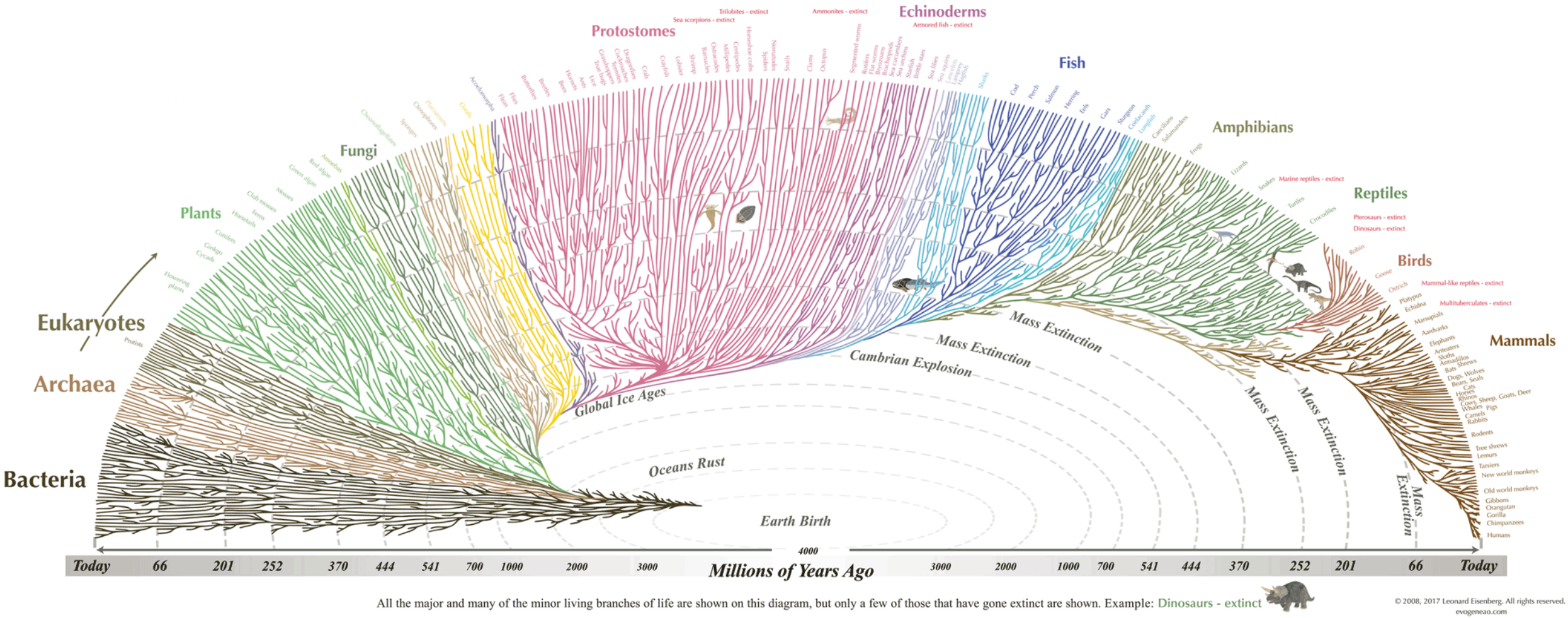
COGS 143:
Behavioral Variation in Primates across and within species

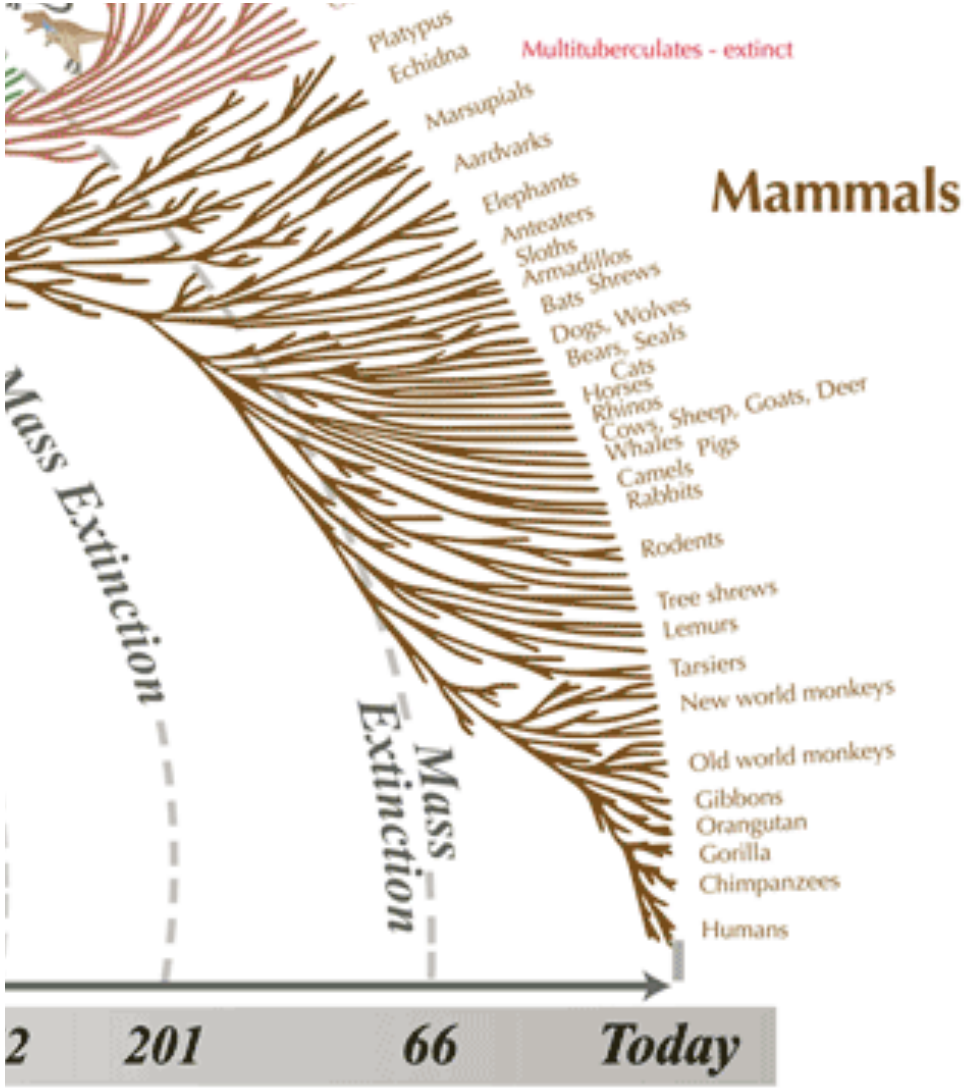
Stephan Kaufhold

Phylogenetic Tree

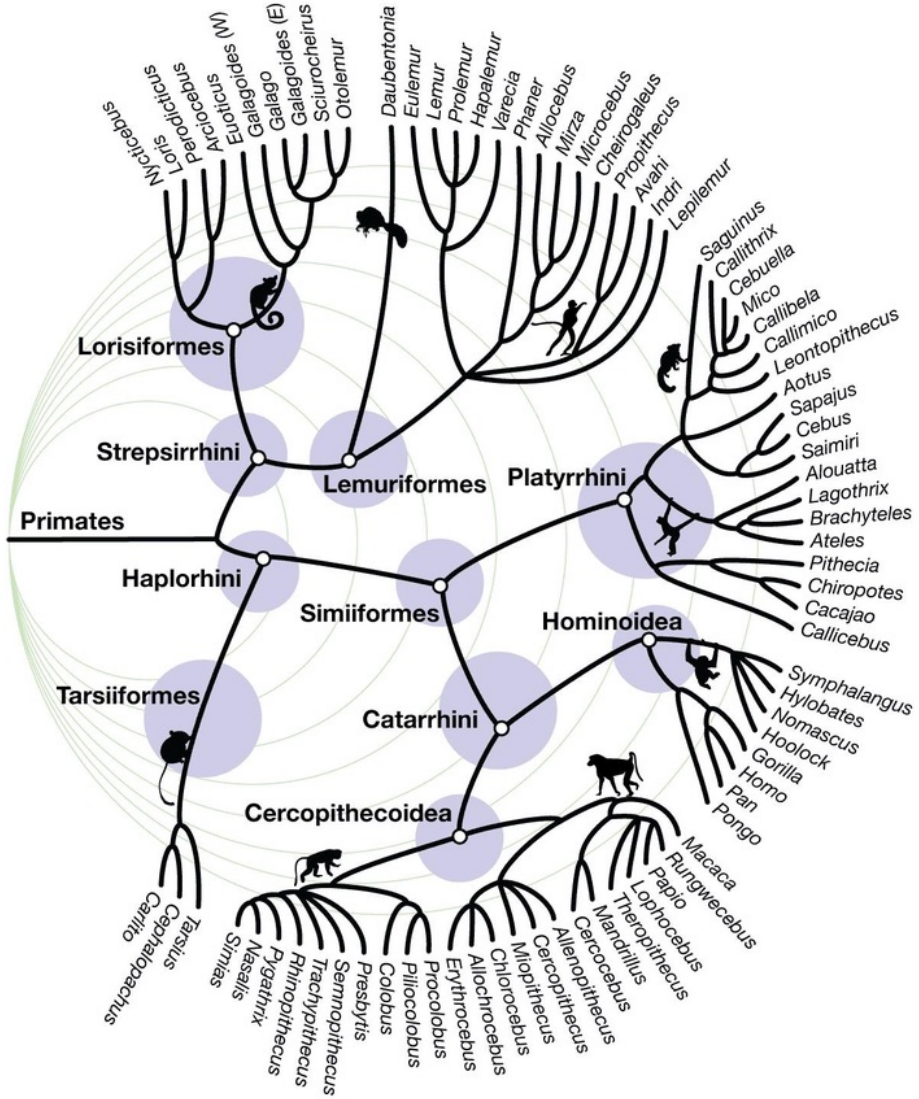


All the major and many of the minor living branches of life are shown on this diagram, but only a few of those that have gone extinct are shown. Example: Dinosaurs - extinct

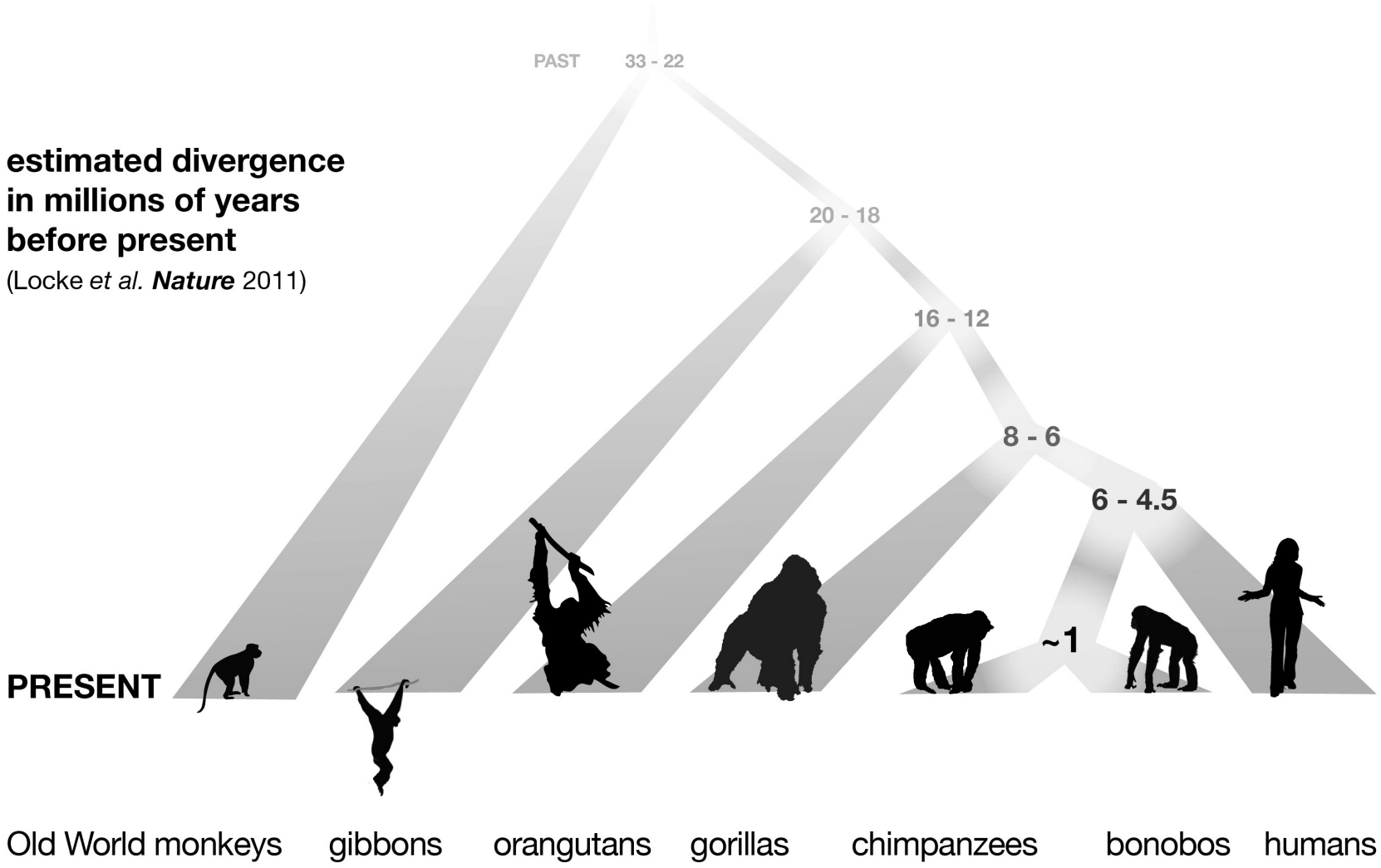
Phylogenetic Tree

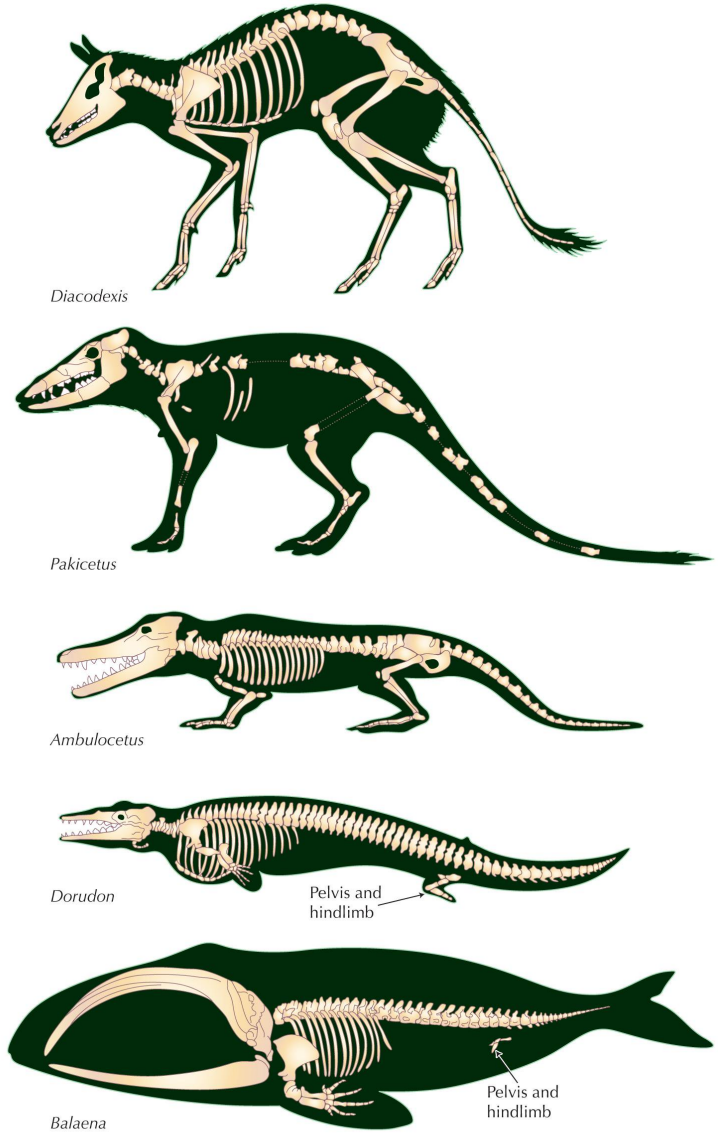


Primate Phylogeny



Primate Phylogeny





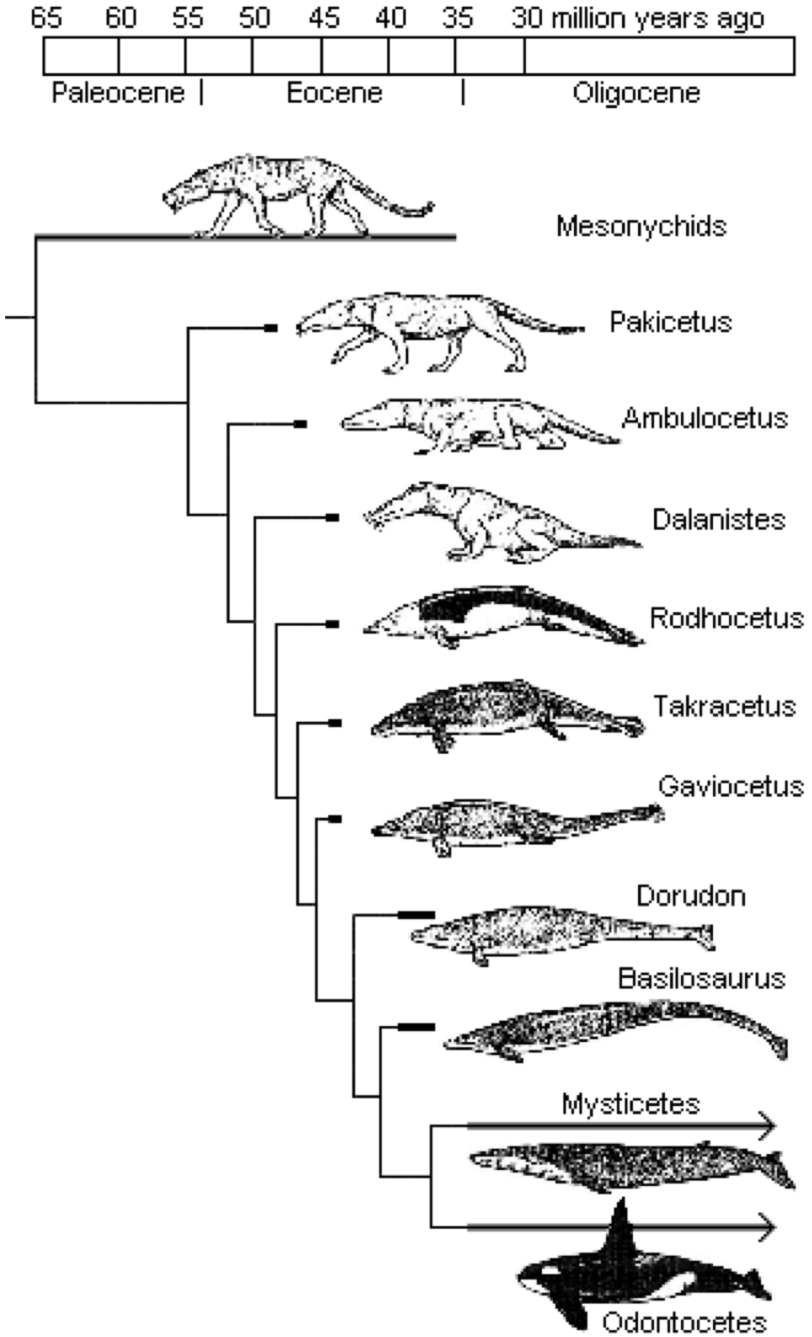


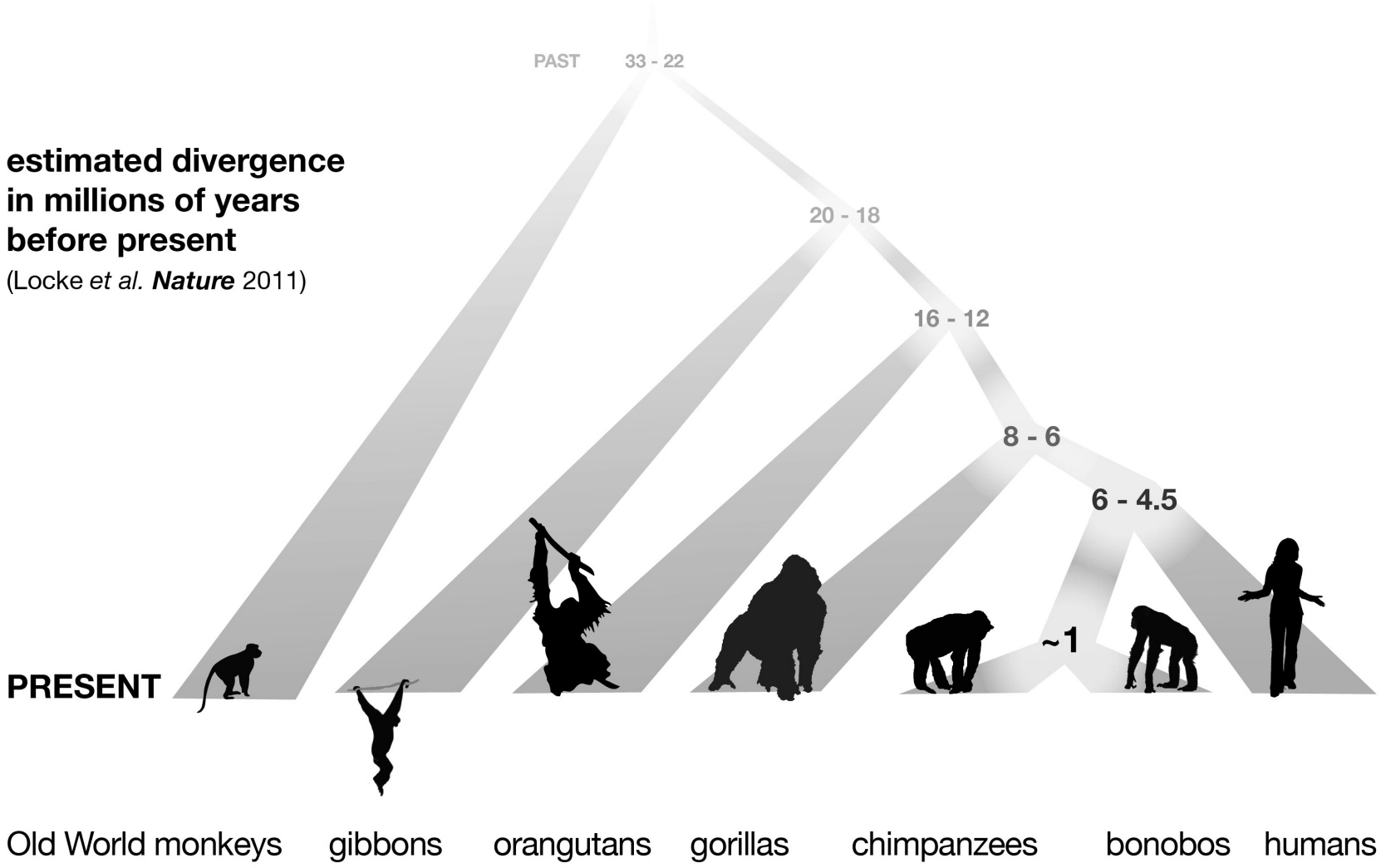
FIGURE 3.18. A series of fossils from the Eocene (~50 Mya) hippo-like artiodactyl (*Diacodexis, top*) to a skeleton of the modern whale (e.g., *Balaena, bottom*) shows how mammals adapted to life in the sea. Among the most important changes, the pelvis and hindlimbs were reduced, the tail was lengthened for swimming, and the jaws were modified for feeding on plankton.

3.18, redrawn from de Muizon C., *Nature* **413**: 259–260, © 2001 Macmillan, www.nature.com

Behavior Does Not Fossilize!

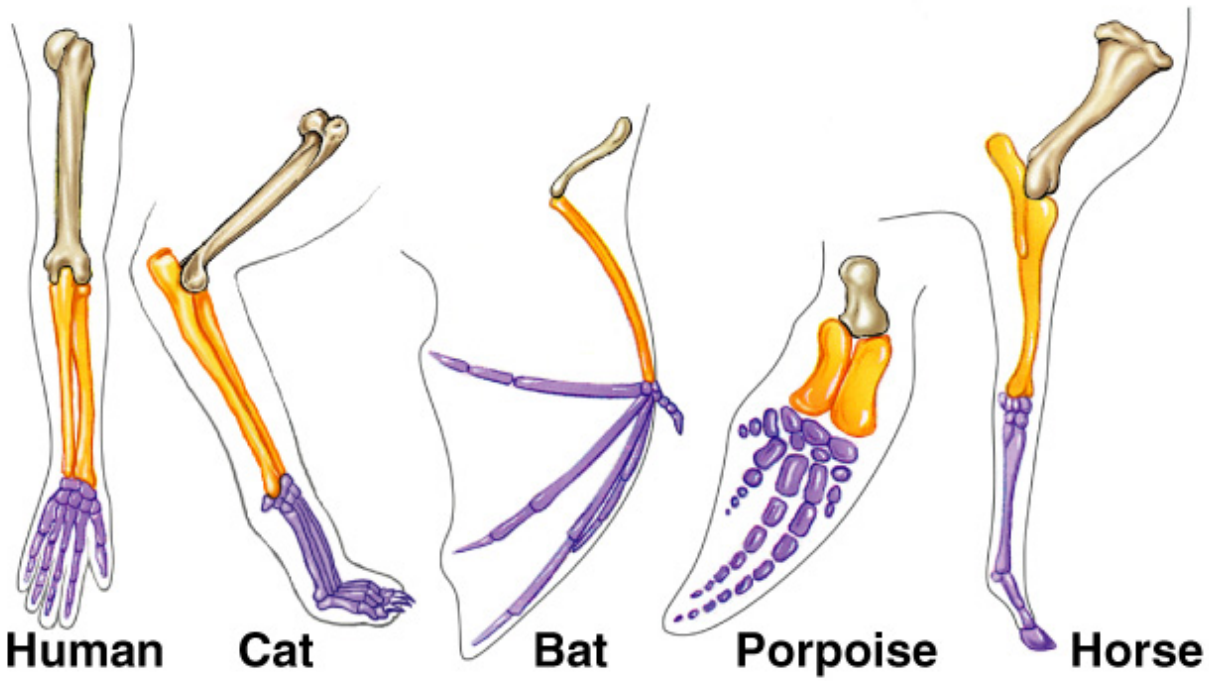
- And we don’t have time machines.
- Luckily, there is the comparative approach!

Primate Phylogeny



Homology

= **similarity of structures** found in different species that can be explained by their **common descent** from a shared ancestor



Analogy

= structures with **similar function** and superficial resemblance but **different evolutionary origins**

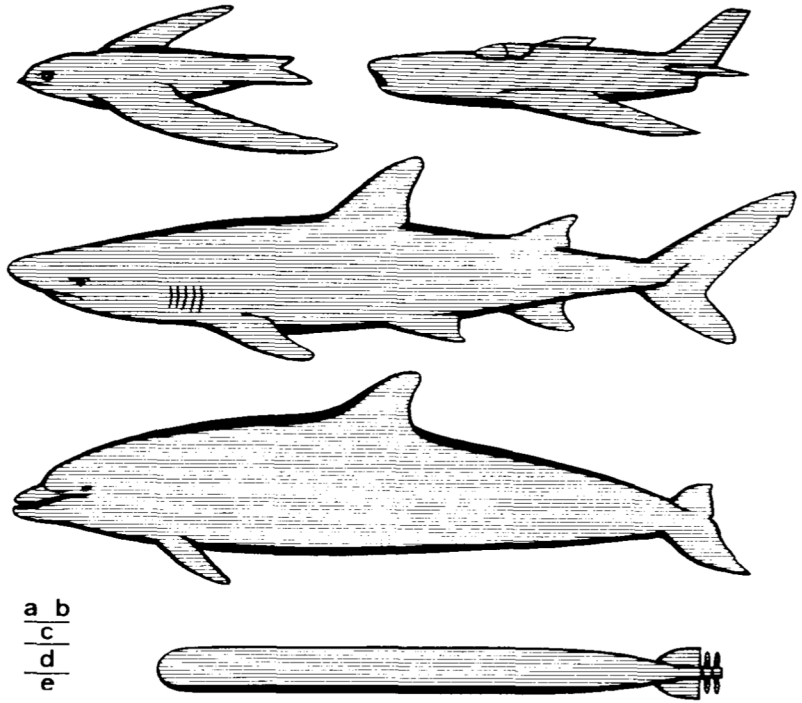
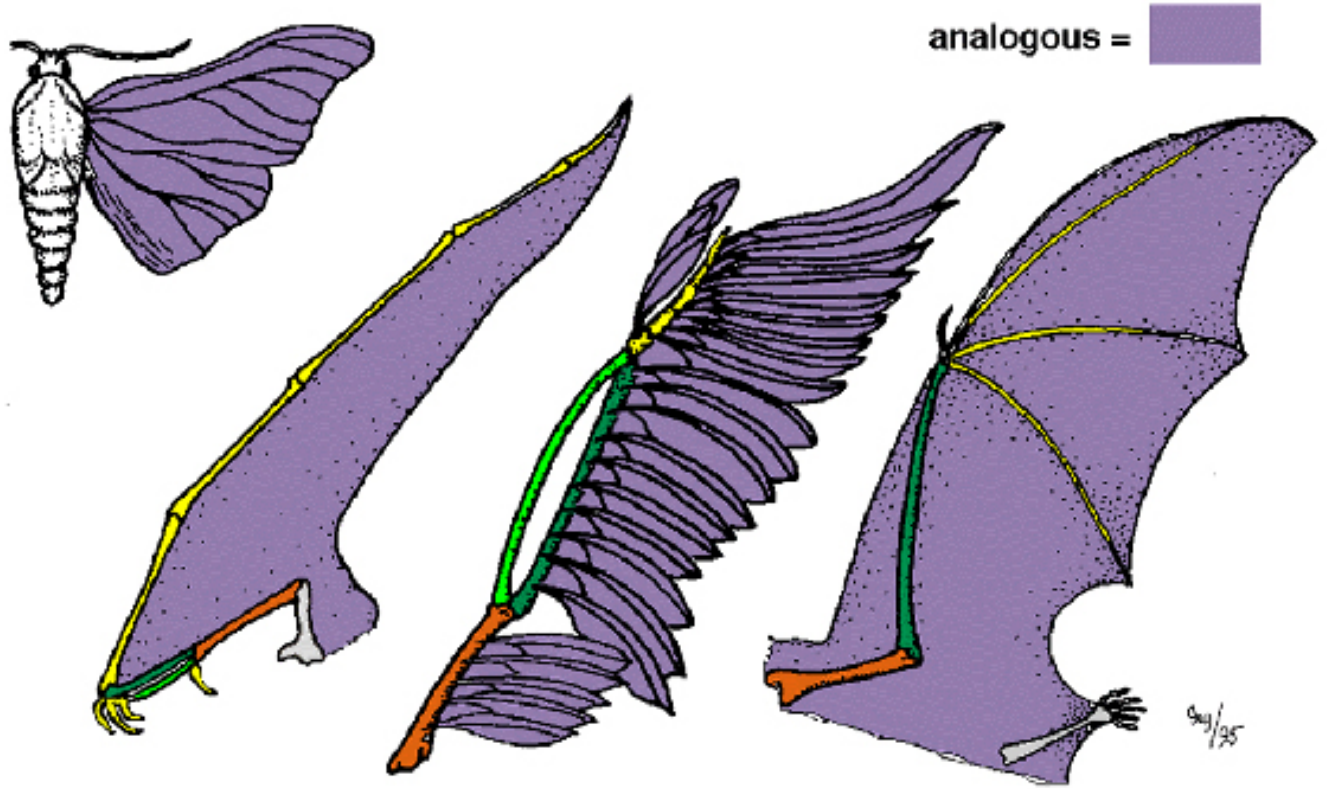


Fig. 1. Analogy of form due to adaptation to an identical function. Streamlining in a) a swift, b) a fighter plane, c) a shark, d) a dolphin, e) a torpedo.



Project 1: Social Attention in Gibbons

Social Attention in Gibbons

- Gibbons are the least studied ape
  - Difficult to get appropriate sample sizes because they are pair-bonded apes (no big groups, less social)

- Attention-following (or gaze-following) is a basic socio-cognitive skill and a prerequisite for more sophisticated forms of social cognition
  - documented in many species in the primate order (e.g., ring-tailed lemurs, capuchin monkeys, rhesus macaques, hominids)

- Is this a **product of convergent evolution to social complexity or a product of homology**, i.e. a product of shared descent among primates?

Subjects

Eastern Hoolock Gibbon

Hoolock leuconedys

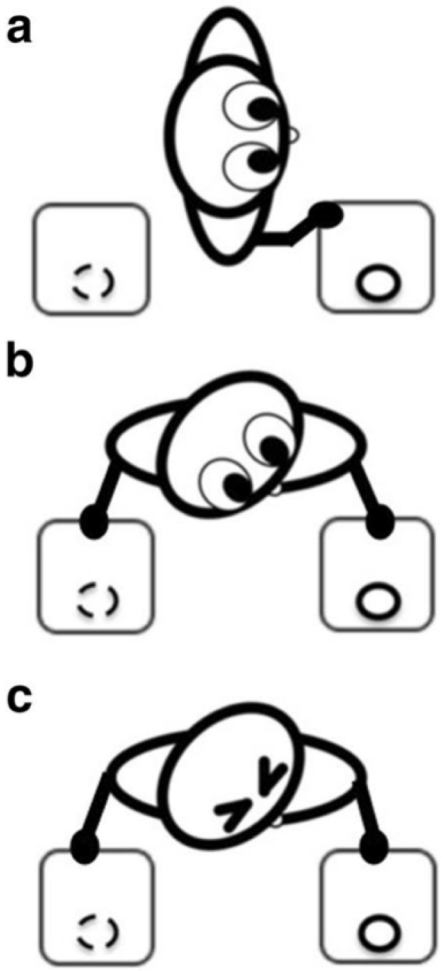
Silvery Gibbon

Hylobates moloch

Study Design

- We used a **competitive** paradigm (take food experimenter can't see)
- We built a species-appropriate **elevated apparatus** – gibbons did not have to go onto the ground (they are arboreal apes)

Study Design



Body + Head + Eye-open

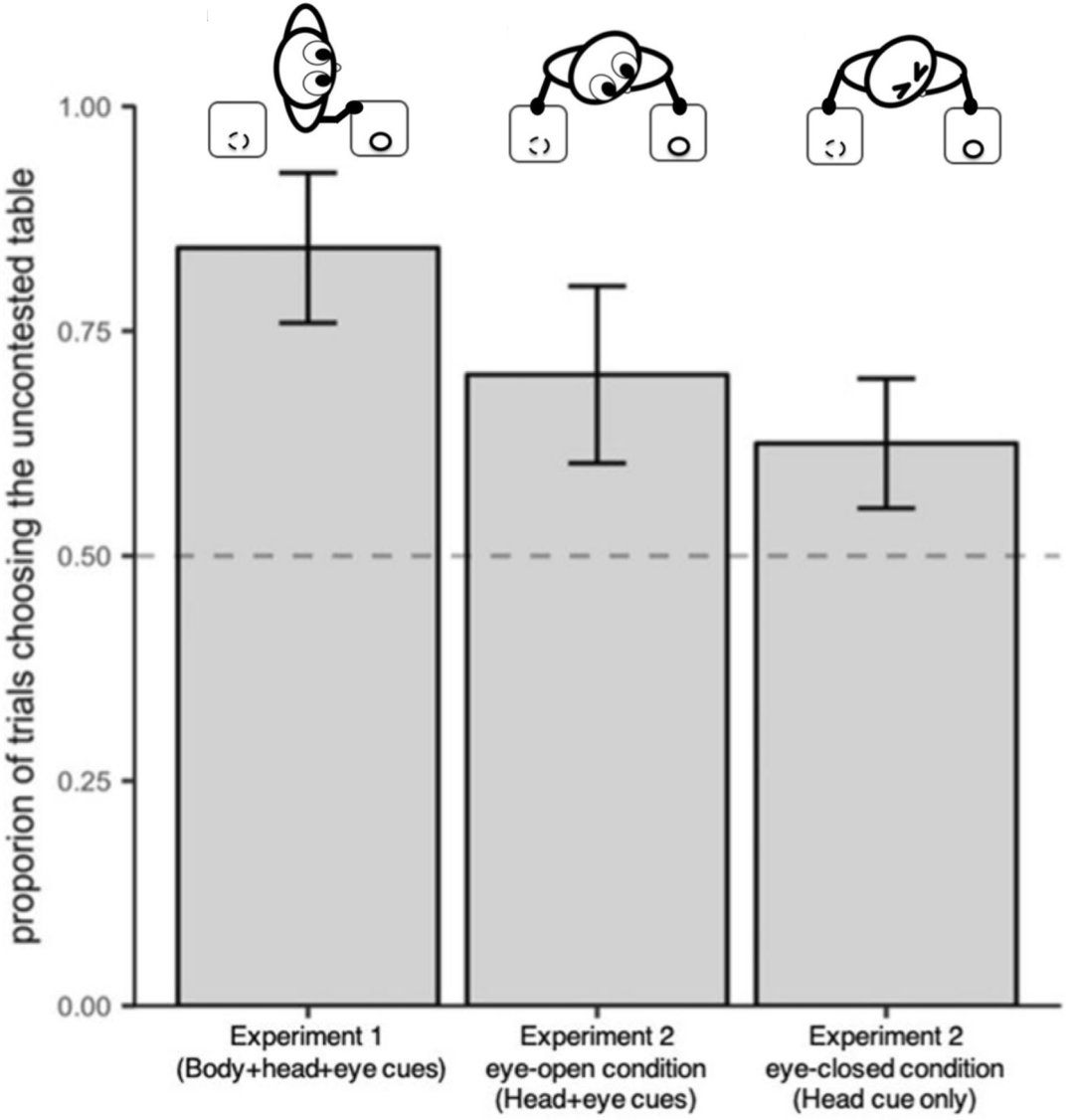
Head + Eye-open

Head + Eye-closed

Test Trial: Head + Eyes Open

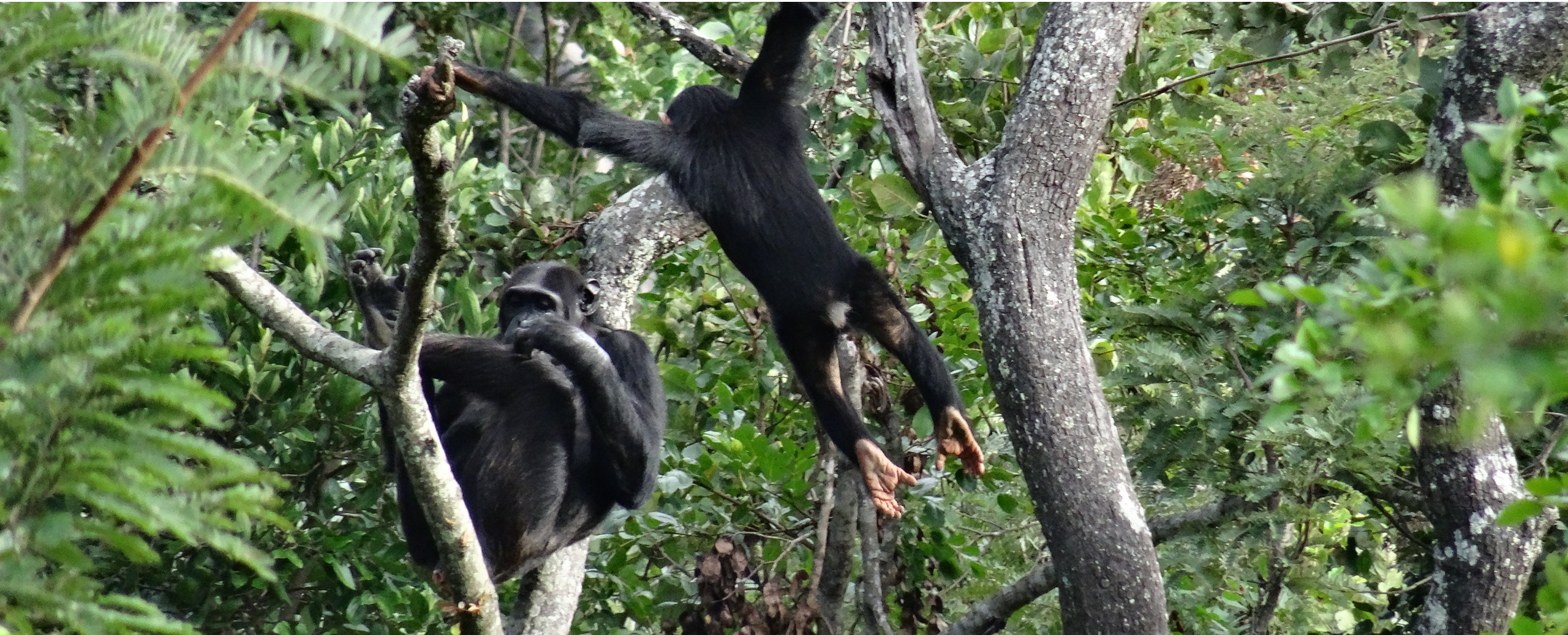
Results: Gibbons Used Body and Head Cues

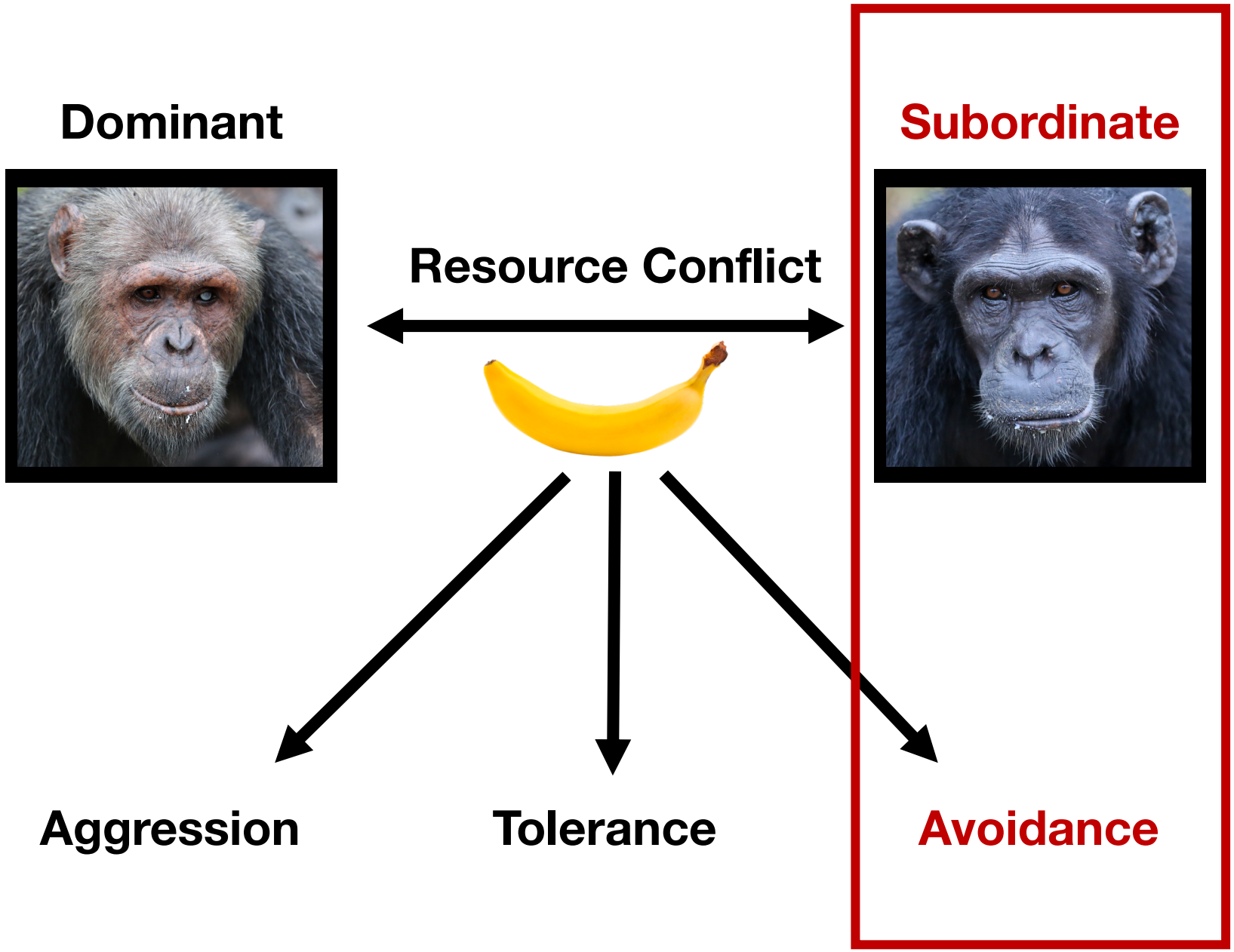
- Suggests that sensitivity to body- and head-orientation cues is a product of shared descent among primates
- They used body and eye cues in our study but did not differentiate between open and closed eyes
  - ➢ Might be a by-product of our specific study design



Sánchez-Amaro, Tan, Kaufhold, & Rossano, 2019

Project 2: Resource Monopolization, Inhibitory Control, and Planning in Chimpanzees




Dominant
Subordinate
Resource Conflict
Aggression
Tolerance
Avoidance

de Waal, 2000

Conflict Avoidance

Avoid Resource

Avoid Adversary

de Waal, 2000

Observations of Adversary Avoidance

- Sneak copulations (e.g., Soltis et al., 2001)
- Concealment (e.g., Byrne & Whiten, 1988, 1992)
- Distraction (e.g. Byrne & Whiten, 1988, 1992)

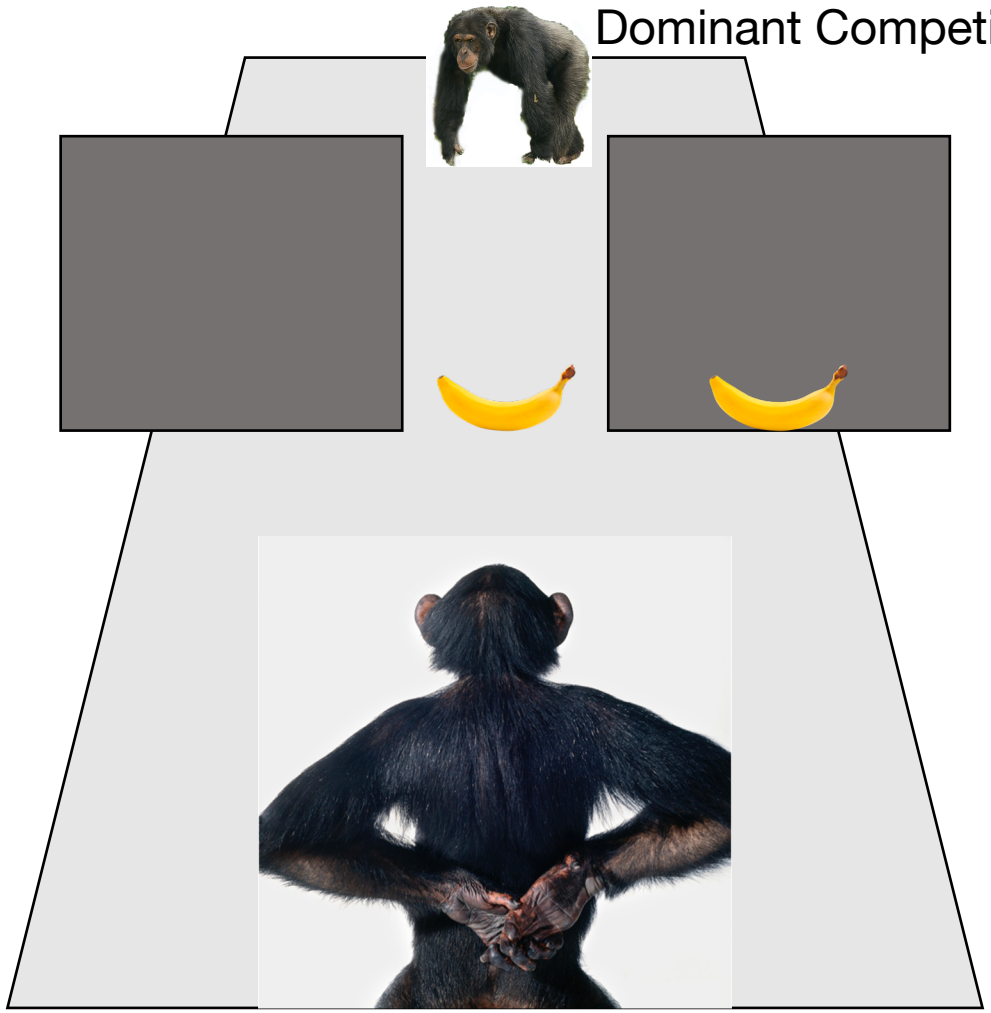
Prospection or Associative Learning?

- Are these behaviors the result of higher or lower level cognitive processes?

- Some researchers suggest apes are able to form subgoals and future plans (e.g., Mulcahy & Call, 2006; Osvath & Osvath, 20019, Völter & Call, 2014)

- Others maintain this ability is unique to humans (e.g., Suddendorf et al., 2018; Suddendorf & Corballis, 2010)

Chimpanzees Anticipate Conflict and Know What Others Can See



Hare et al., 2000

Do Chimpanzees Hide Food?

- Revealed food to cooperator
- Kept food hidden from competitor
- However, they **did not actively hide food**
- Problem of **inhibitory control**?

Karg et al., 2015

Manipulating What Other Can Do

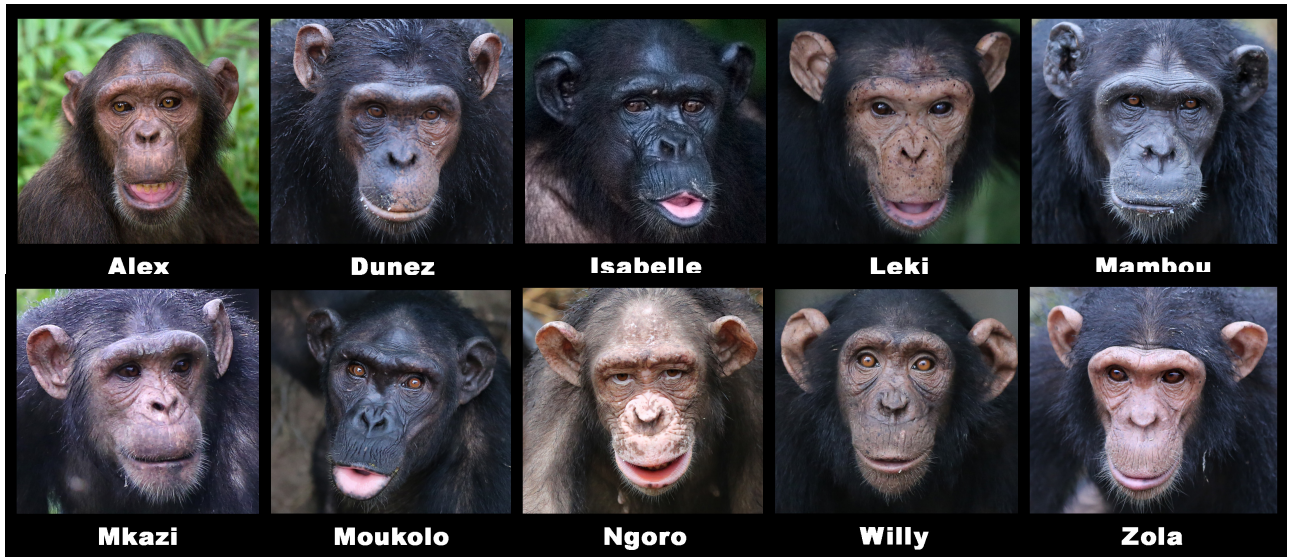
- Knowing what others can *see* is only useful as far it allows to predict what others can *do*

- Do chimpanzees manipulate what others can do?

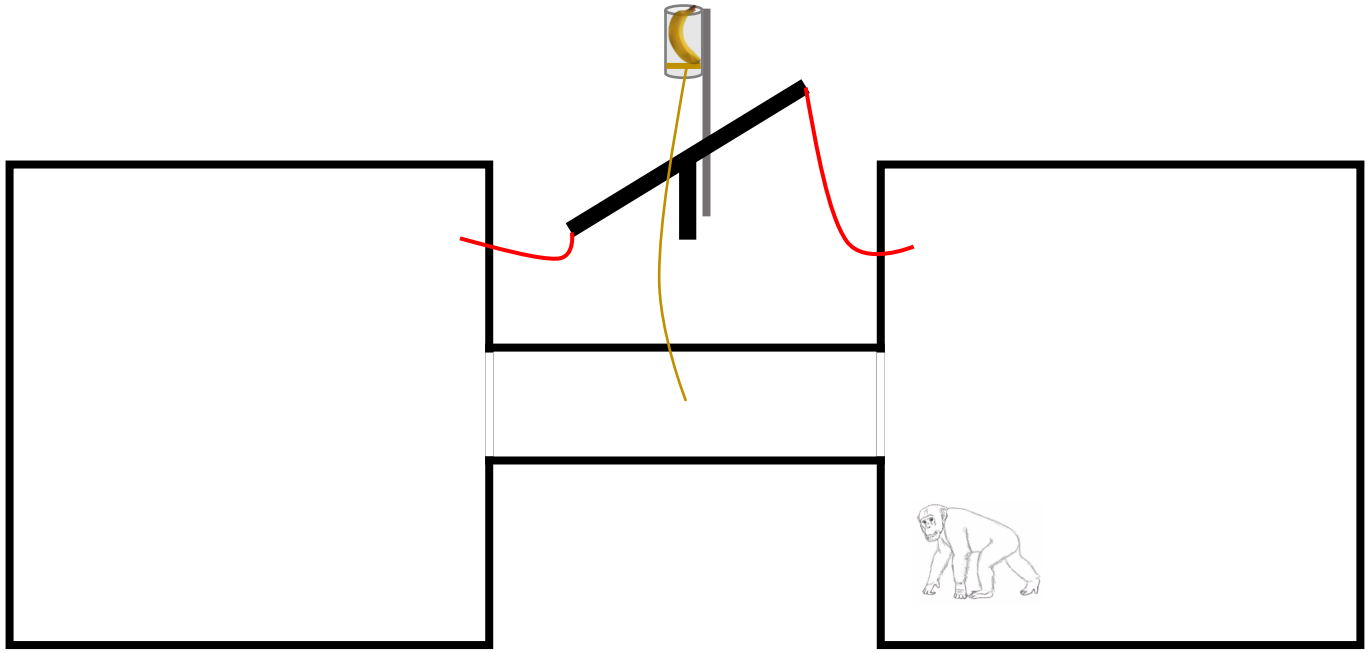
Subjects

- Sanctuary-living chimpanzees (n=10)
- 6 ♂; 4 ♀
- Mean age: 10.3 years (range: 6-15)

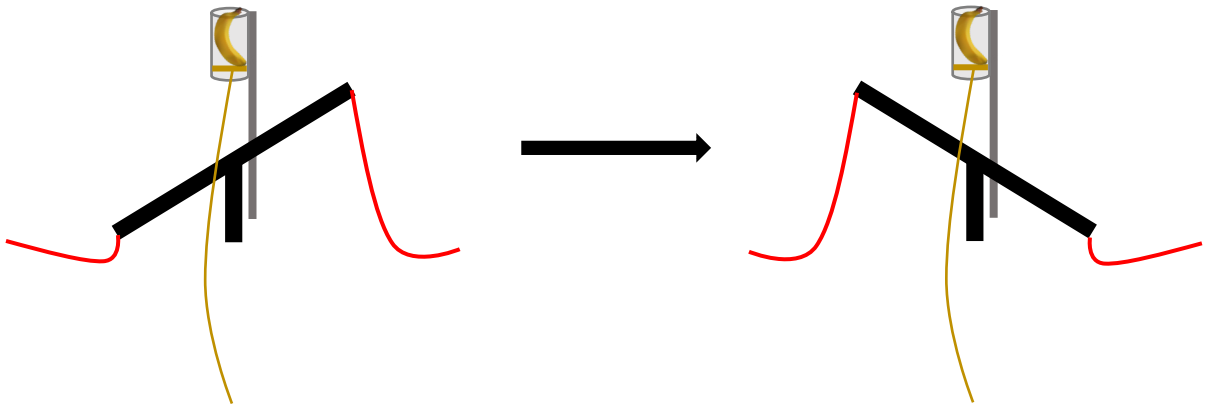
Jane Goodall Institute



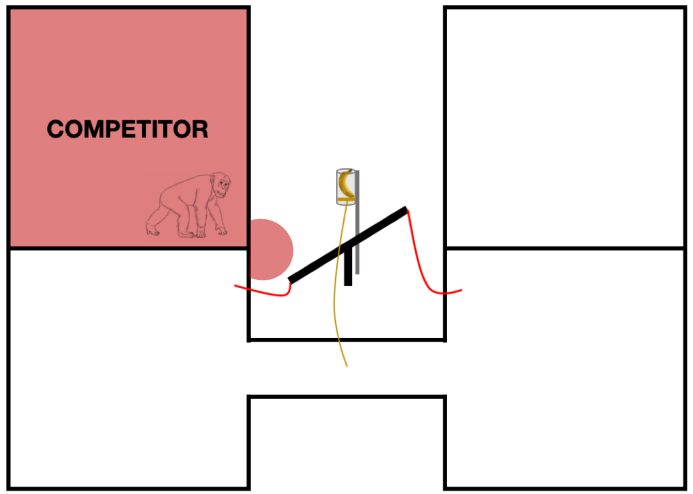
Subject can release food



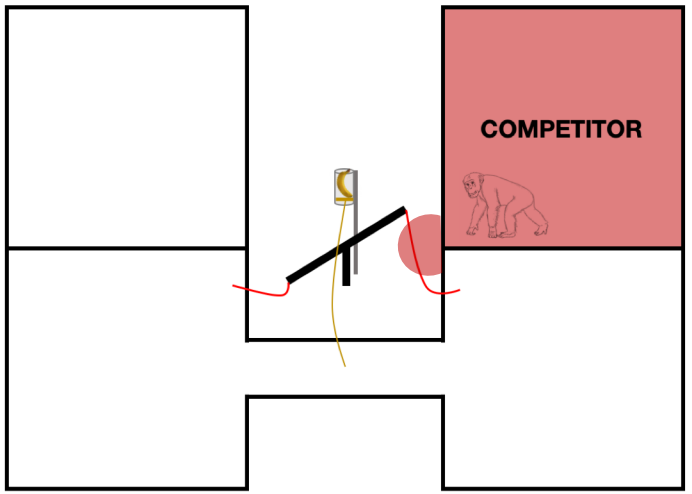
Subject can manipulate orientation of seesaw



Across Session Manipulations
Dominant Conspecific Side



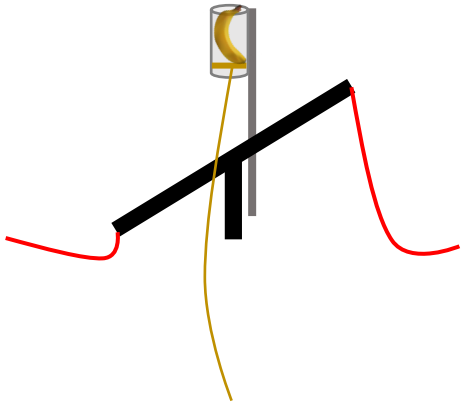
vs.



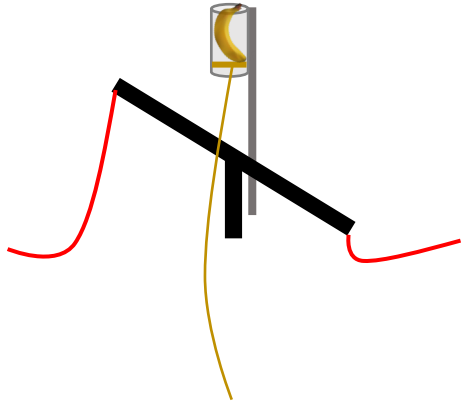
Left

Right

Within Session Manipulation:
Orientation of Seesaw



vs.



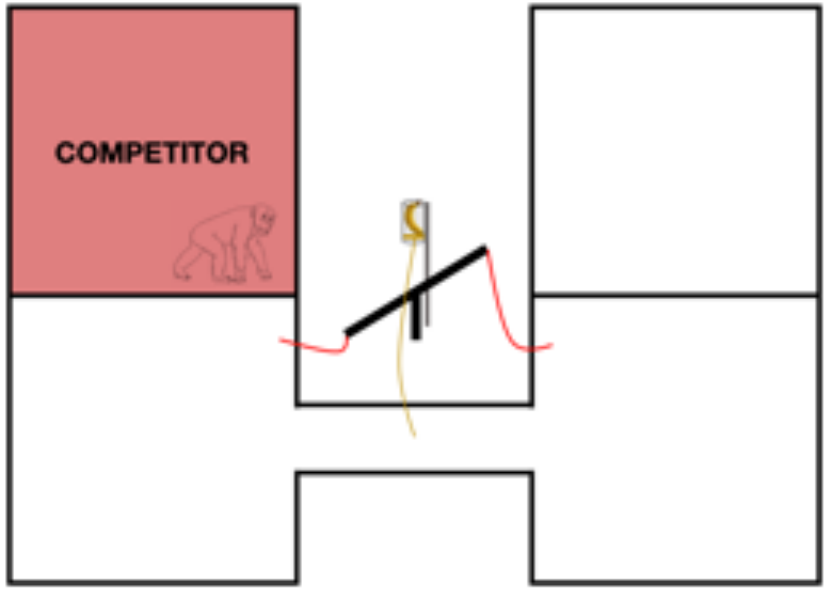
left

right

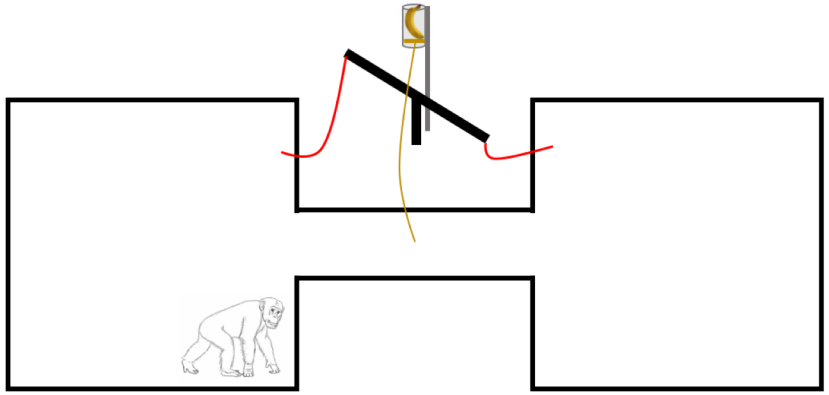
Contested vs. Uncontested

Refers to the orientation of the seesaw at the beginning of a trial.

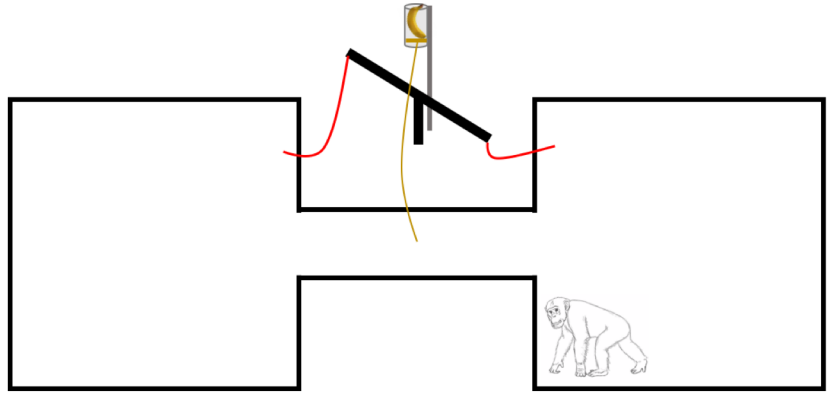
- Contested: if subject releases the food without reorienting the seesaw the food will drop to the location that can be reached by the subject and competitor
- Uncontested: If subject releases the food without reorienting the seesaw it will drop to the location that is only accessible to the subject



Within Session Manipulation:
Orientation of Seesaw



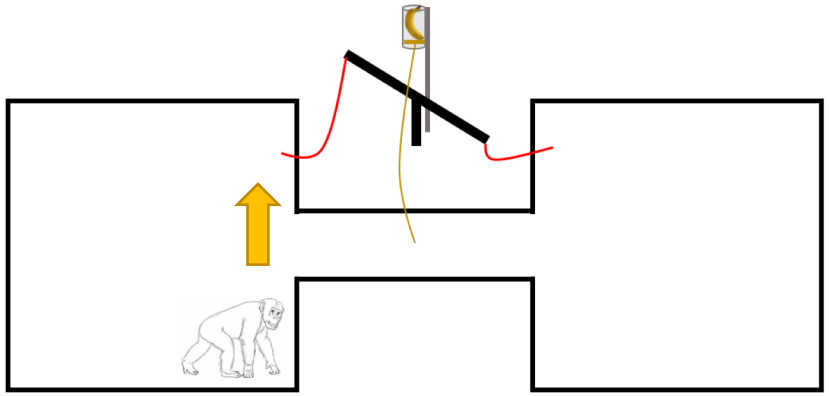
vs.



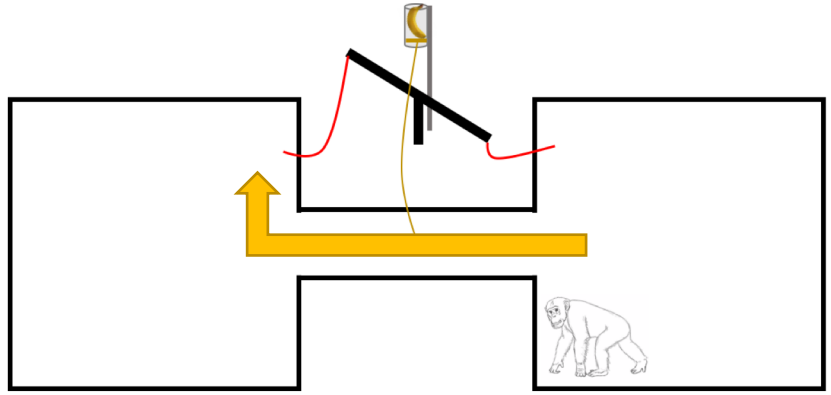
Close

Far

Within Session Manipulation: **Starting Position Subject**



vs.



Close **Far**

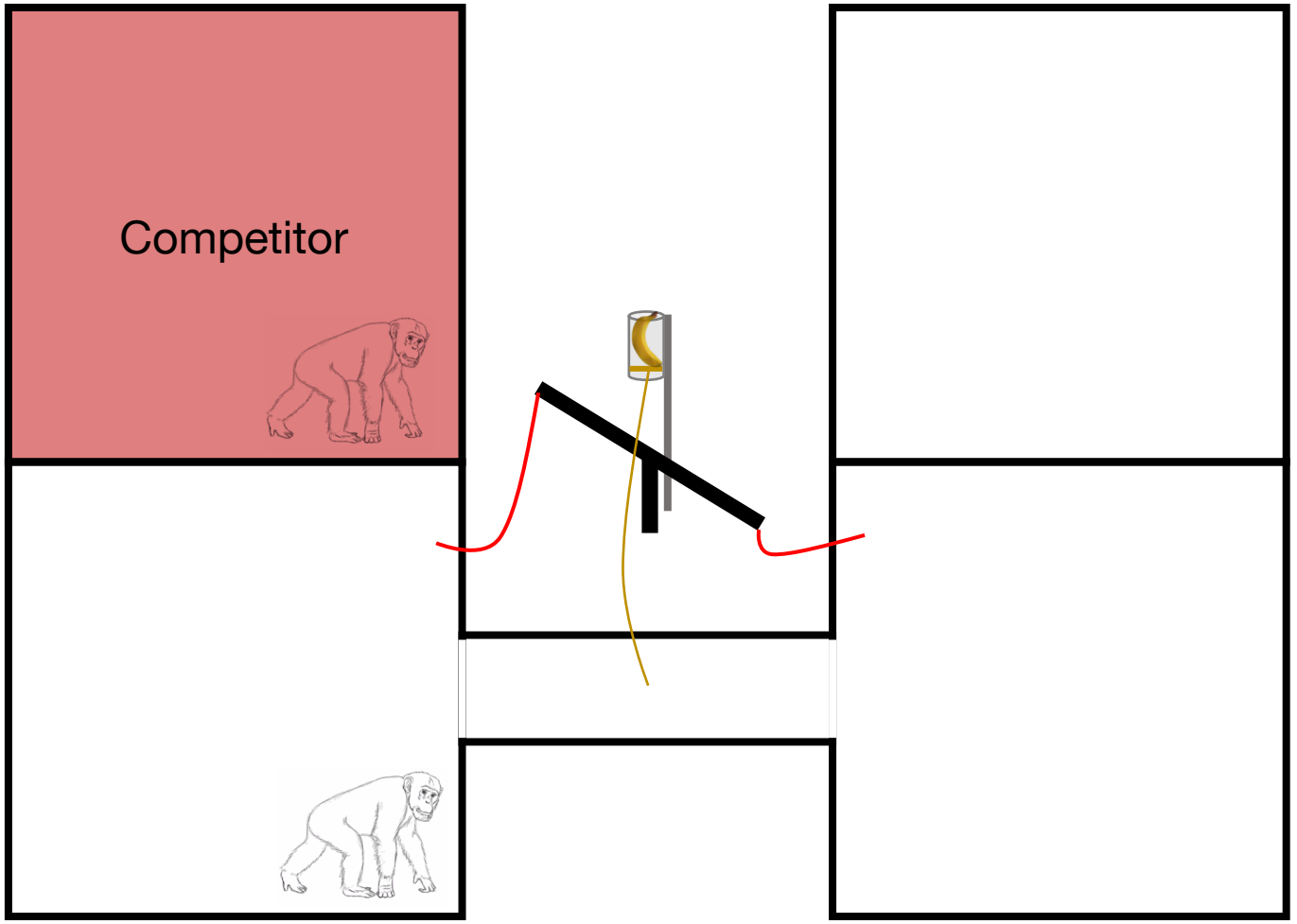
How far does the subject need to walk to reorient the seesaw?

- Close – same room, little inhibitory control; low inhibitory control needed
- Far – move to other room while inhibiting to pull the release; high inhibitory control needed

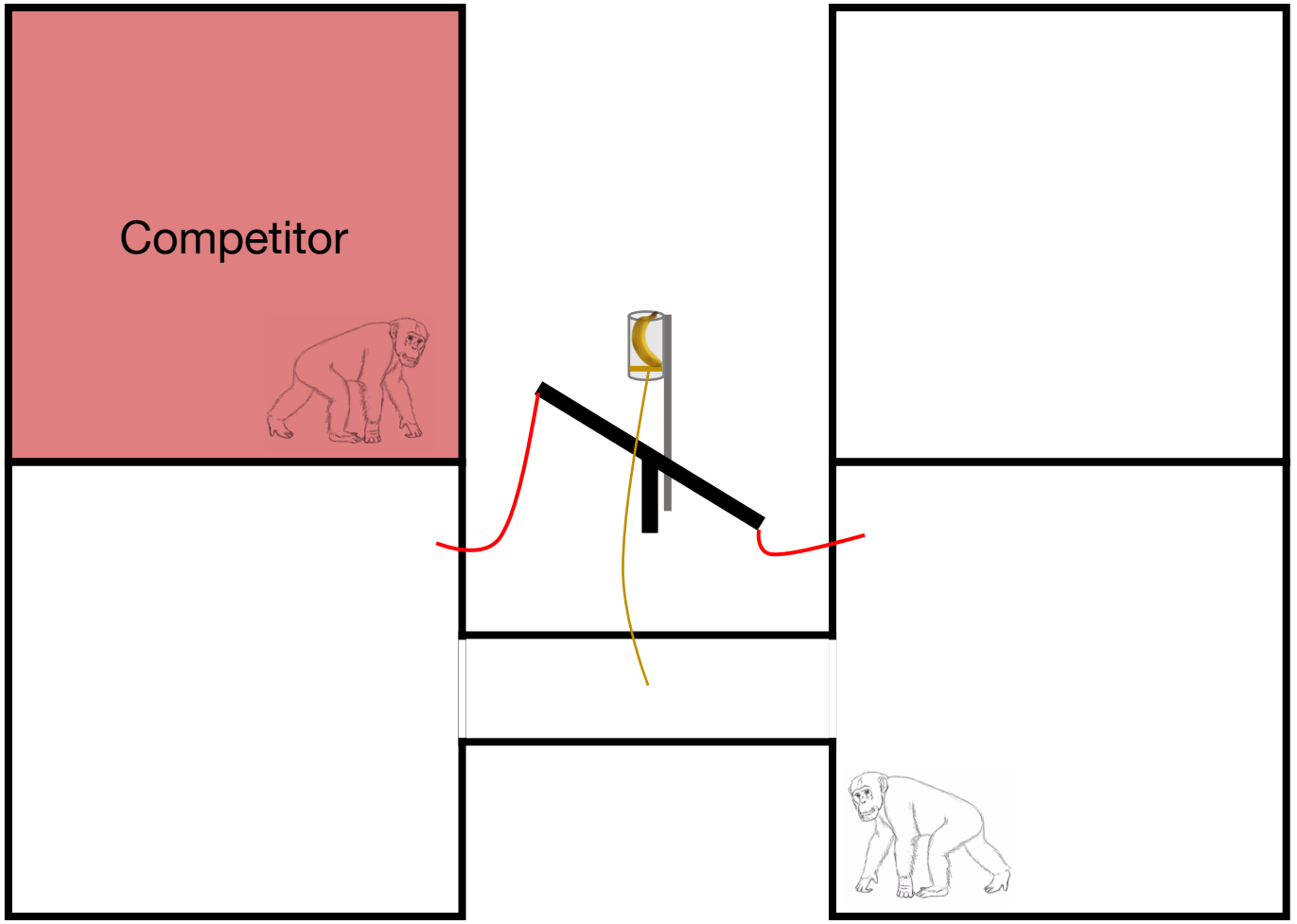
Four possible Trials within each Session

- Uncontested – Close
- Uncontested – Far
- Contested – Close
- Contested – Far

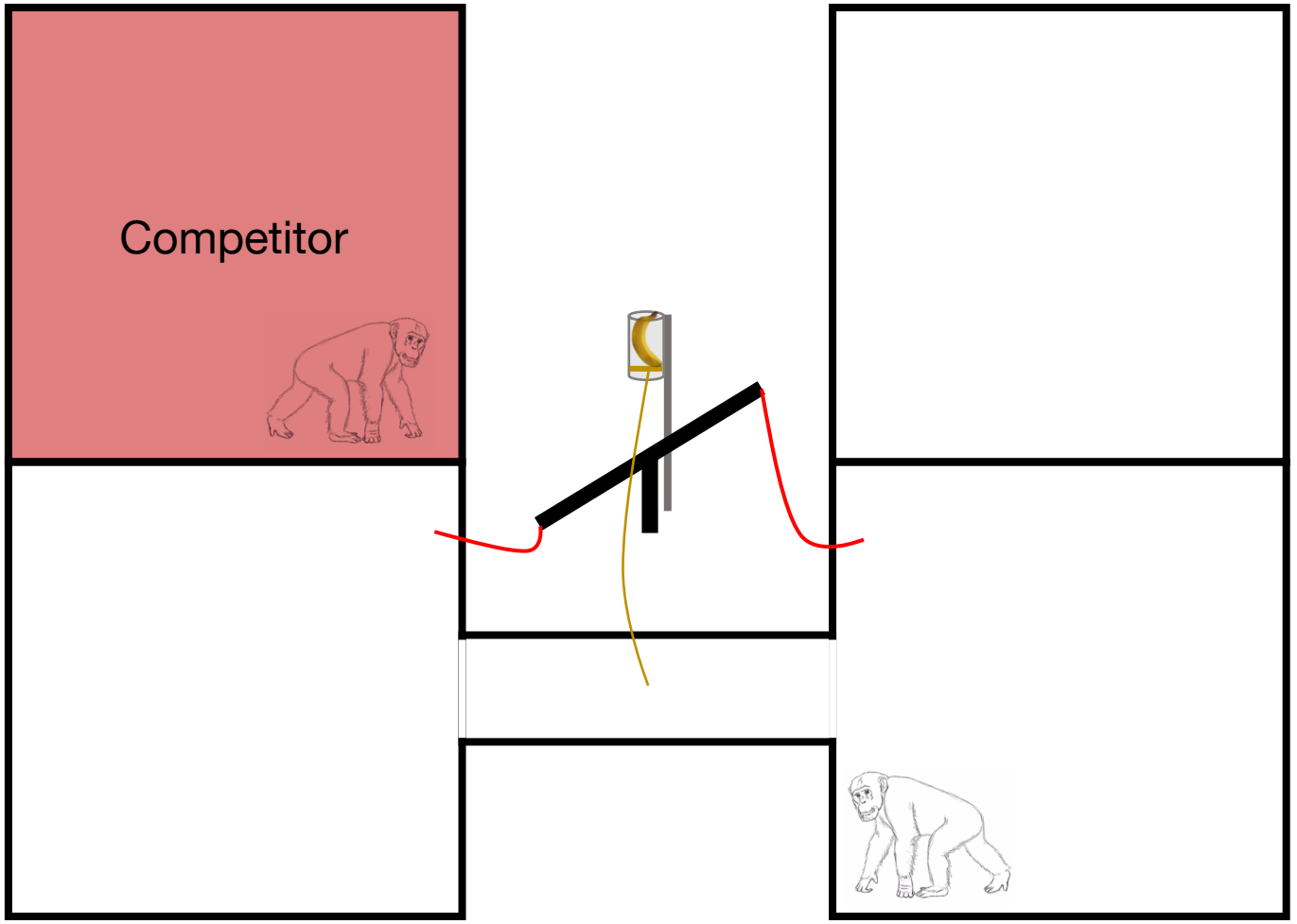
Uncontested - Close



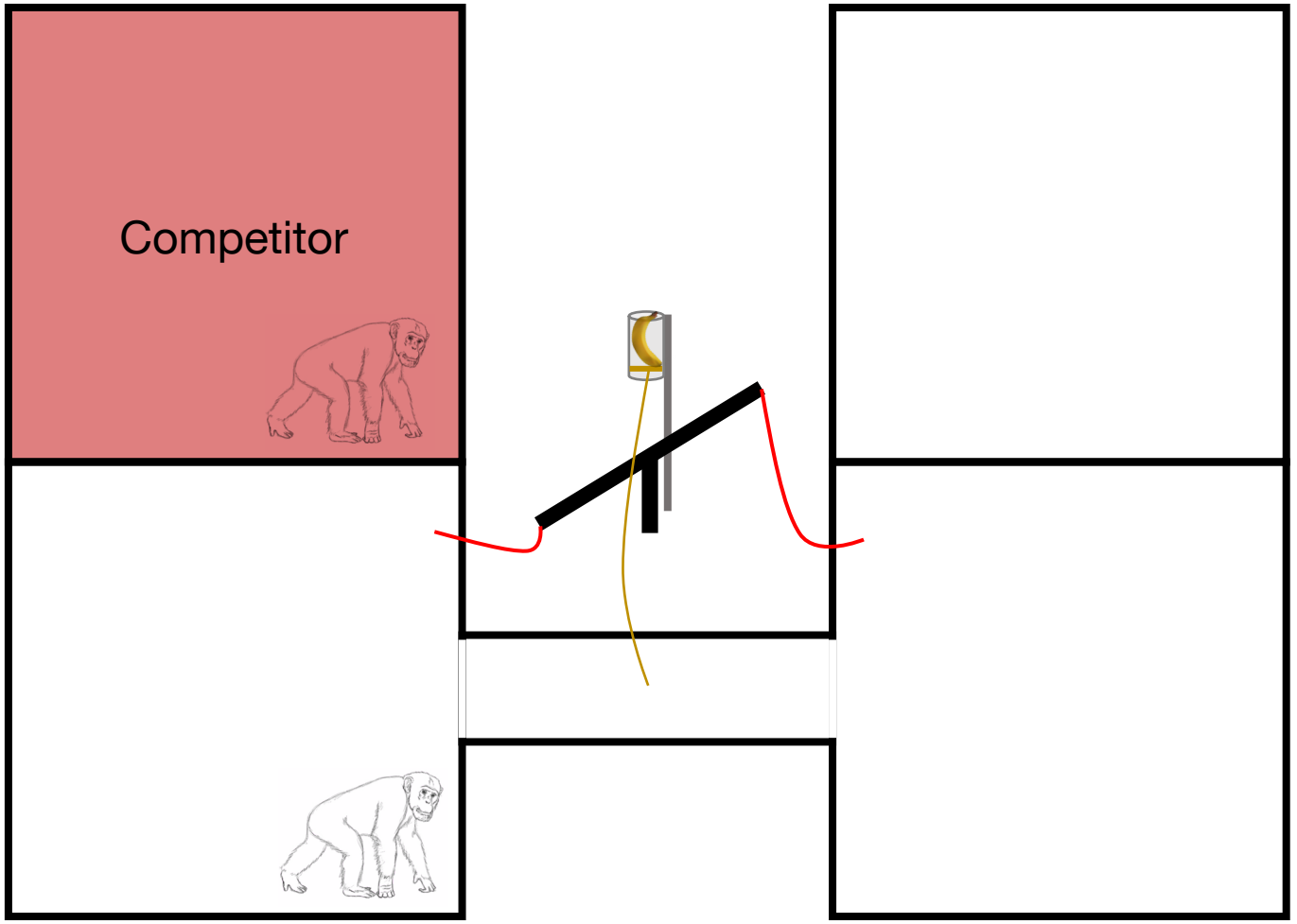
Uncontested - Far



Contested - Close



Contested - Far

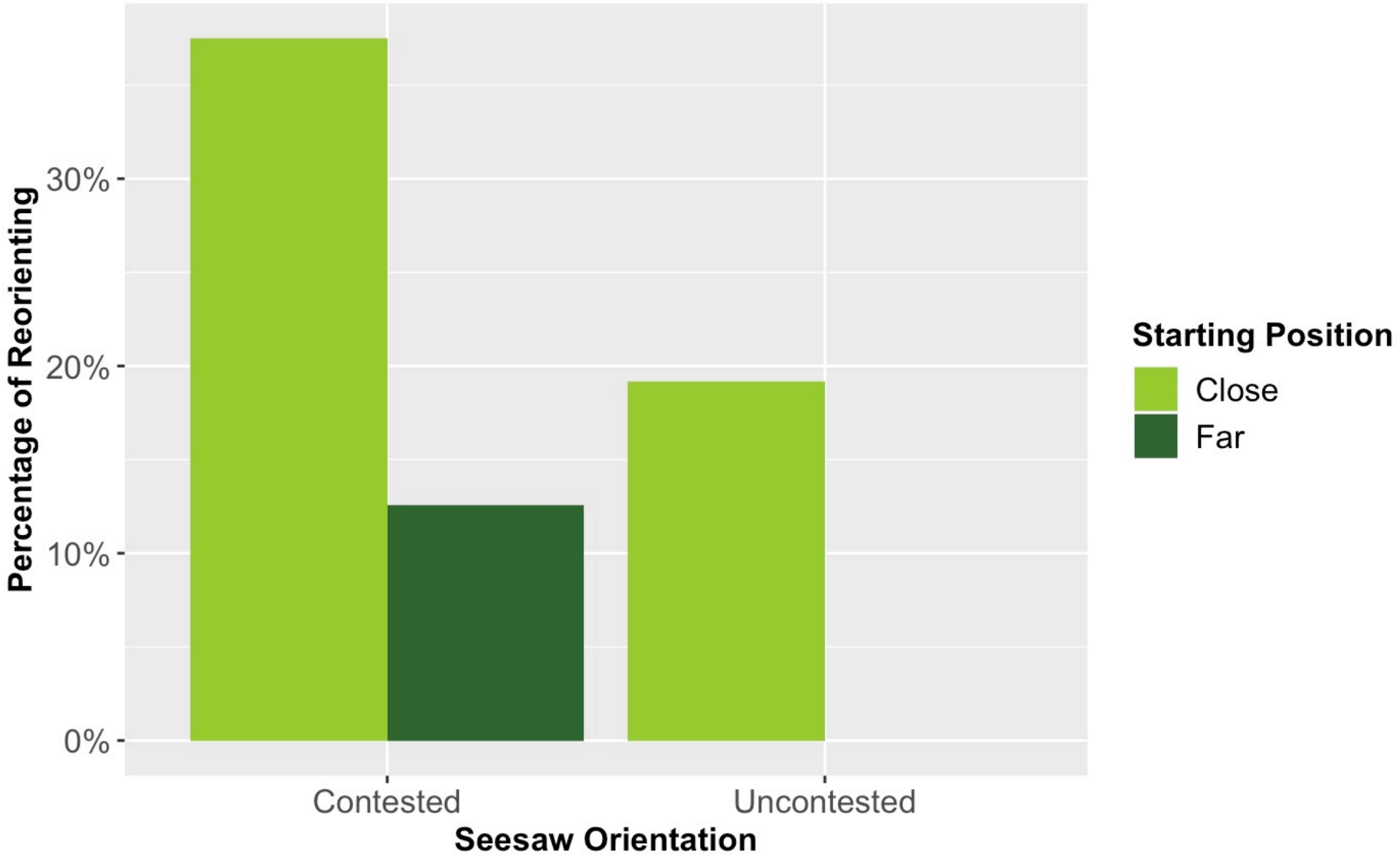


Hypotheses

1. Subjects will use the apparatus competitively to monopolize rewards by strategically changing the pathway.
   - Seesaw significantly more often reoriented in contested trials than in uncontested trials

2. An increase of inhibitory task demands (starting position of the subject) will decrease their likelihood to change the pathway.
   - Subjects will reorient the seesaw significantly more often in close trials than in far trials

Results


Percentage of Reorienting
30%
20%
10%
0%
Contested
Uncontested
Seesaw Orientation
Starting Position
Close
Far

Results

- Chimpanzees used the apparatus **competitively** and monopolized food by changing the pathway to the uncontested location
- They reoriented the pathway **more often during trials that required less inhibitory control** (close starting position)
- There was **no learning effect** within or across testing sessions, suggesting that subjects used some form of **prospection** or **future planning**
  - This highlights the possible role of **subordinate strategies** in the **evolution of complex social cognition**

Project 3: Intergroup Variation in Prosociality in Chimpanzees

Prosocial Behavior

= behavior performed to improve another's welfare (Cronin, 2012)

Are chimpanzees prosocial?

- some studies suggest that chimpanzees behave prosocial (e.g. Claidiére et al. 2015; Horner, Carter, Suchak, & de Waal, 2011; House, Silk Lambeth, & Schapiro, 2014)
- while others could not find a tendency for prosocial behavior (z.B. Amici, Visalberghi,& Call, 2014; Jensen, Hare, Call, & Tomasello, 2006; Silk et al., 2005; Tennie, Jensen, & Call, 2016)

Explanations for mixed results?

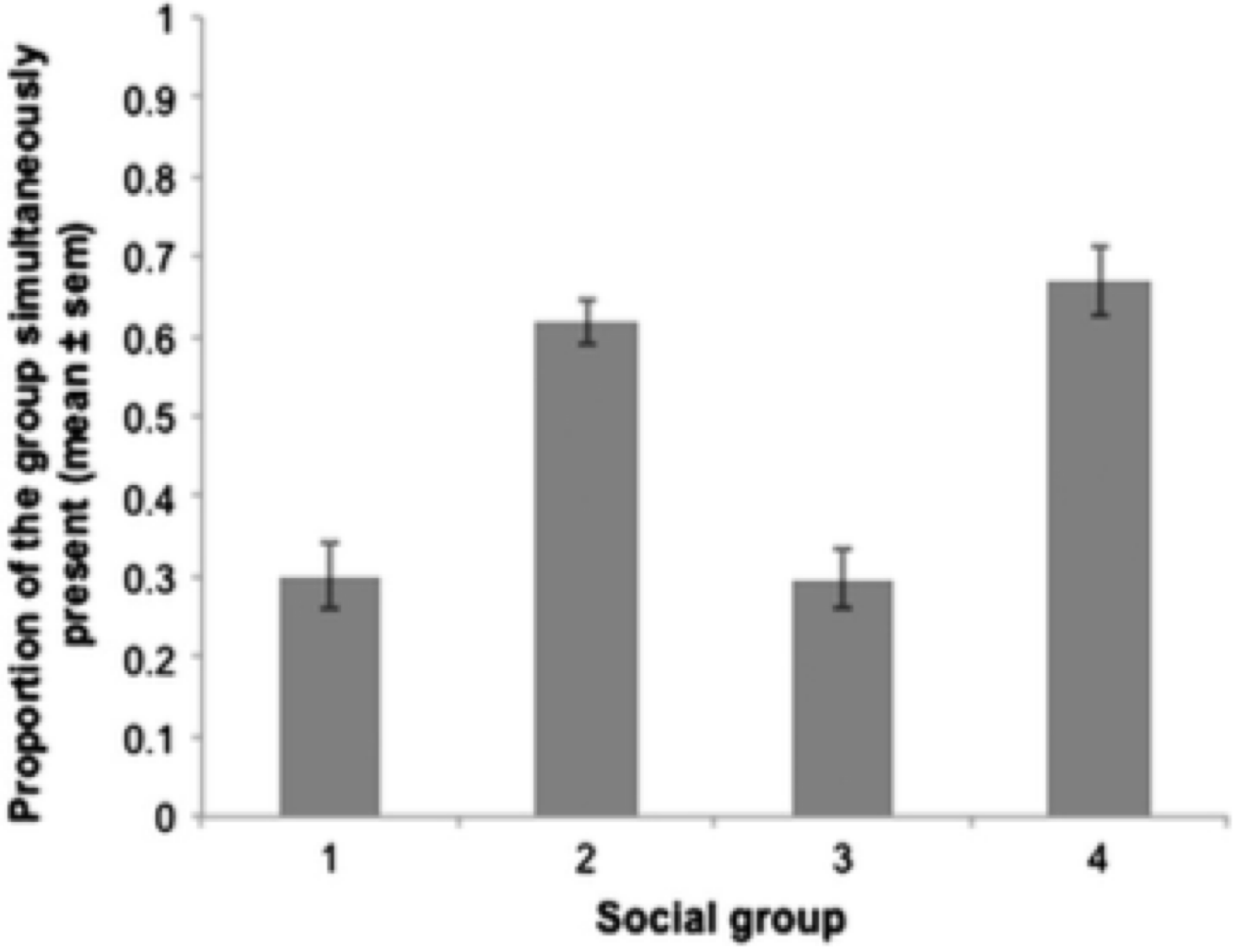
- Study design?
- Group differences?
  - Genetic differences?
  - Ecological differences?
  - Socio-cultural differences?

Social Tolerance

Probability that individuals will be in proximity to conspecifics around valuable resources with little or no aggression (Cronin & Sanchez, 2012)

Social Tolerance

- Chimpanzee groups differed in their levels of social tolerance despite similar ecologies (while also controlling for genetic variance)



Cronin, van Leeuwen, Vreeman, & Haun, 2014

Social Tolerance

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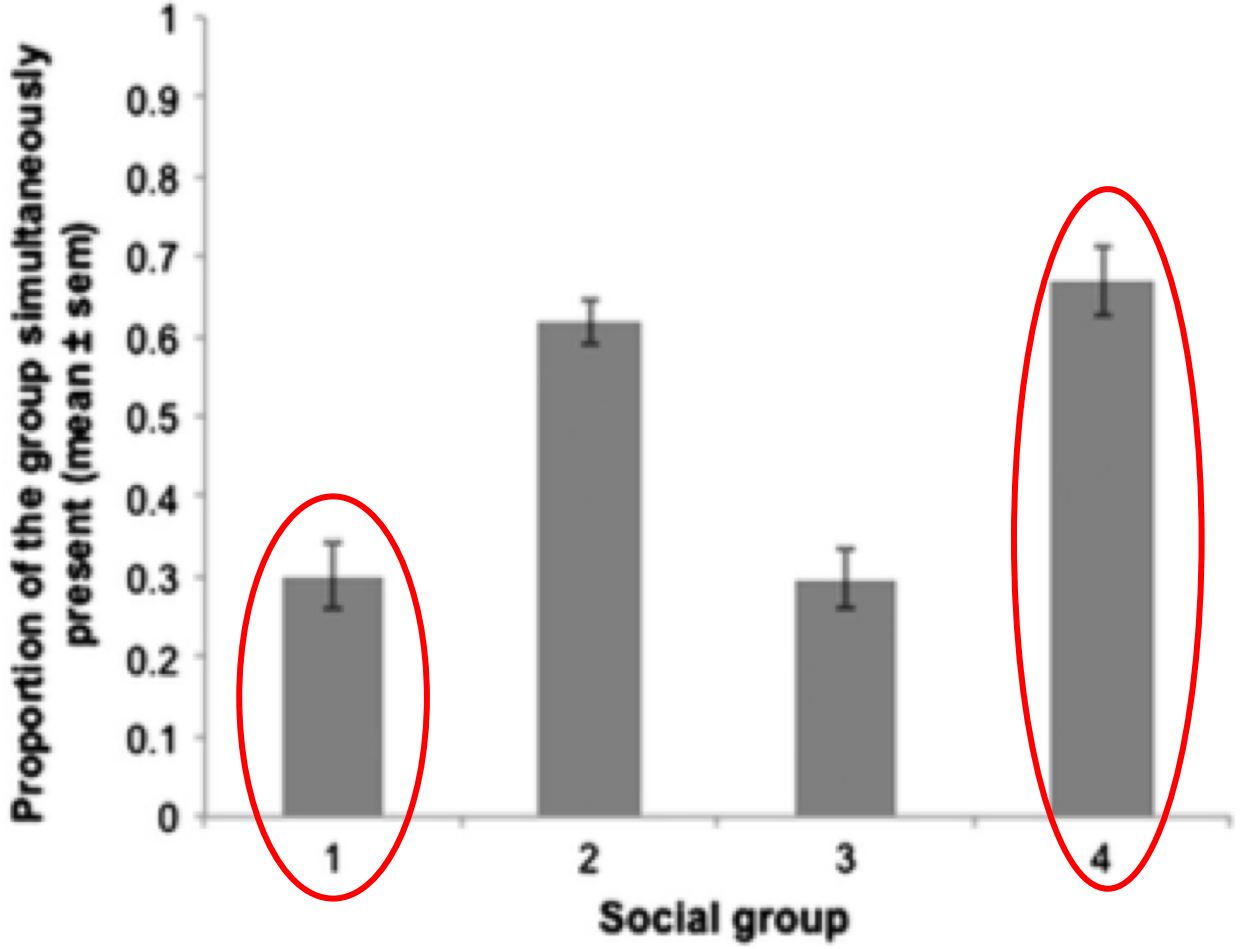
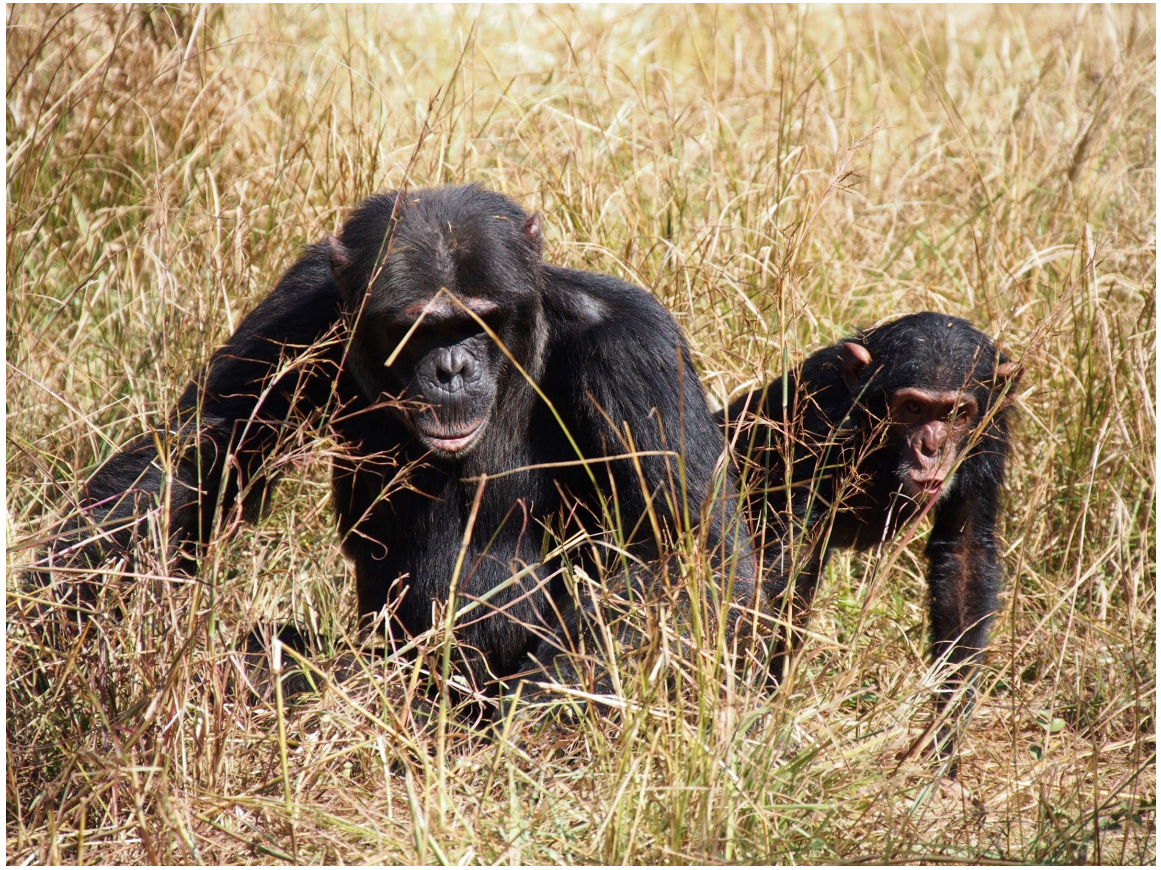


Cronin, van Leeuwen, Vreeman, & Haun, 2014

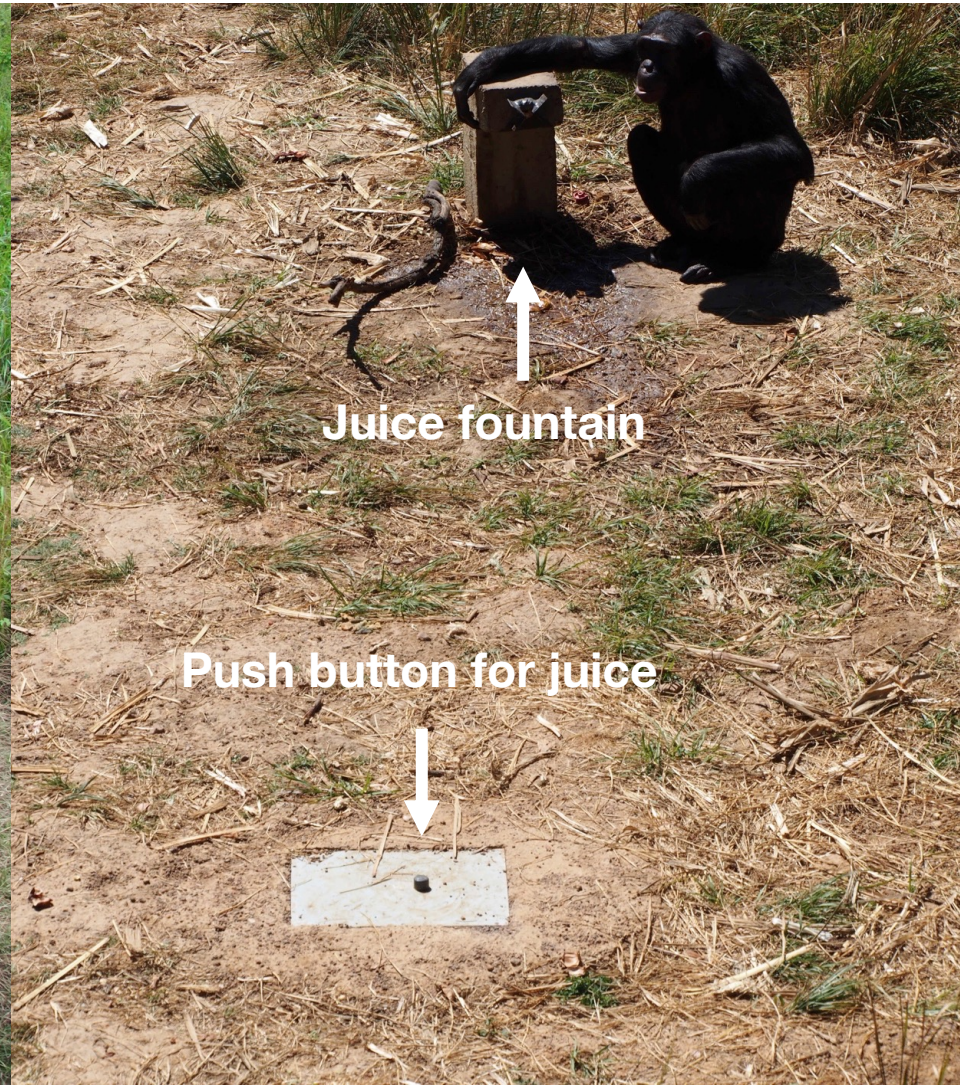
Subjects

Group 1 (n=25; 9♂, 16♀)



Group 4 (n=11; 9♂, 2♀)

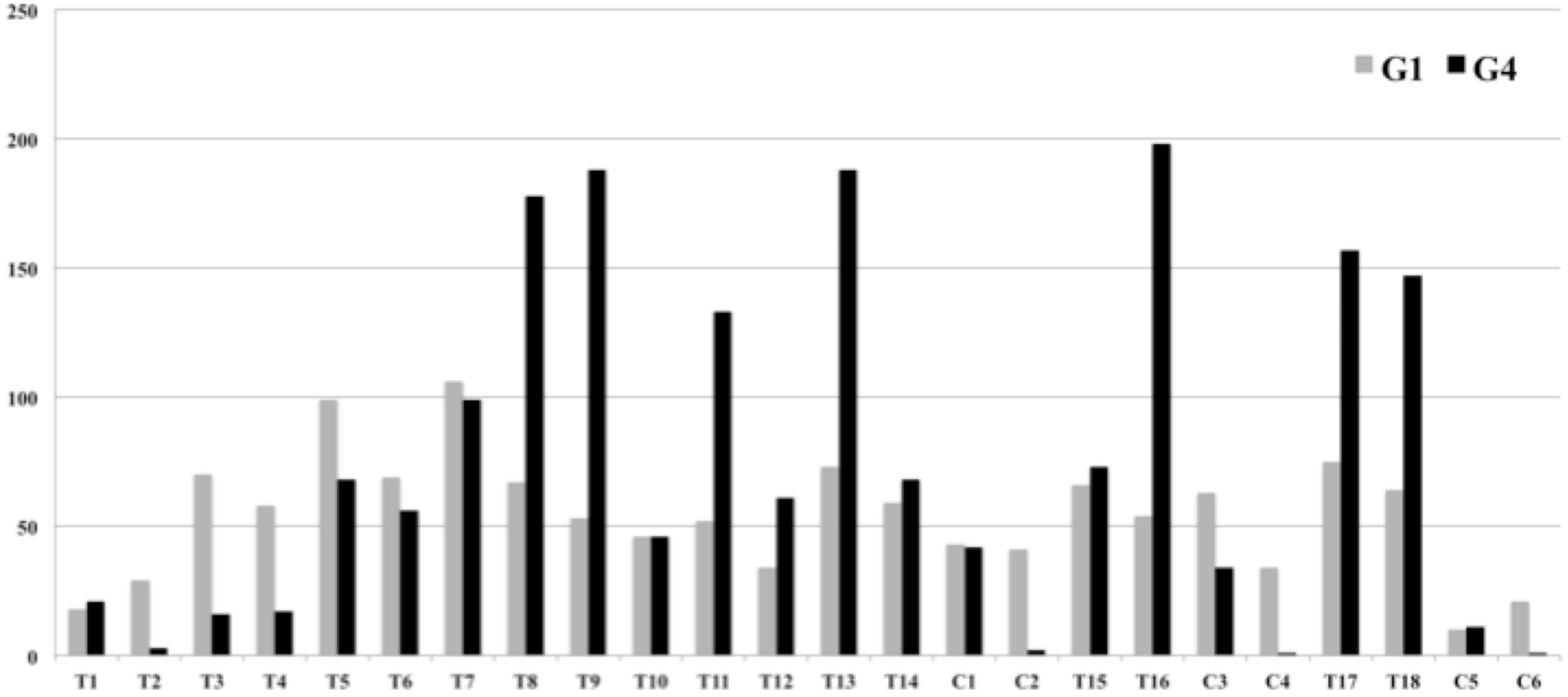
Apparatus



Apparatus

1. Training Sessions
2. Test Sessions (n=18)
3. Control Sessions (n=6)
    - Fountain outside of enclosure controlling that they don't push for the sake of pushing a button

Results



Pushing events during testing and control sessions

Results

- The **group with higher social tolerance** (G4) **pushed significantly more** than the group with lower social tolerance (G1)
- The socially tolerant group (G4) provided juice for a high proportion of group members, whereas the **less socially tolerant** group (G1) showed **more selective prosociality towards kin**
- This highlights the **importance of considering intergroup variation for understanding social behavior**, especially with regards to propensity to perform behaviors rather than capacity (Kaufhold & van Leeuwen, 2019)

Social Tool Use

Schweinfurth, DeTroy, van Leeuwen, Call, & Haun, 2018

Thanks for Your Attention! Questions?

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