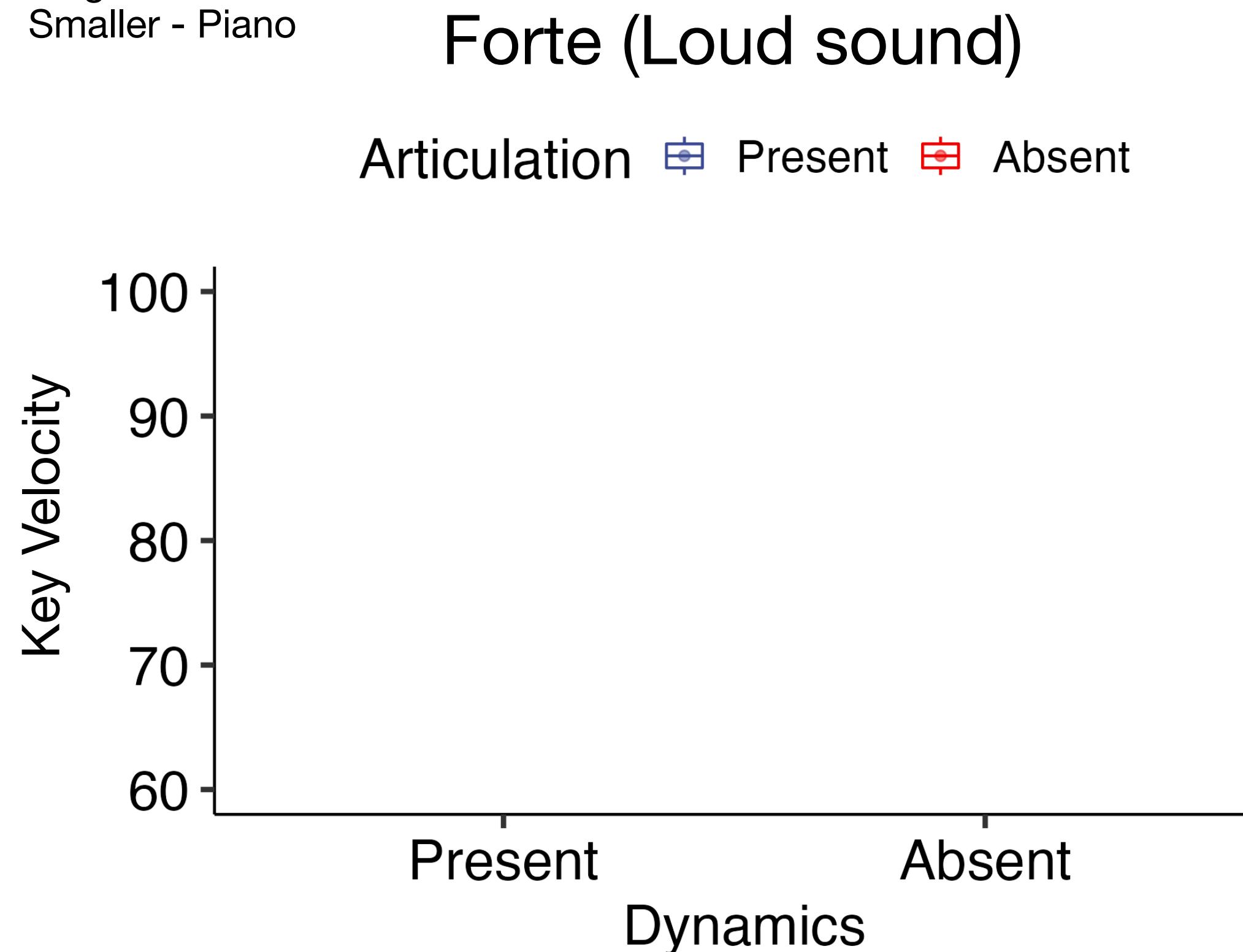
As predicted, pianists exaggerated articulation when articulation was missing



- Shorter staccato if articulation was not implemented

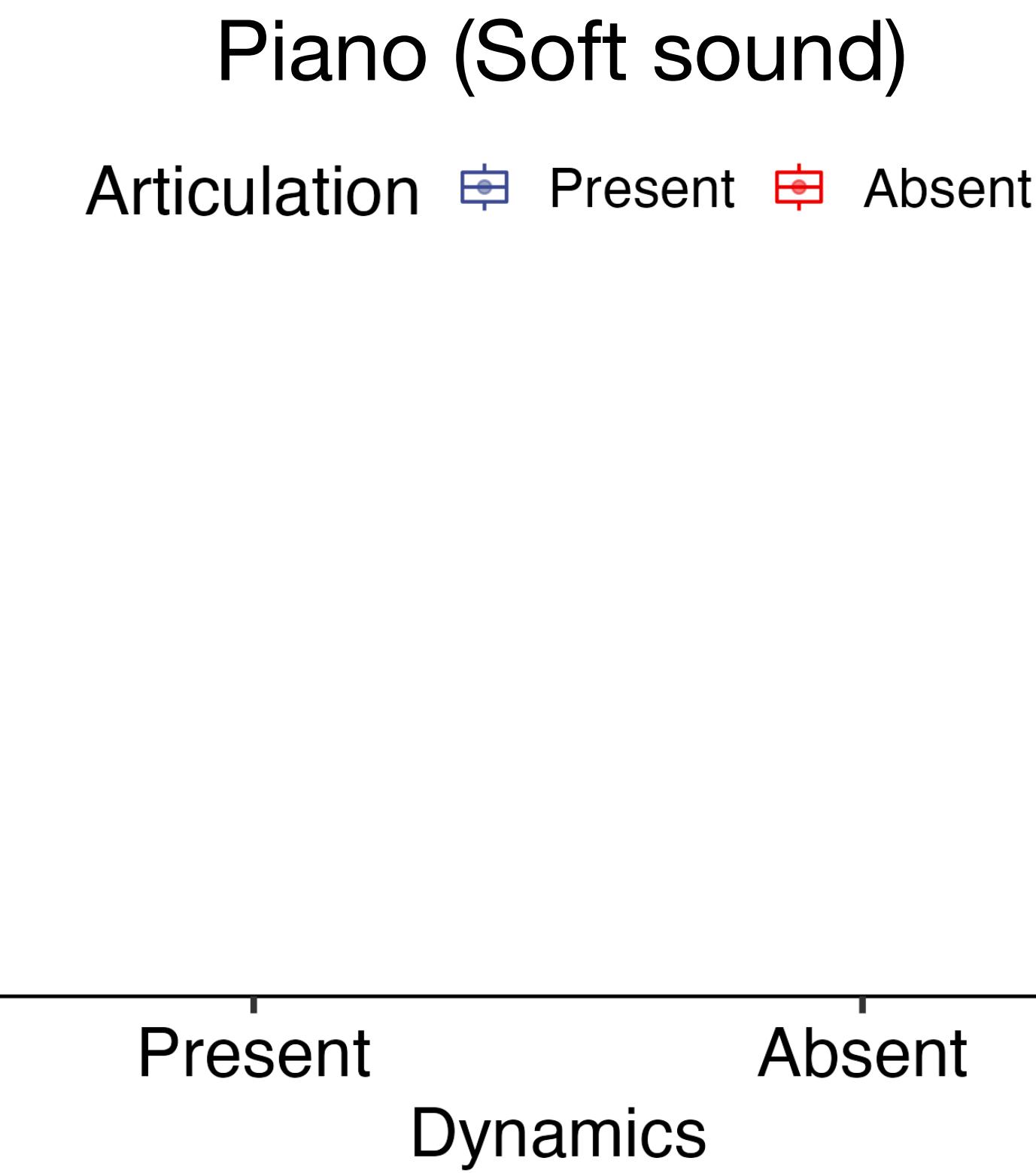
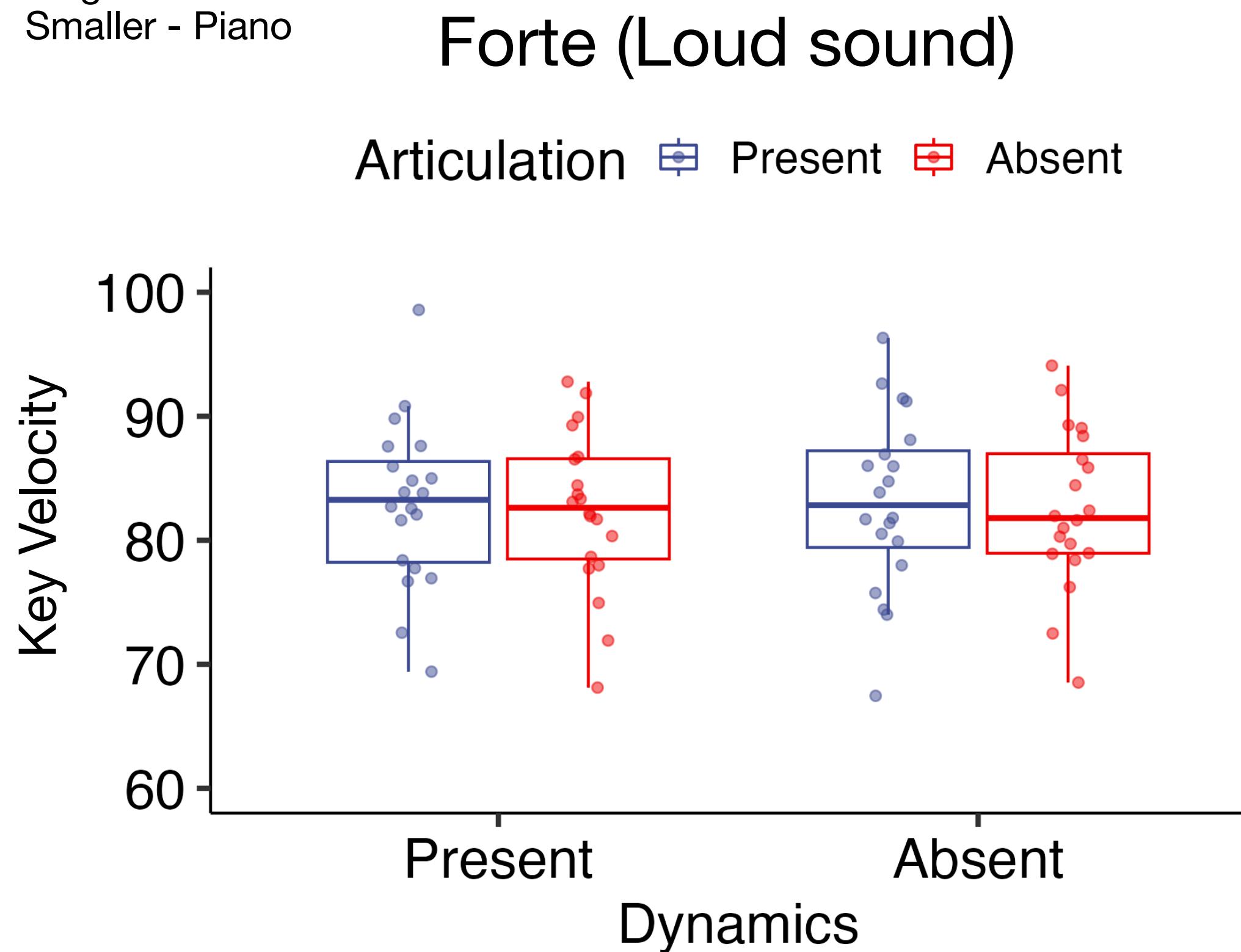
Loudness Dynamics

Key Velocity
Larger - Forte
Smaller - Piano



Loudness Dynamics

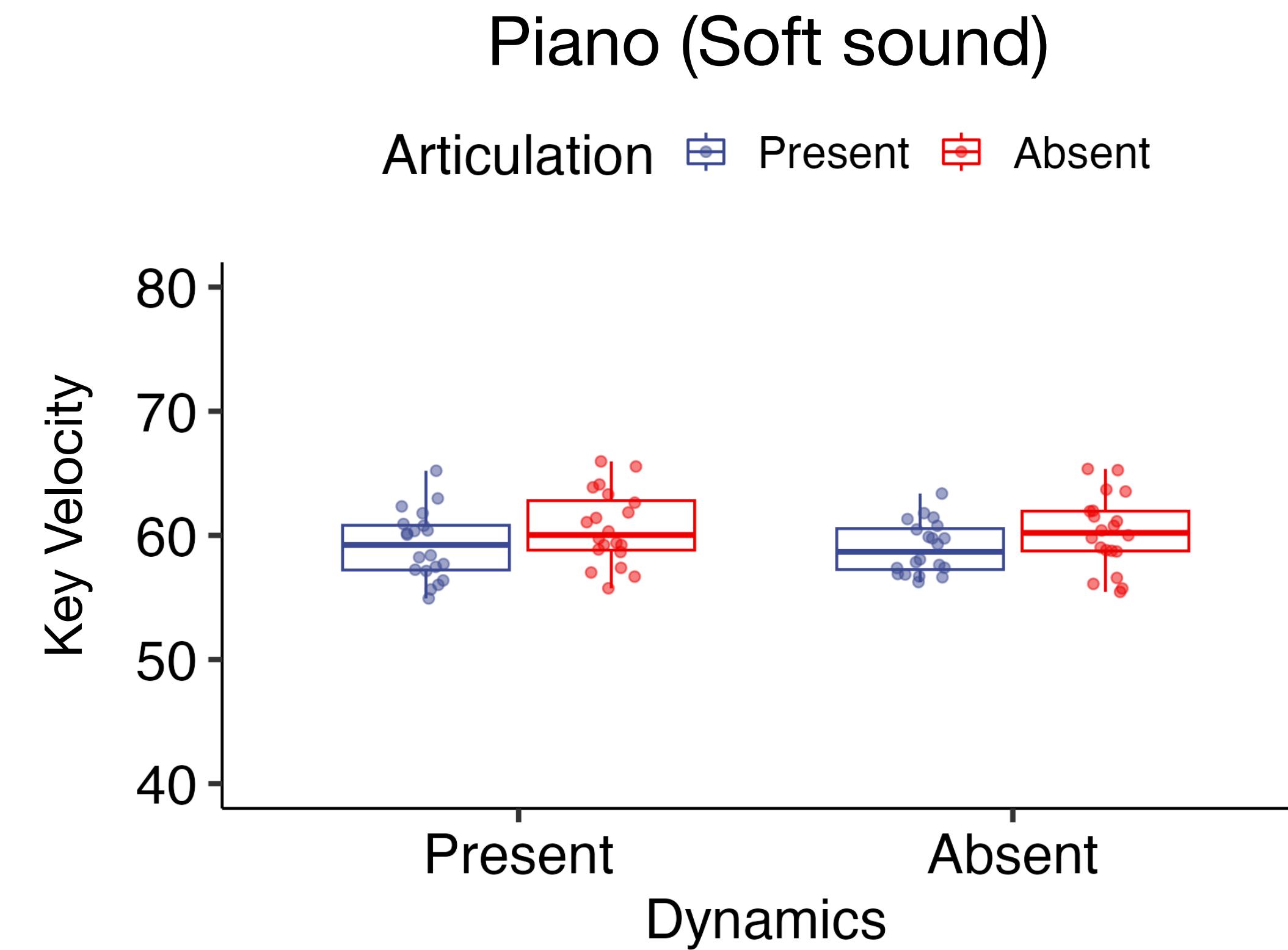
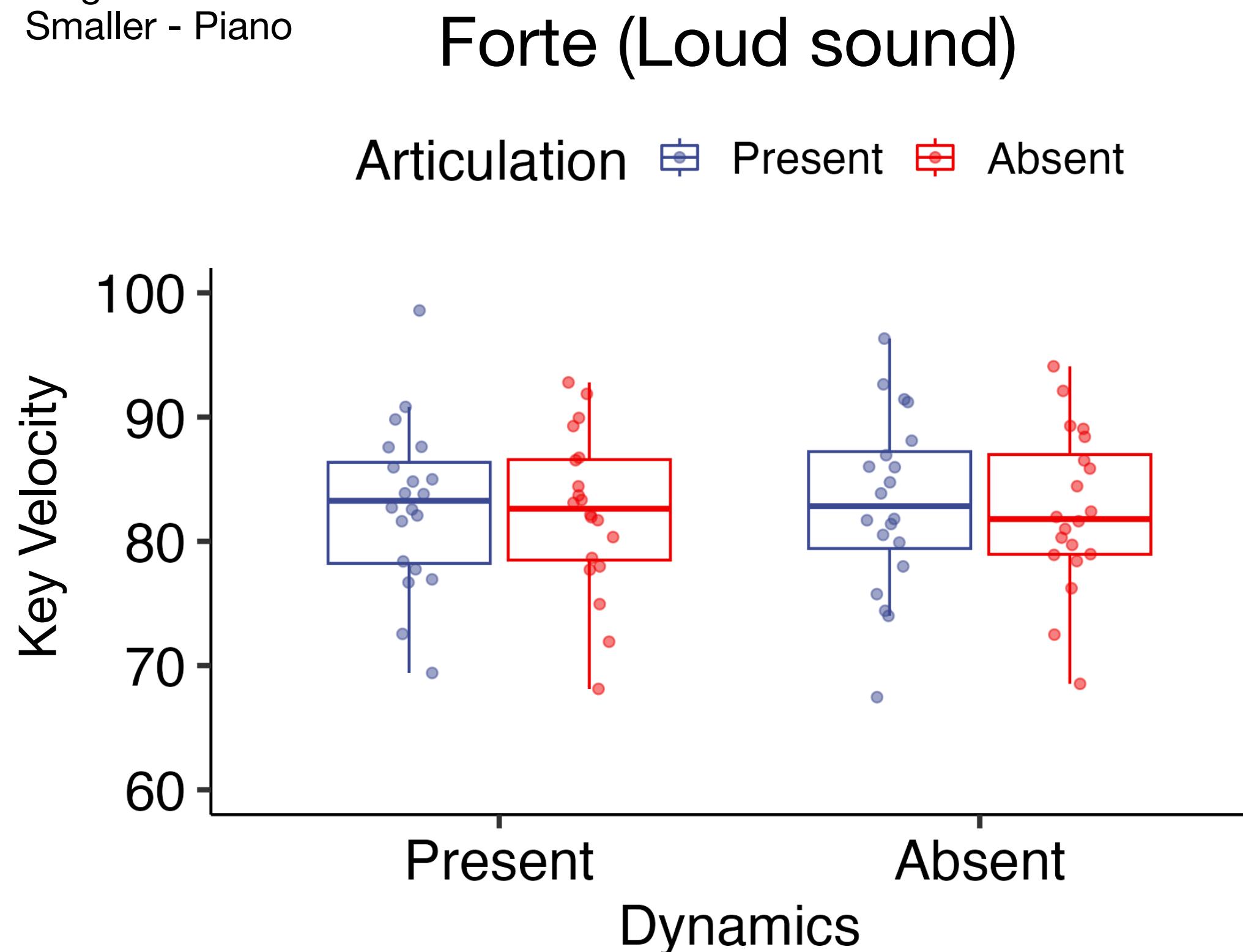
Key Velocity
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- No difference

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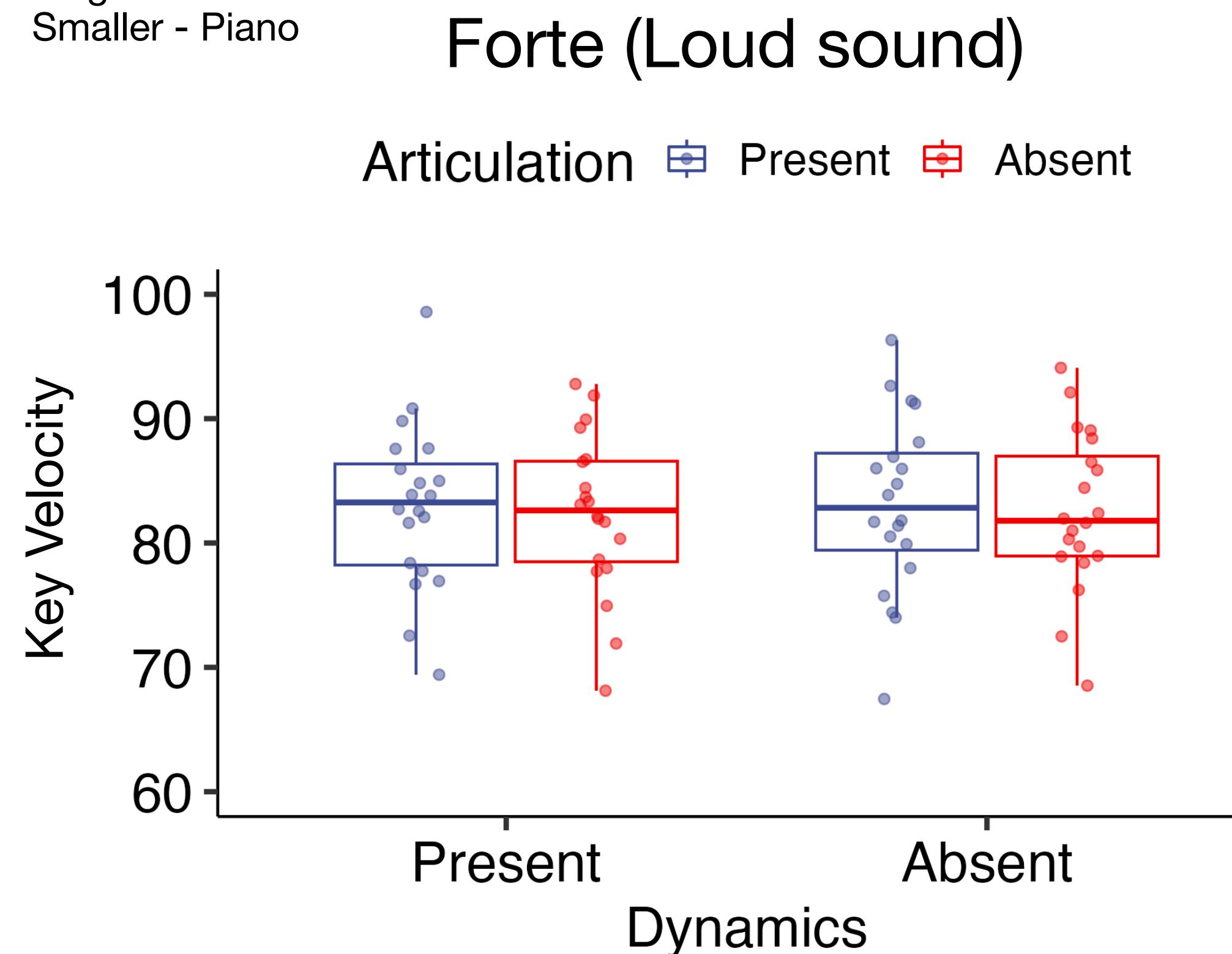


- No difference

- Softer piano only when articulation was implemented

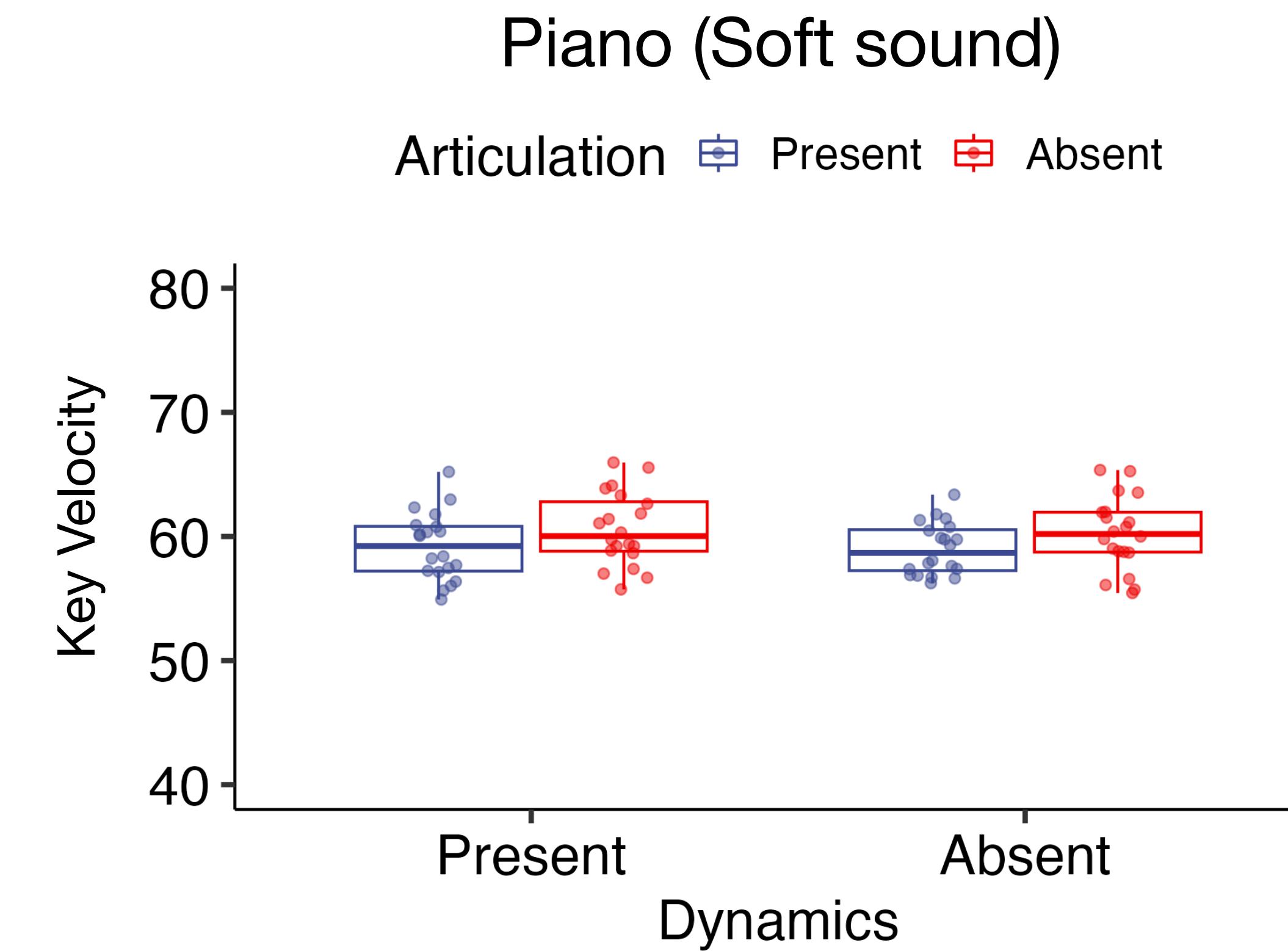
Loudness Dynamics

Key Velocity
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Unlike our predictions, pianists exaggerated dynamics only when articulation was implemented



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 - No interaction with students

Learning from others

Perceiving pedagogical intentions

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- Learning from others through pedagogical signals (Csibra & Gergely, 2009)
 - Pedagogical behavioural modulations **provide constraints** on novices' cognitive mechanisms to **narrow down the possible goals** of observed actions

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 - Some evidence in adults (e.g., McEllin et al., 2018)

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 - Some evidence in adults (e.g., McEllin et al., 2018)
- In music, exaggerated performance seems to be used to infer pedagogical intentions (Tominaga et al., *in prep*)
- How do pedagogical signals modulate novices' performance?
 - Not only attention, but also other learning processes (memory, imitation etc)

Thank you!



References

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