



General Level of Engagement of NHPs with the XBI

Antonino Calapai

Statement of significance



Cage-based, autonomous training and testing of Non-Human Primates has gained substantial traction over the last two decades. A variety of paradigms have been implemented across several NHP species and experimental settings.

However, in order to achieve high throughput, standardized training and testing across species and experiments it is important to first establish: 1) the level of general engagement with the paradigms; 2) how consistently animals interact across consecutive sessions; 3) how these two are affected by potential changes in task difficulty.

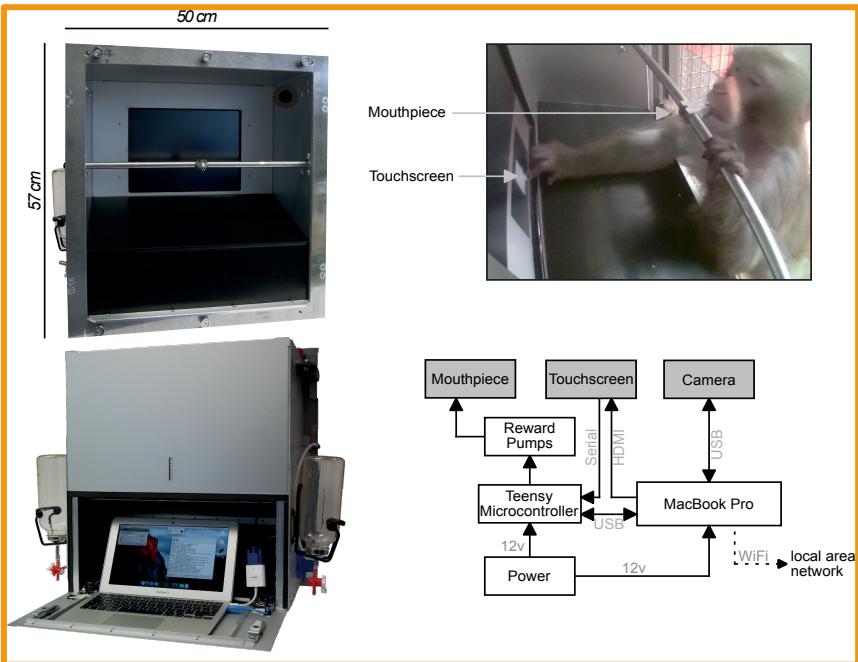
Here I report the level of engagement of three different species of NHP across different experiments, while quantifying changes in engagement as a function of changes in difficulty and trial outcomes.

Results reveal that the level and quality of engagement with cage-based devices: a) varies across species; b) remains relatively stable across multiple sessions; and c) for some species it is modulated by changes in difficulty.

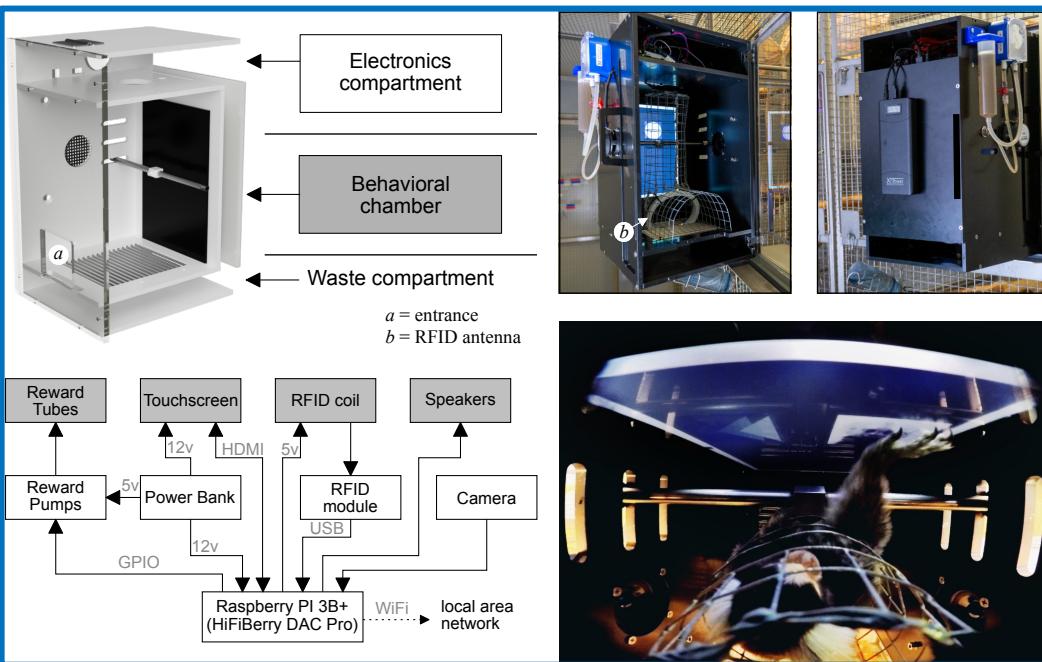
The Experimental Behavioral Instruments (XBI) in use at the DPZ



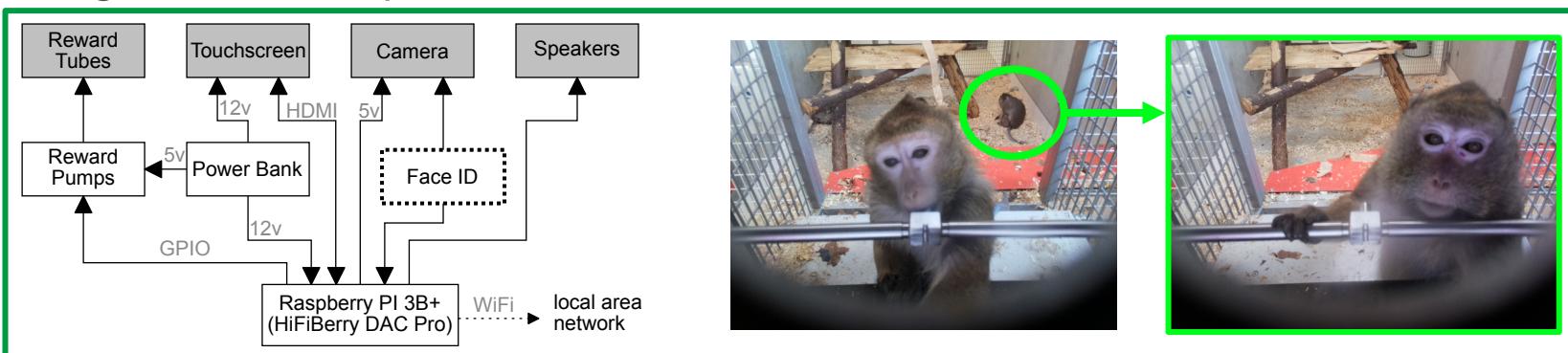
Rhesus Macaques



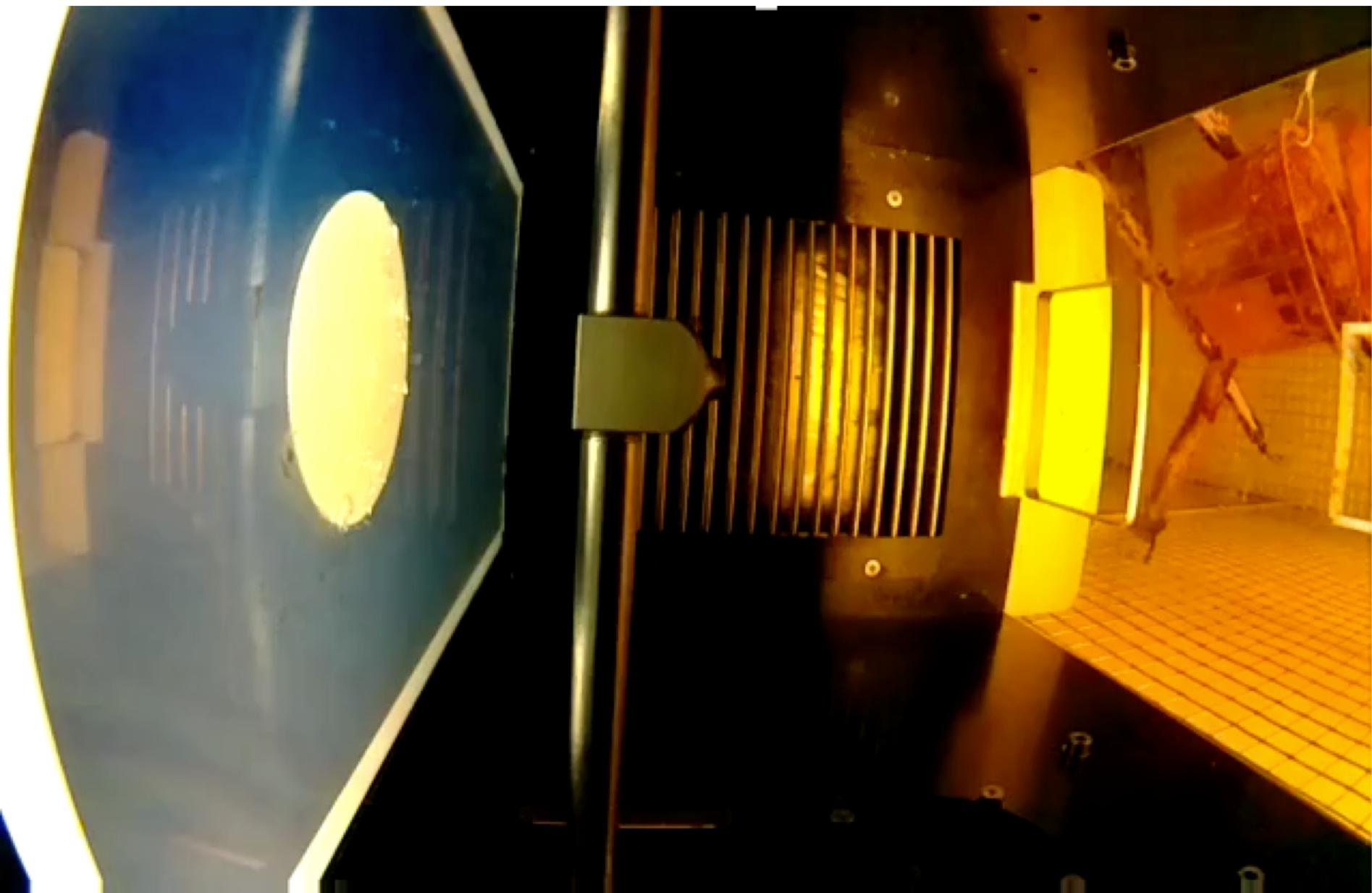
Common Marmosets



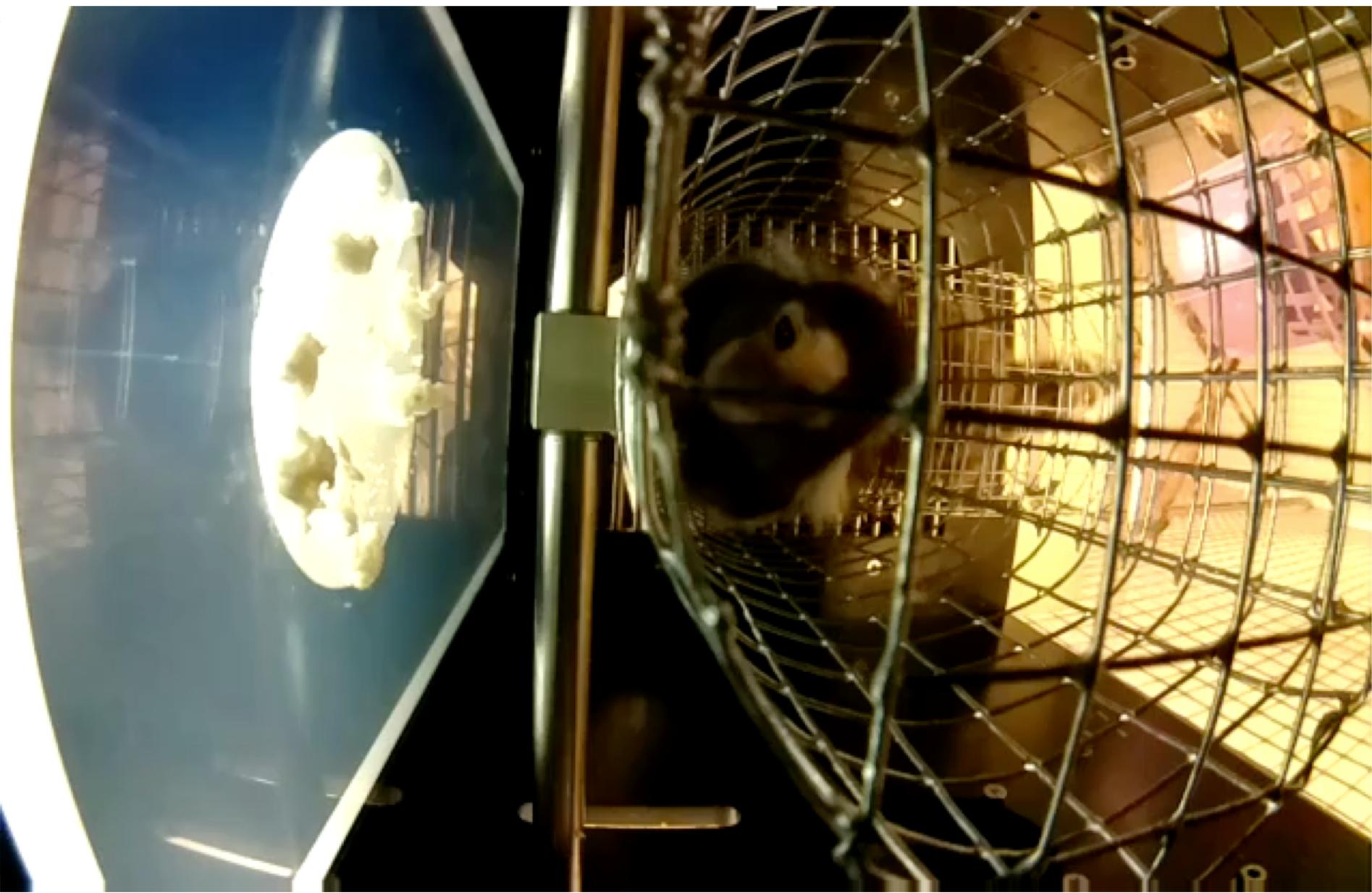
Long-tailed Macaques



Marmoset XBI – shaping phase 1 (~2 sessions)



Marmoset XBI – shaping phase 2 (~3 sessions)

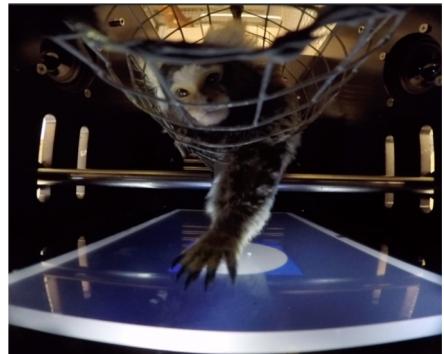


Marmoset XBI – 2AC Experiment



Experimental conditions

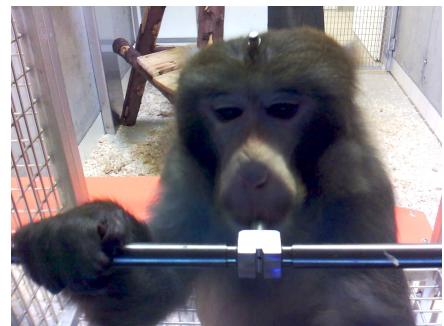
Marmoset



- In group (N = 12, 6 groups, *RFID*)
- Exp. 1: Automated Unsupervised Training (2AC)
- Exp. 2: Visuo-Acoustic Discrimination Experiment
- 1 to 5 hours session duration

Jorge
Cabrera-Moreno
(CHiP)

Rhesus



- Isolated (N = 11)
- Exp. 1: Automated Unsupervised Training (4AC)
- Exp. 2: Reversal Learning Experiment
- 1 to 3 hours session duration

Pinar Yurt
(CNL)

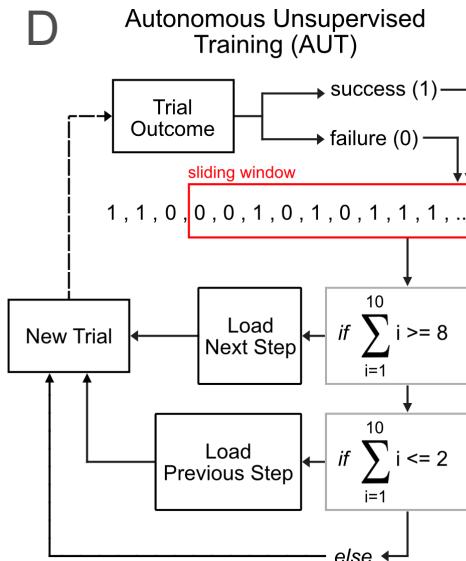
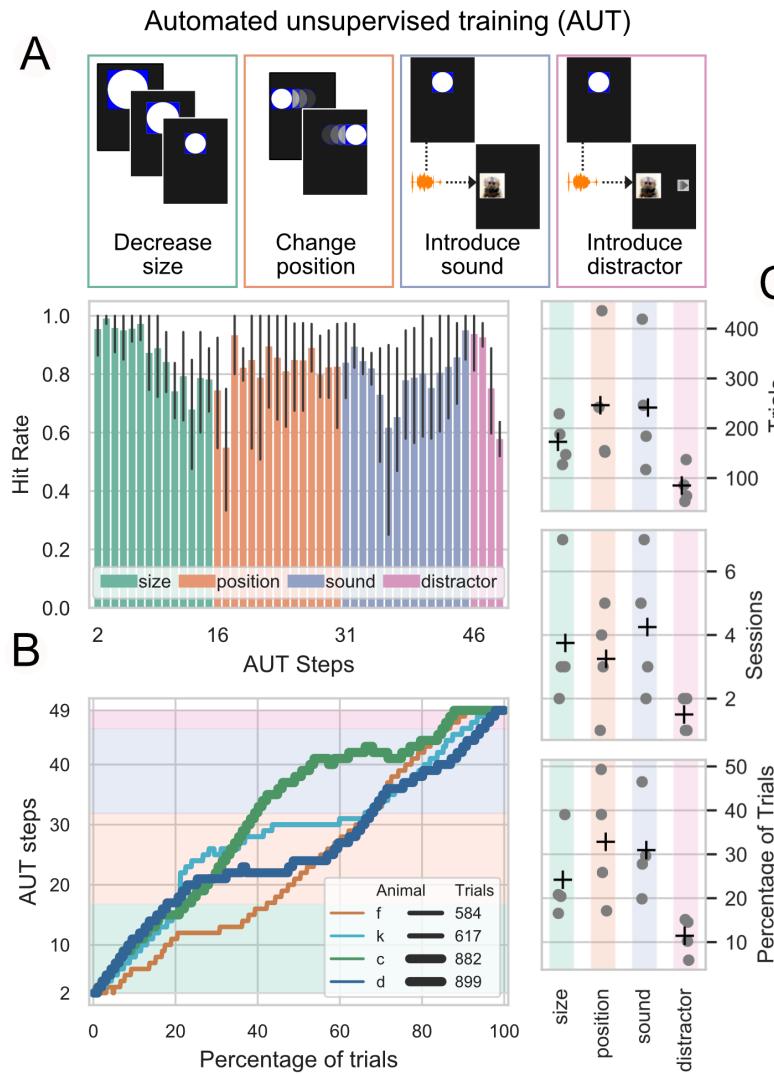
Long-tailed



- In group (N = 6, 2 groups, *Face ID*)
- Exp : Automated Unsupervised Training (2AC)
- 1 to 3 hours session duration

Lena Jeanson
(FIL)

.. wait a moment, what is an automated unsupervised training (AUT)?



Outline of analysis and results



1) General level of Engagement

- How much do the animals interact with the XBI?
- Is the engagement consistent across sessions?

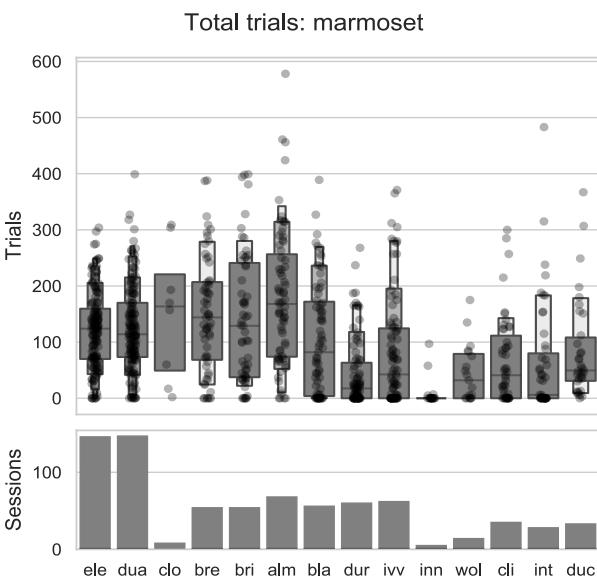
2) Session Engagement

- At what point of the session are most of the trials performed?
- What is the interaction rate? Is it comparable in training and testing?

3) Interaction “attitude”

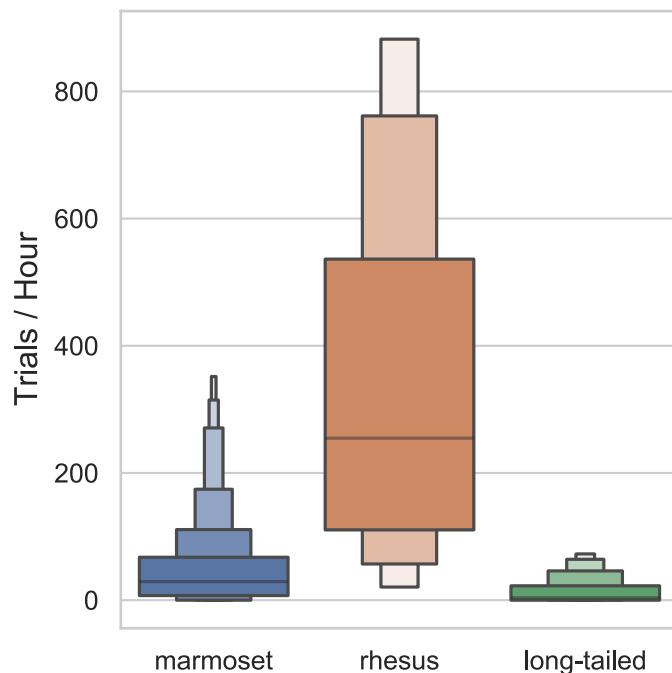
- What is the likelihood of initiating a new trial after a rewarded trial vs a non-rewarded trial? (e.g. *frustration*)
- How changes in difficulty affect engagement? (e.g. *effort*)

1) General level of Engagement

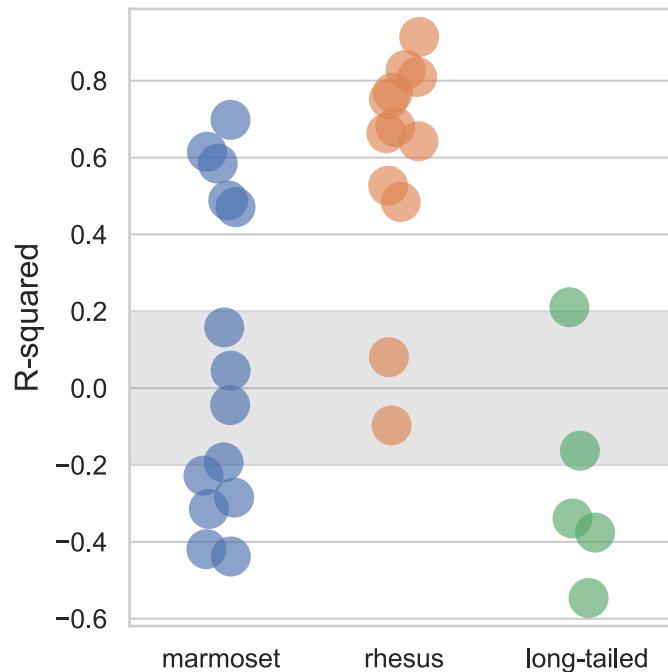


1) General level of Engagement

How much do the animals interact?



Rate of interaction
consistent across sessions?



- Rhesus interacted more often
- Marmoset and long-tailed have comparable rate of interaction

- Rhesus' engagement increases
- Long-tailed's engagement decreases
- Marmosets' engagement varies

Outline of analysis and results



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2) Session Engagement

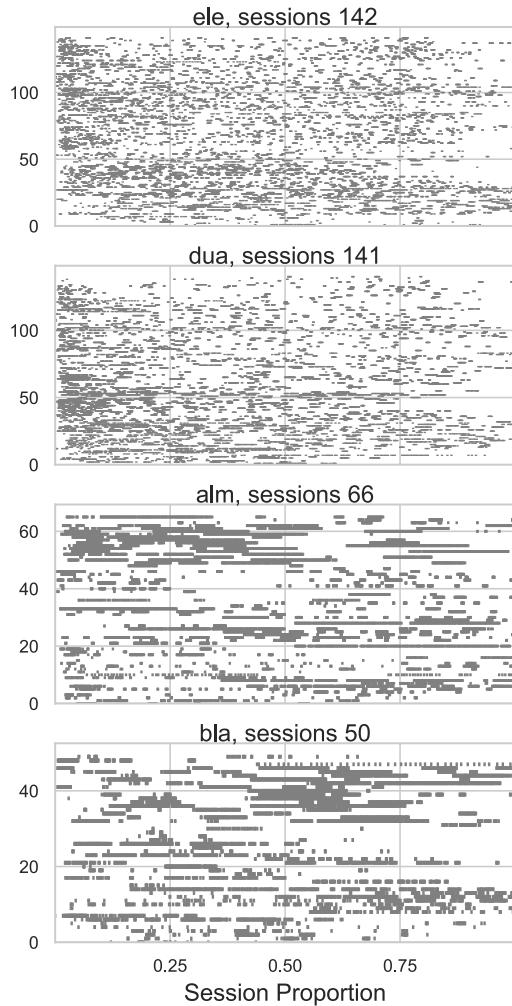
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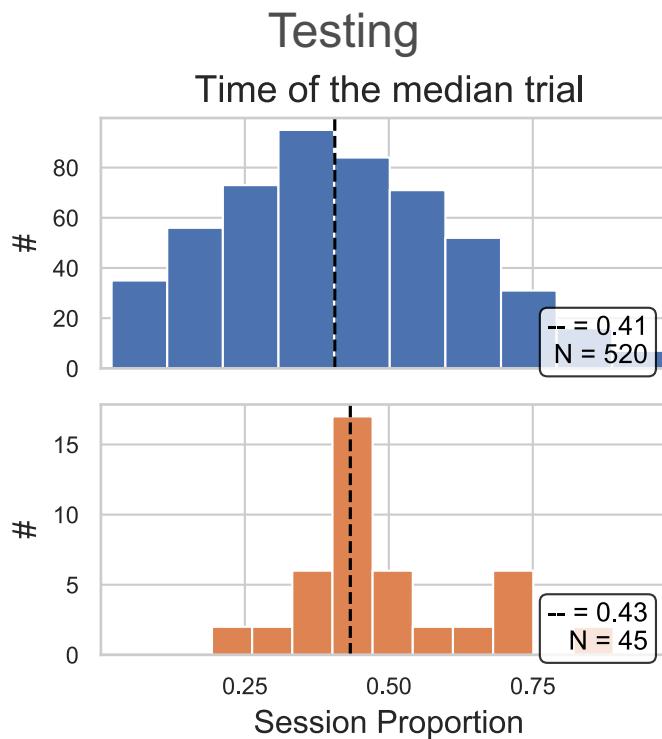
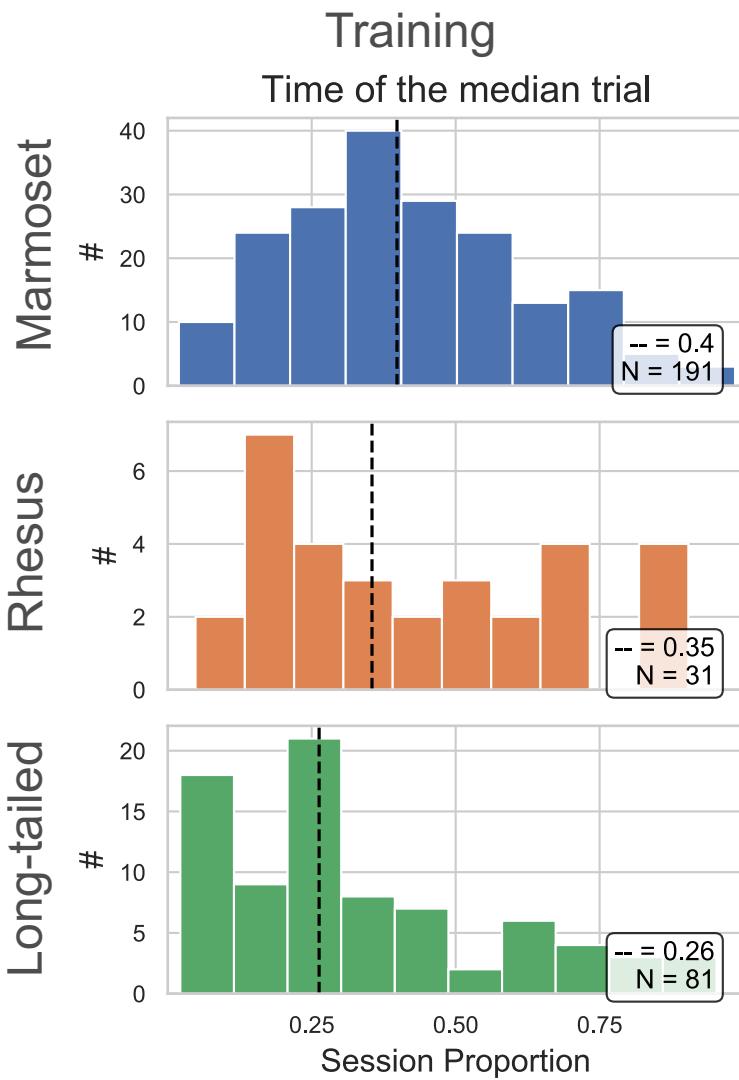
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2) Session Engagement

Marmoset



2) Session Engagement



- Marmoset interact consistently
- Macaques interact mostly at the beginning in training sessions (first third of session)
- Rhesus interact consistently in the experiment

Outline of analysis and results

1) General level of Engagement

- How much do the animals interact with the XBI?
- Is the engagement consistent across sessions?

2) Session Engagement

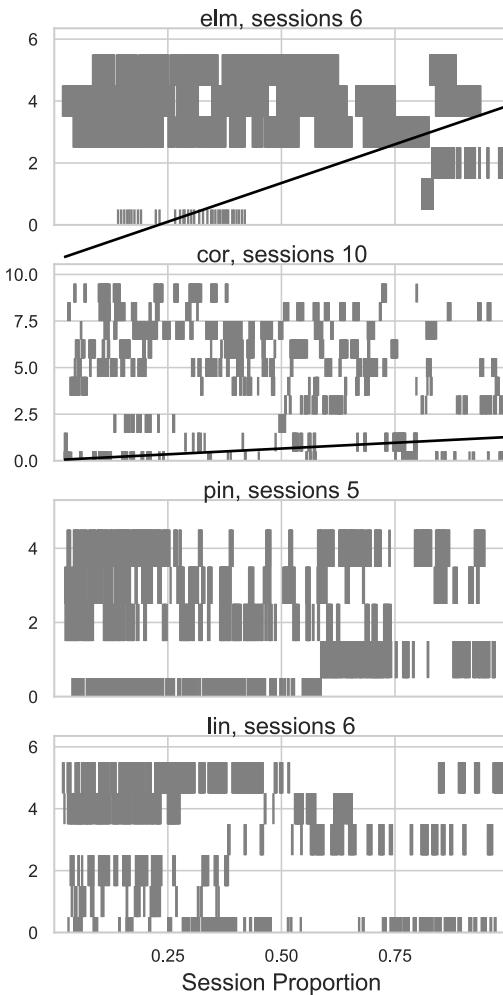
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3) Interaction “attitude”

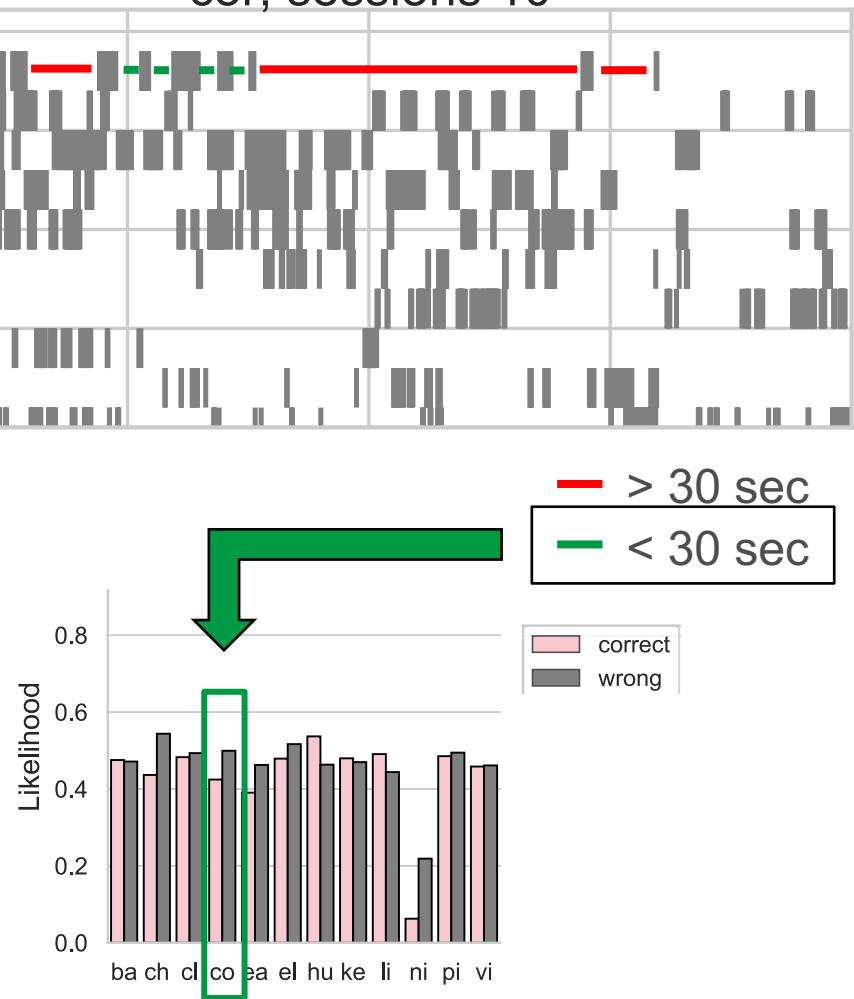
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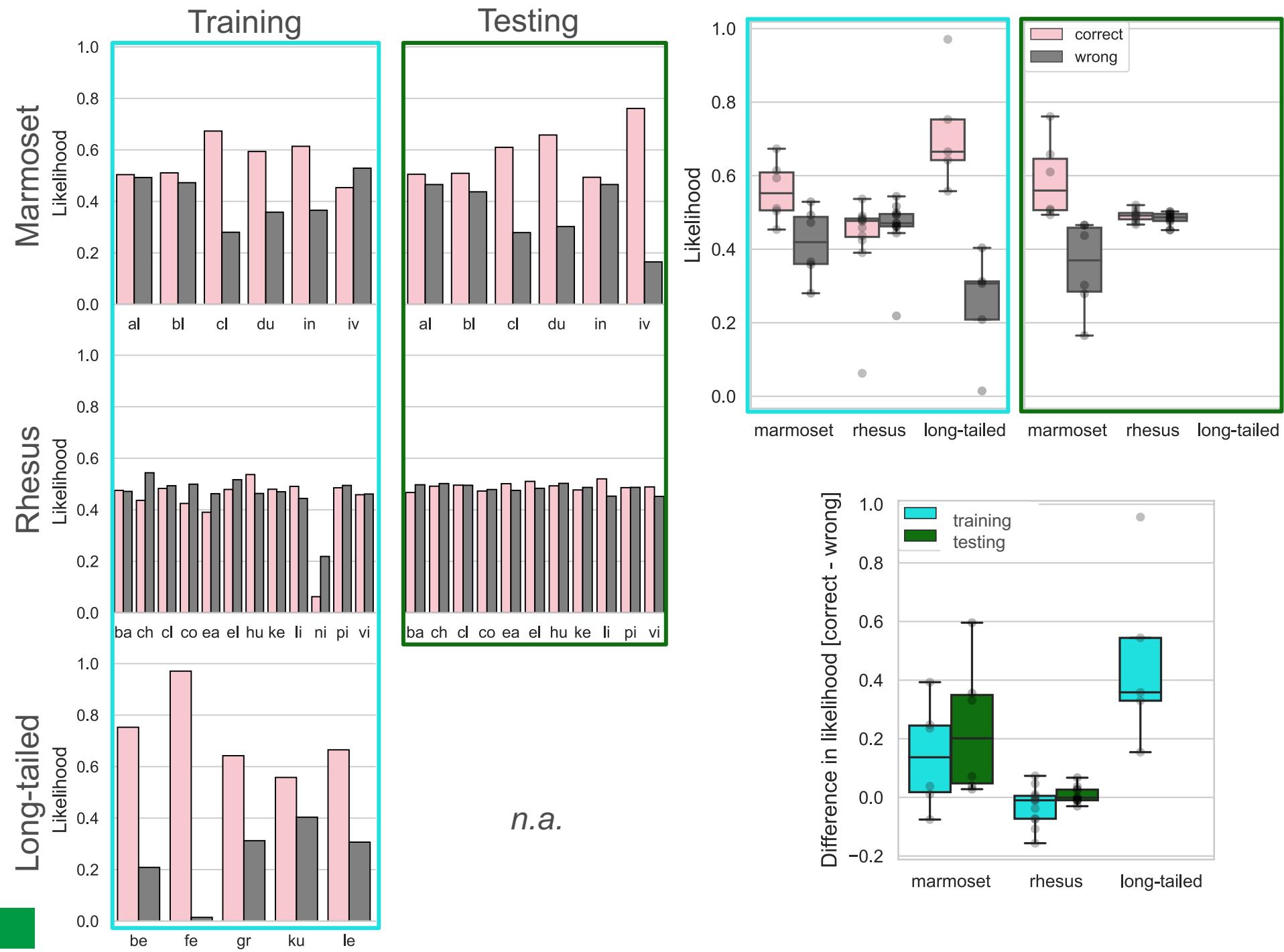
3) Interaction “attitude”: likelihood of initiating a trial after a correct vs a wrong response

Rhesus

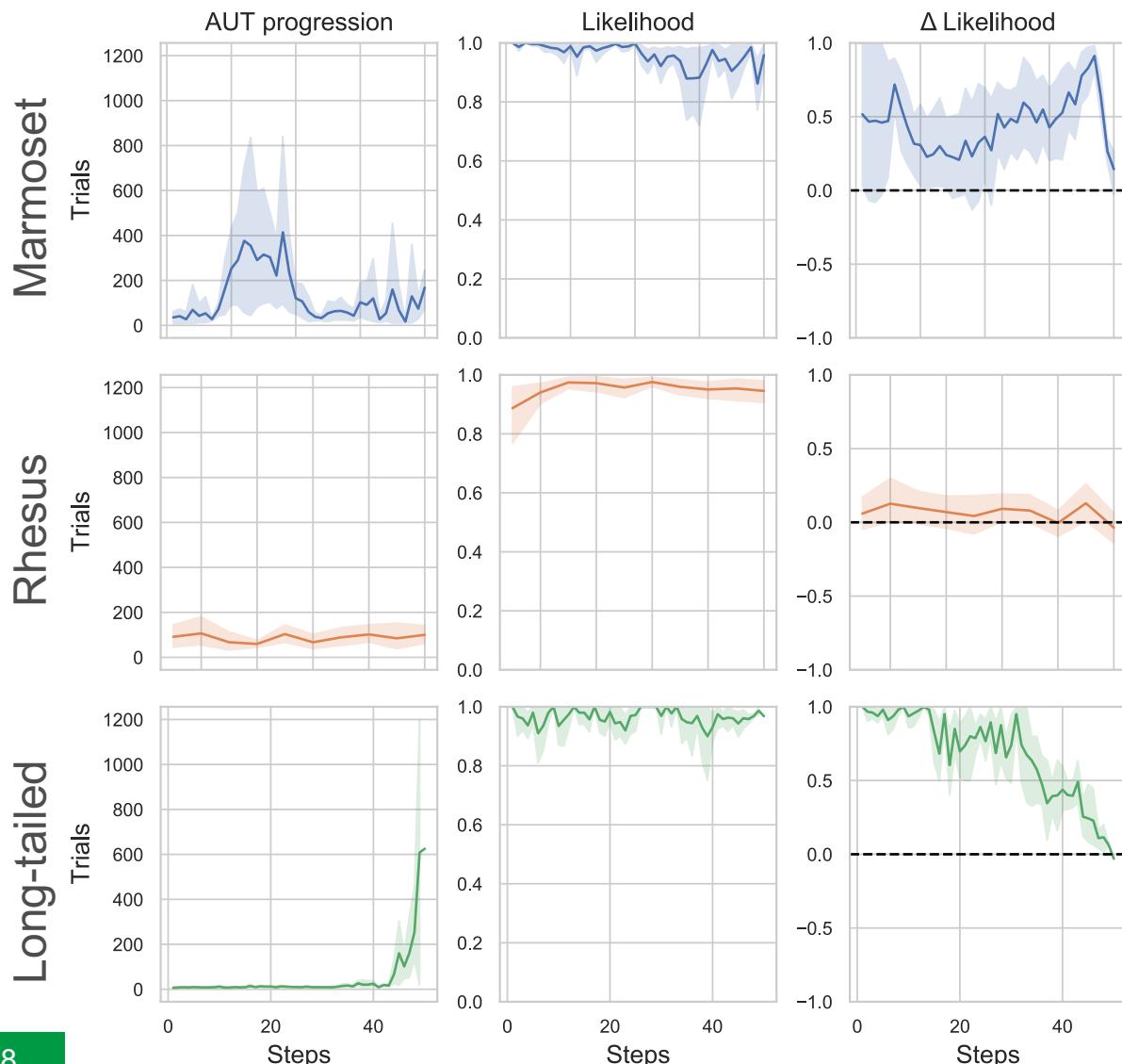


cor, sessions 10





3) Changes in difficulty vs likelihood of new trial



- Increase in task difficulty does not affect the likelihood of interacting
- Changes in task difficulty increase the likelihood of interacting after no-reward (long-tailed)
- Rhesus could not care less about previous trial outcome

Summary, conclusions, and weaknesses



▪ General Engagement

- Almost all animals, across species, task type, and experimental settings spontaneously interacted with the device.
- The engagement remains stable if the level of challenge is adequate, but it is nonetheless variable between individuals

... wait a moment!!

▪ Problem 1

- These tasks are too different, there are too many confounds..

▪ Problem 2

- Rhesus' cheated (no fluid, no companion)

▪ Problem 3

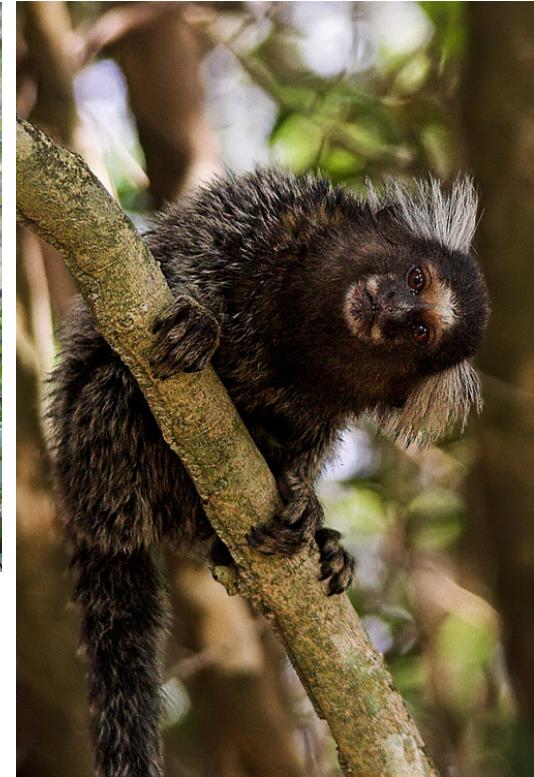
- ...

▪ In-Session Engagement

- With the exception of Long-Tailed macaques, animals regularly interact with the device, independently on the session duration

▪ Interaction "attitude"

- Task difficulty as well as trial history modulate interaction rate.
- More work on this will follow...



Thanks

Rhesus' engagement data

