

SOCIAL COGNITION



6 October 2020
Primate Social Behavior

TODAY

- Review of Friendship and Biological Market theories
- Social intelligence hypothesis
 - Brain size
 - Social knowledge
- Next Assignment

FRIENDSHIP THEORY

- Relationships are composed of past dyadic interactions
- Emotion-based book keeping
- Individuals have *implicit* knowledge of their own and others relationships
- Relationship is 'real' because it affects how a dyad behaves

BIOLOGICAL MARKET THEORY

- Individuals exchange services to meet current needs
- 'Prices' fluctuate according law of supply and demand
- Grooming is a currency
- Long-term emotional bonds unnecessary to explain 'relationships' seen in most primates
- Concept of non-human 'relationship' is an anthropomorphic projection

BREAKOUT ROOM QUESTIONS

- 'Chimpanzees share food at high rates with individuals with whom they have an equitable grooming relationship with. In what way does this support or contradict the notion of grooming as a currency in a biological market?
- According to Biological Market Theory, why would one expect grooming rates in a social group be more reciprocal during periods of low aggression compared to periods of high aggression?

SOCIAL BONDS → SOCIAL COGNITION

- Social bonds are an important determinant of fitness
- We should expect cognitive adaptations designed to maximize benefits of social bonds

SOCIAL INTELLIGENCE HYPOTHESIS

- Primate intelligence evolved as a response to the challenges posed by social complexity

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How to test this hypothesis?

Predictions of this theory?

SOCIAL INTELLIGENCE HYPOTHESIS

- Primate intelligence evolved as a response to the challenges posed by social complexity

Predictions of this theory?

- 1. More socially complex species should be more intelligent than less socially complex societies**
- 2. Primates living in socially complex societies should have deep understanding of their social environment**
- (3. Individual variation in social cognitive abilities should co-vary with measures of fitness)**

ARE SOCIALLY COMPLEX SPECIES SMARTER?

- How to operationalize 'social complexity' and 'intelligence'?

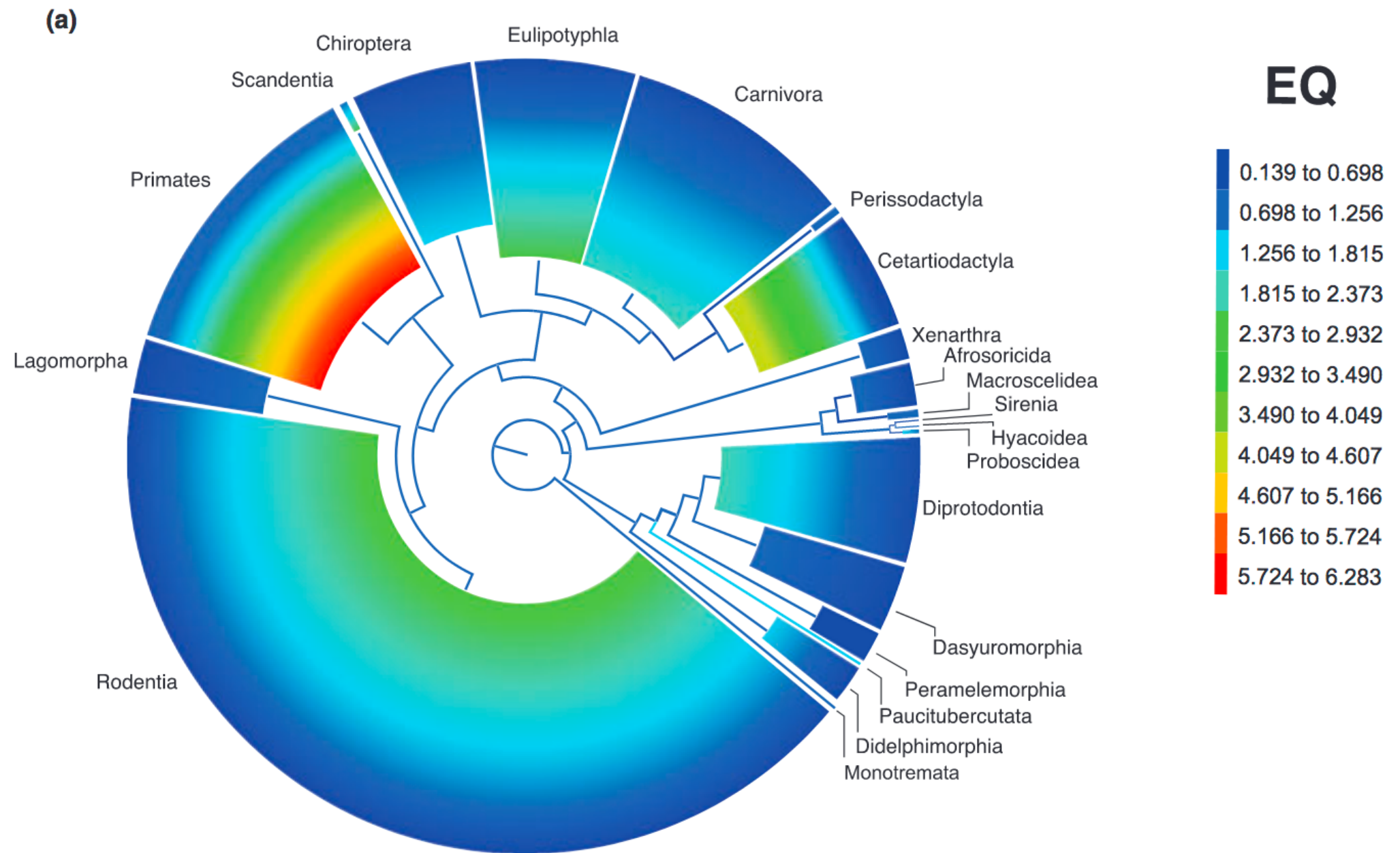
ARE SOCIALLY COMPLEX SPECIES SMARTER?

- How to operationalize 'social complexity' and 'intelligence'?

- Group size as a proxy for social complexity**

- Brain size as a proxy for intelligence**

BRAIN SIZE ACROSS MAMMALIAN ORDERS



EQ IN MAMMALIAN ORDERS

- Primates have larger-than-expected brains, compared to other mammals

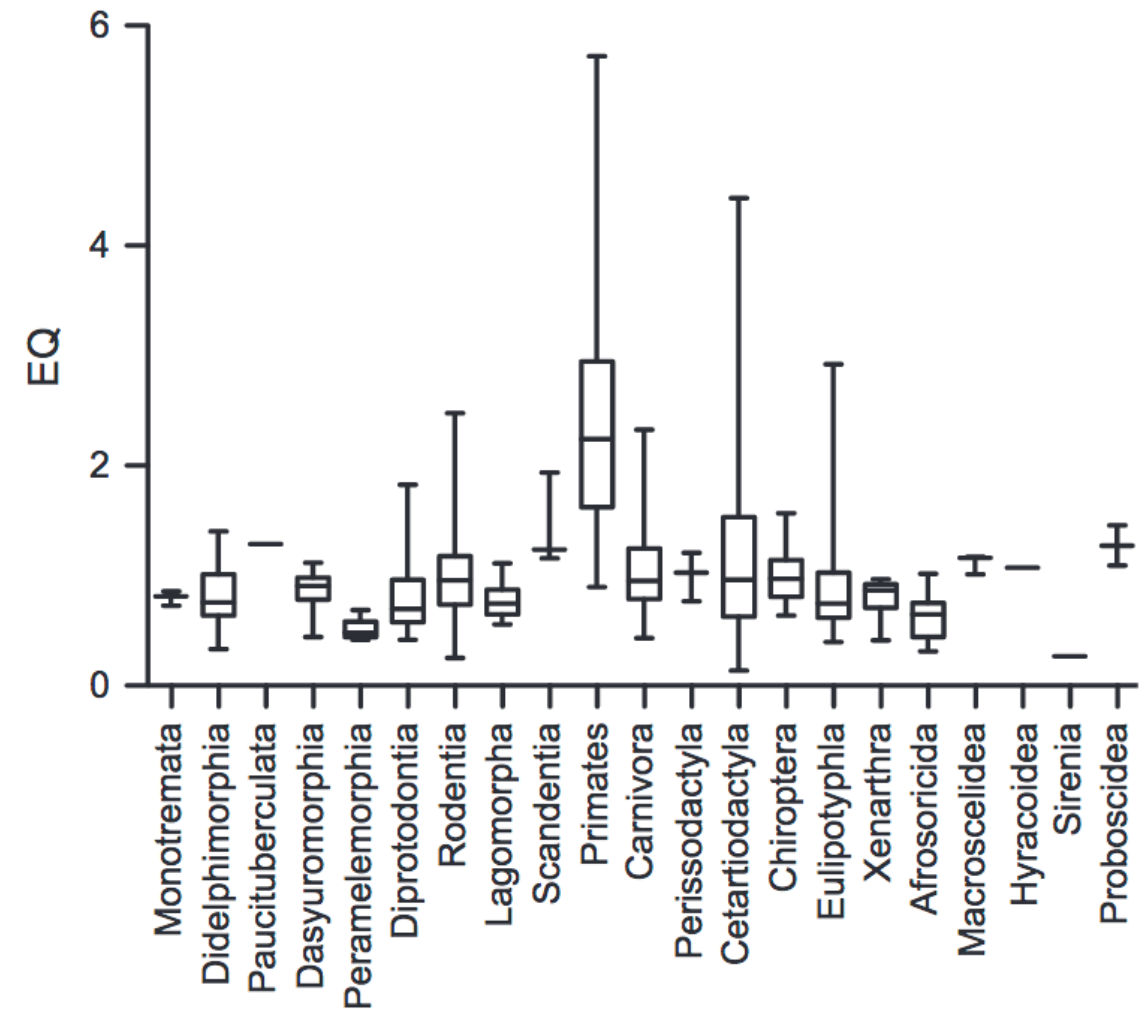
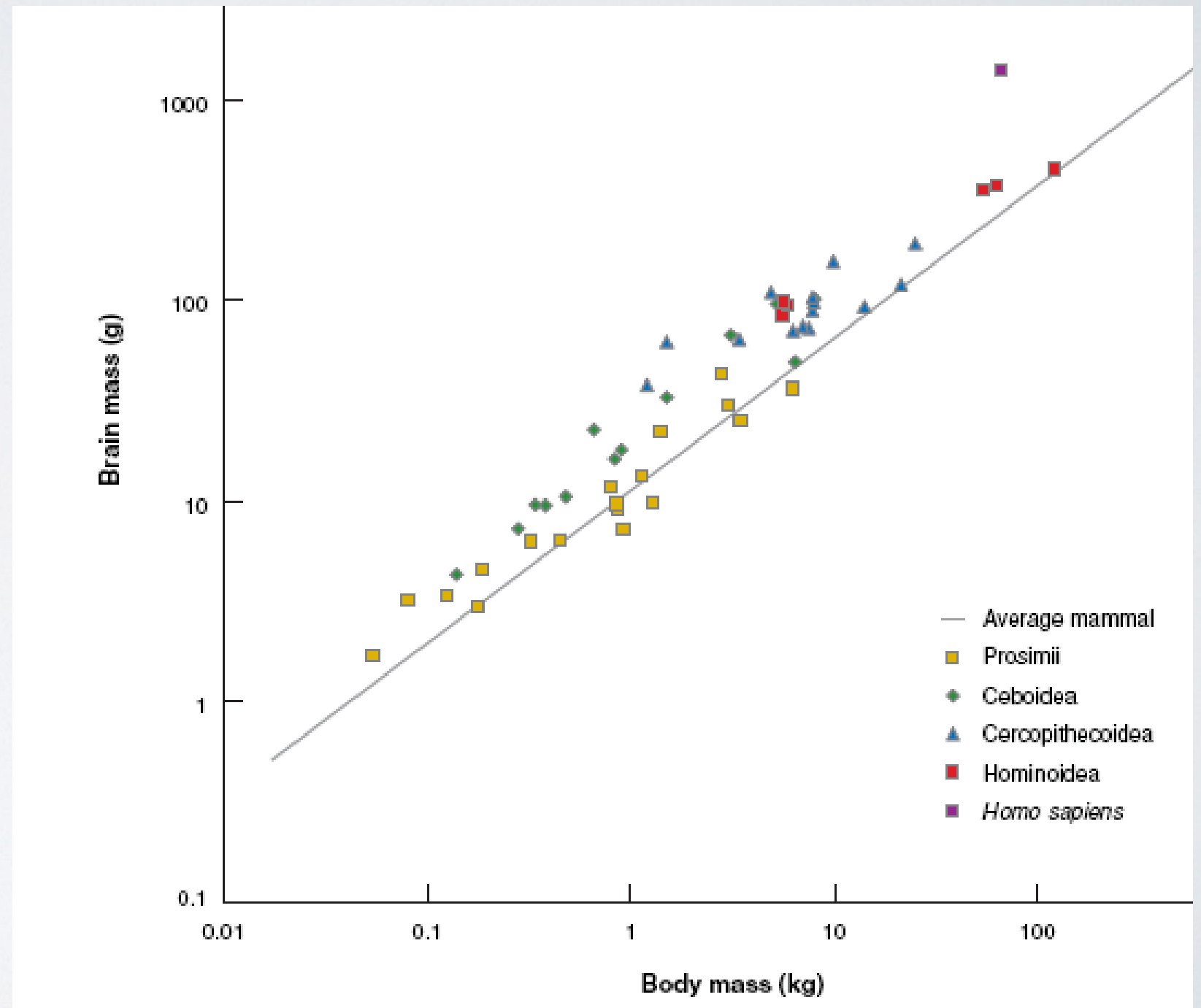


Fig. 3 Box plot representing the mean, interquartile, and range of EQs for 21 different mammalian orders included in this analysis.

VARIATION IN PRIMATE BRAIN SIZE

- Lots of variation among primate species



LARGER GROUPS=LARGER BRAINS?

- Neocortex ratio increases with group size

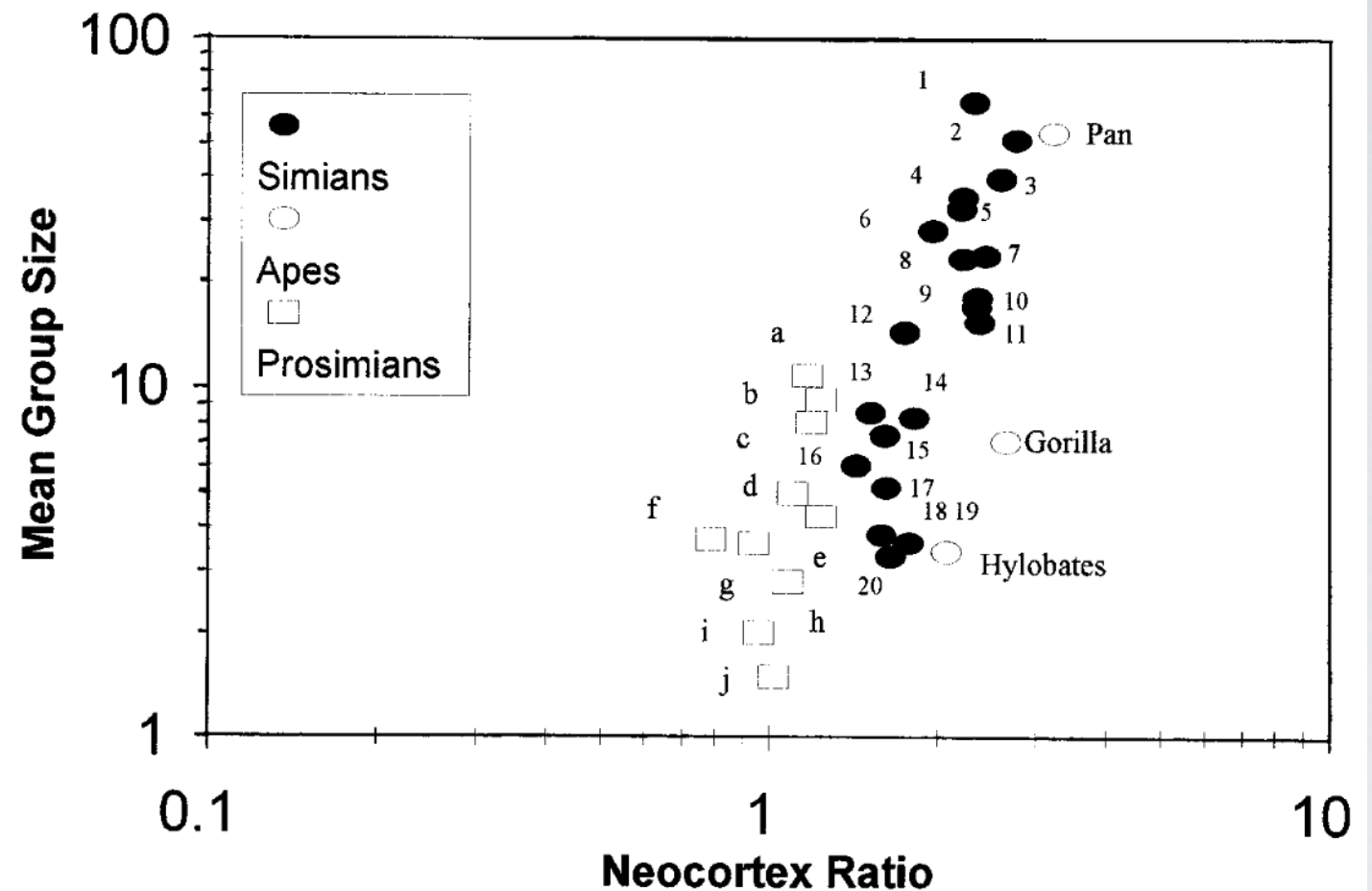
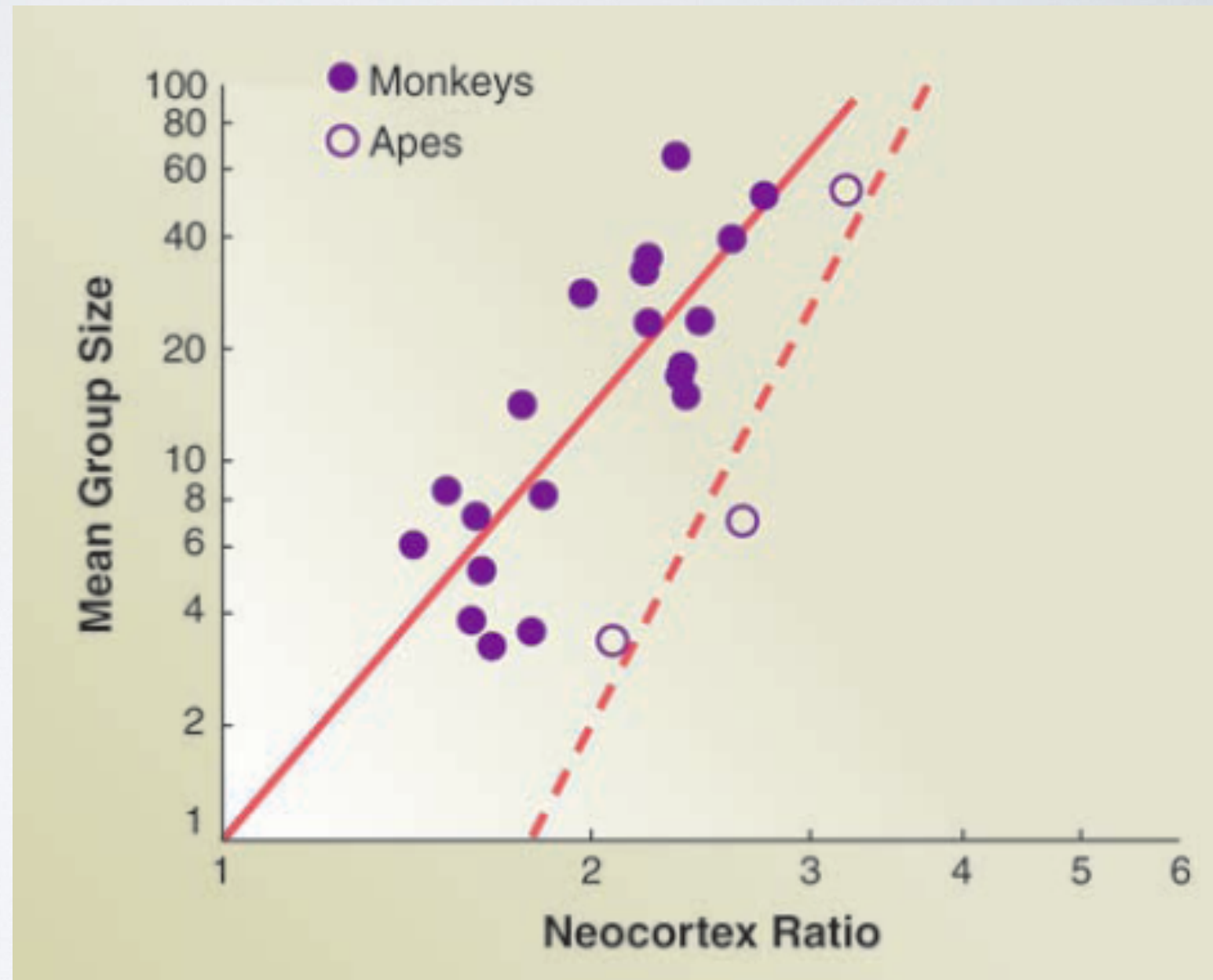


Figure 3. Mean group size plotted against neocortex ratio for individual genera, shown separately for prosimian, simian, and hominoid primates. Prosimian group size data, from Dunbar and Joffe,²⁵ include species for which neocortex ratio is estimated from total brain volume. Anthropoid data are from Dunbar.²⁴ Simians: 1, *Miopithecus*; 2, *Papio*; 3, *Macaca*; 4, *Procolobus*; 5, *Saimiri*; 6, *Erythrocebus*; 7, *Cercopithecus*; 8, *Lagothrix*; 9, *Cebus*; 10, *Ateles*; 11, *Cercocebus*; 12, *Nasalis*; 13, *Callicebus*; 14, *Alouatta*; 15, *Callimico*; 16, *Cebuella*; 17, *Saguinus*; 18, *Aotus*; 19, *Pithecia*; 20, *Callicebus*. Prosimians: a, *Lemur*; b, *Varecia*; c, *Eulemur*; d, *Propithecus*; e, *Indri*; f, *Microcebus*; g, *Galago*; h, *Hapalemur*; i, *Avahi*; j, *Perodictus*.

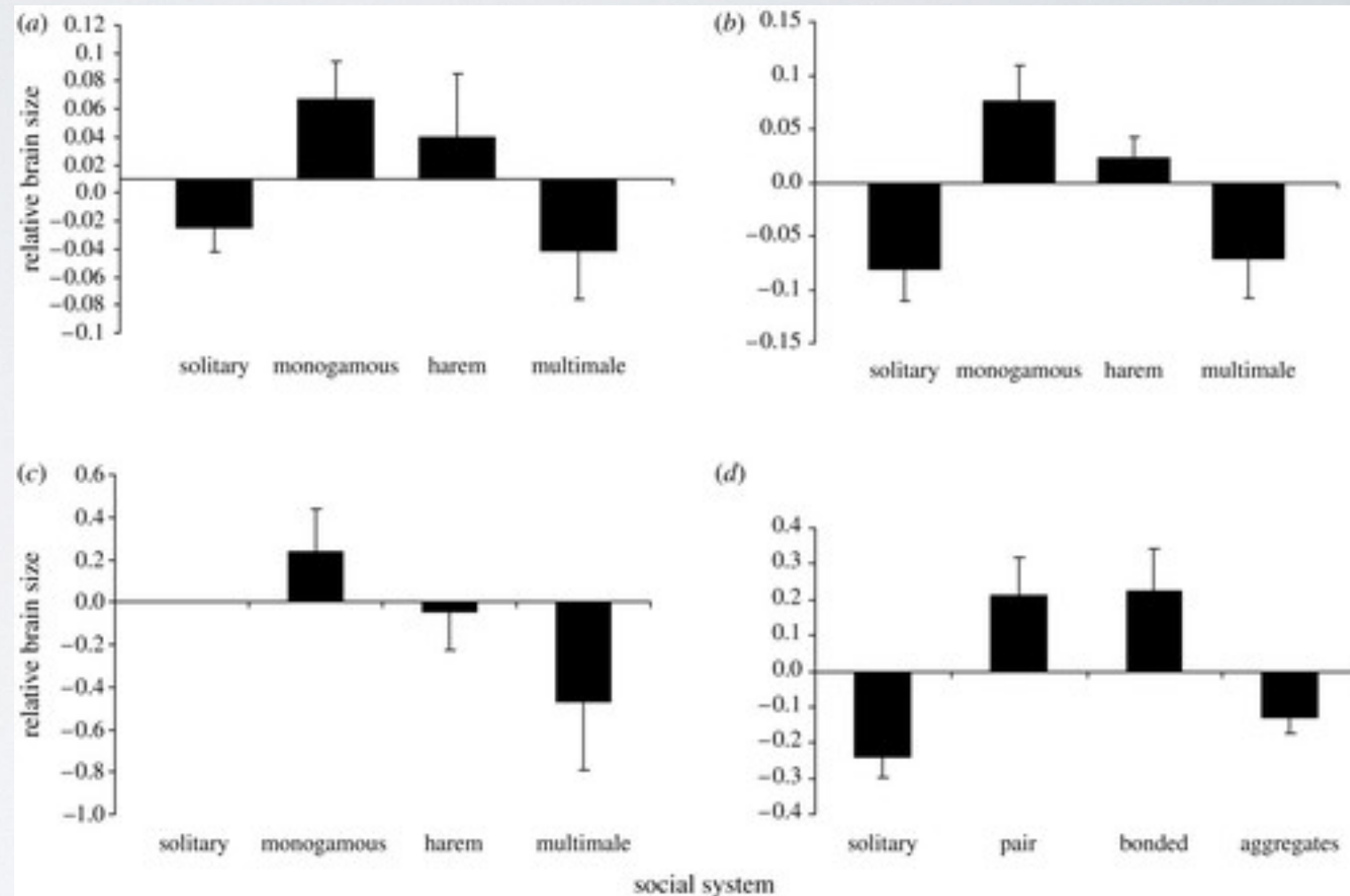
LARGER GROUPS=LARGER BRAINS?

- Neocortex ratio increases with group size
- Correlation stronger for monkeys than apes



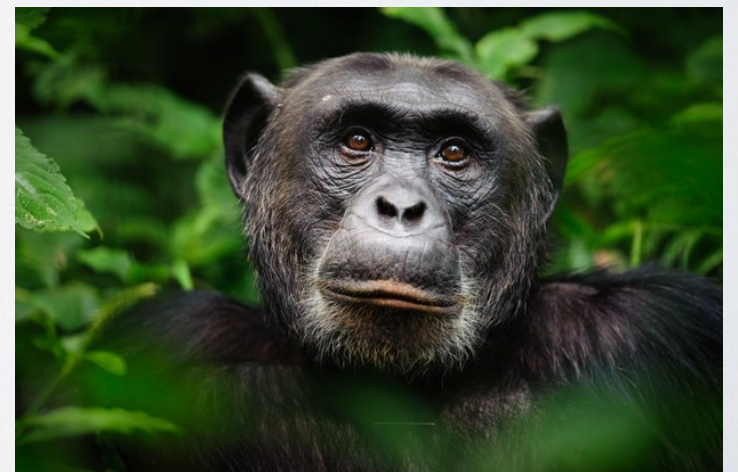
LARGER GROUPS=LARGER BRAINS?

- Outside primate order, group size is not correlated with brain size
- Monogamy and pair bonding associated with larger brain size



ARE SOCIALLY COMPLEX SPECIES SMARTER?

- Strong relationship between group size and neocortex ratio
- What about orangutans, chimpanzees, and capuchins?
- Why doesn't it apply to non-primates?
- Need better measure of social complexity than group size
- Need better measure of intelligence than brain size



ARE SOCIALLY COMPLEX SPECIES SMARTER?

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- Why doesn't it apply to non-primates?
- Need better measure of social complexity than group size
- **Need better measure of intelligence than brain size**
 - **Social cognitive abilities can form basis of cross-species comparison**

WHAT DO PRIMATES KNOW ABOUT THEIR SOCIAL WORLD?

WHAT DO PRIMATES KNOW ABOUT THEIR SOCIAL WORLD?

- Knowledge of others
- Knowledge of others' relationships
- Knowledge others' minds

INDIVIDUAL RECOGNITION

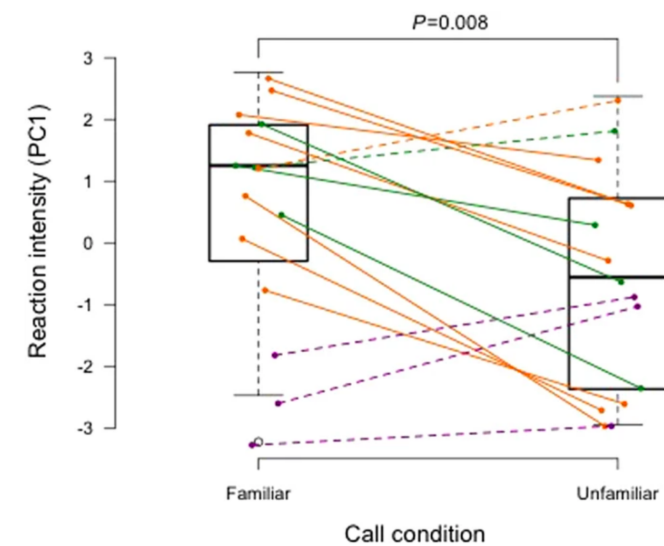
- Individual recognition is widespread
- Occurs across all modalities
- Memory for individual group mates is long-lasting

INDIVIDUAL RECOGNITION

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From: [Enduring voice recognition in bonobos](#)



Bonobo reactions to the calls of familiar and unfamiliar individuals.

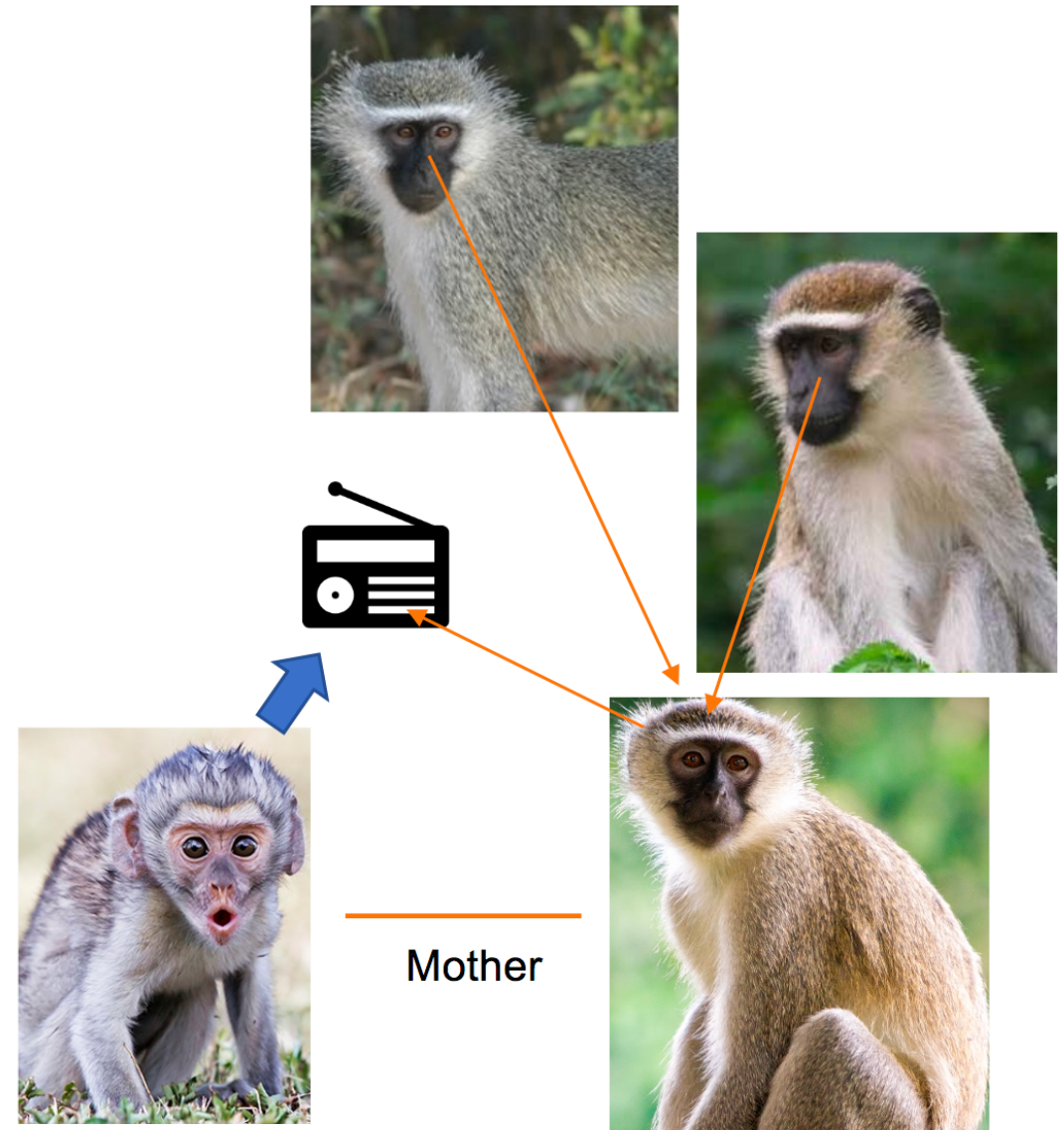
Each individual was tested in both conditions and each line on the figure links the responses in each condition for the same individual. The colour of the lines corresponds to the separation time between the subject and the former group mate used in the familiar condition. Green lines = bonobos that have been separated for 2–3 years ($n = 4$); orange lines = separated for 4.5–5.5 years ($n = 8$); purple lines = separated for 8–9 years ($n = 3$). The principle component score (PC1) represents an integrated measure of the behavioural response, with higher scores indicating a stronger behavioural reaction to the broadcast calls. Solid lines = bonobos that reacted more to the familiar voice; dashed lines = bonobos that reacted equally to both signals or more to the unfamiliar voice.

RECOGNITION OF OTHERS' SOCIAL RELATIONSHIPS

- Kinship of others
- Social bonds of others
- Dominance relations of others

KNOWLEDGE OF OTHERS' KINSHIP

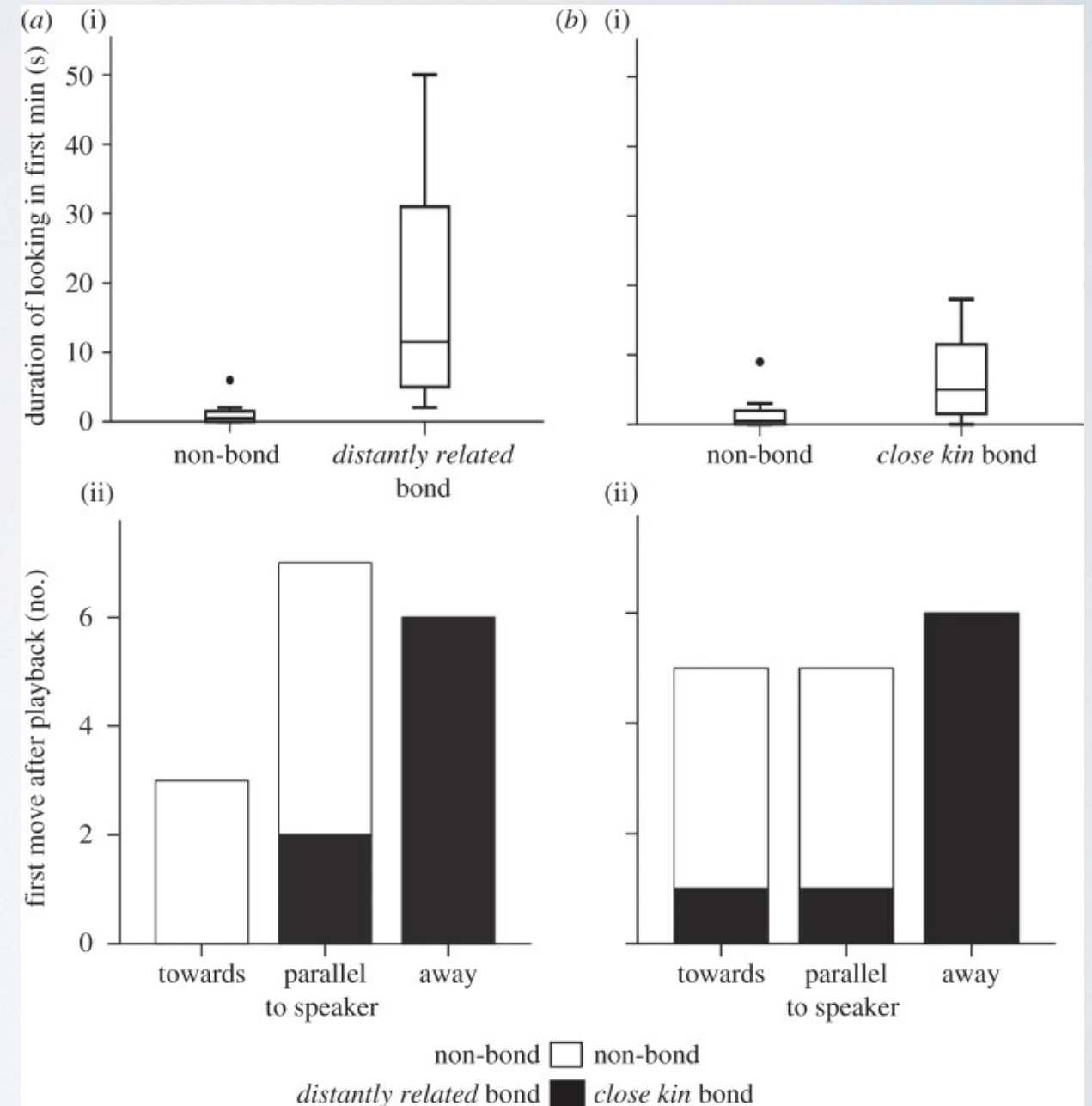
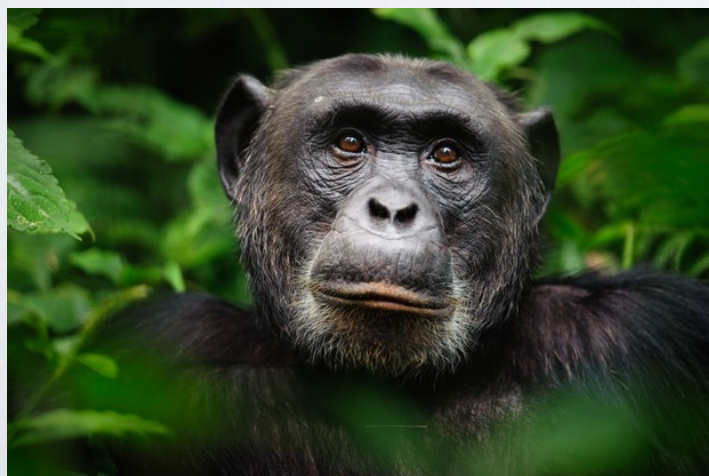
- Recognize kin of others?
- Vervet monkeys hear the distress call of an infant
- Mother looks @ speaker
- Other females look @ at *mother*



(Cheney & Seyfarth, 1980)

KNOWLEDGE OF OTHERS' SOCIAL BONDS

- A and B fight
- 2 hours later experimenters play a recording of an 'aggressive bark' to individual A from either
 - Friend of B
 - Non-friend of B
- Individual A reacts differently depending on the relationship between the 'caller' and Individual B

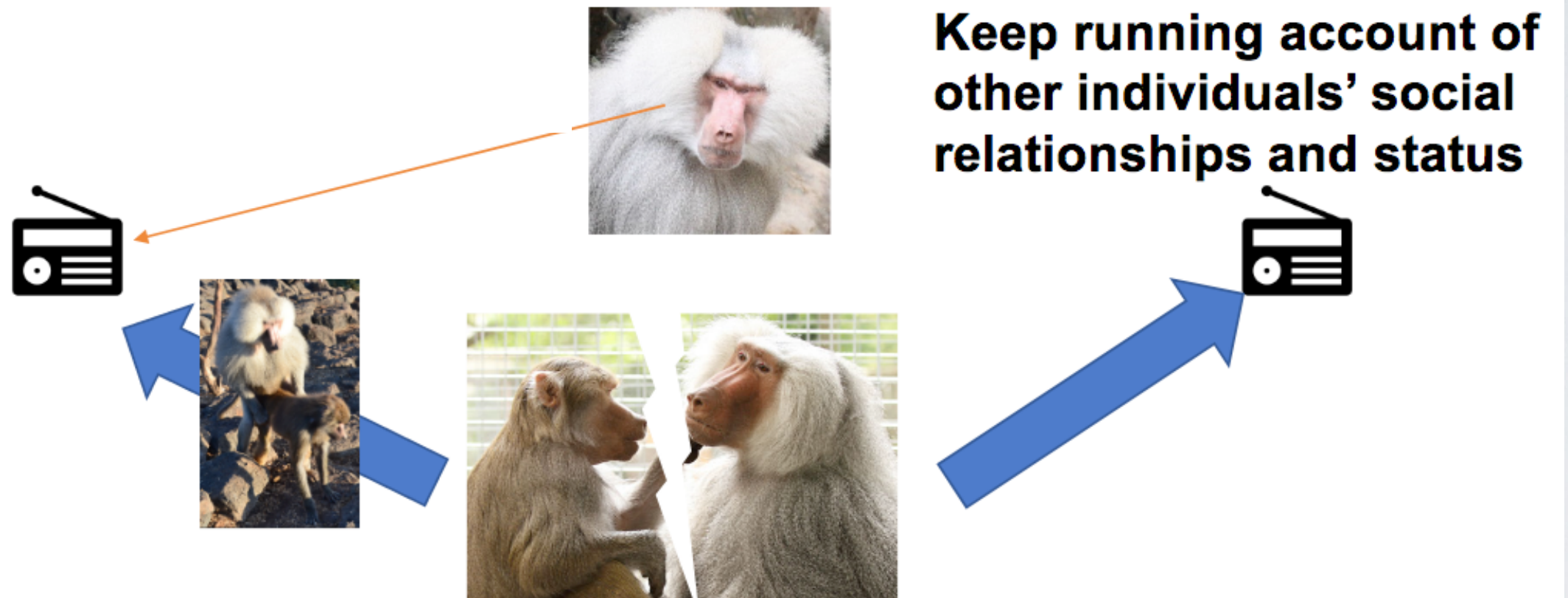


KNOWLEDGE OF OTHERS' TRANSIENT RELATIONSHIPS

- High-ranking males form 'consortships' with estrous females
- Other males excluded from mating



KNOWLEDGE OF OTHERS' TRANSIENT RELATIONSHIPS



(Crockford et al., 2007)

KNOWLEDGE OF OTHERS' TRANSIENT RELATIONSHIPS

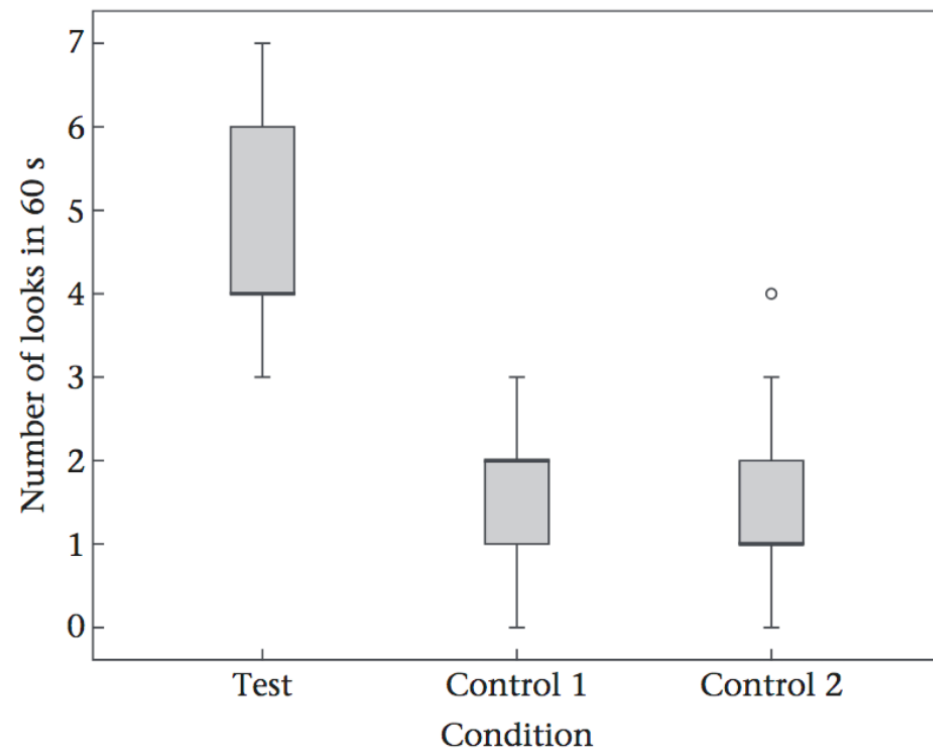


Figure 1. Number of looks given by subjects towards the speaker playing the female copulation call in the first minute after playback for each of the three conditions. $N = 9$ in each condition. Test = consort male and female during consortship; control 1 = other male and female during consortship; control 2 = consort male and female after end of consort. Each box encompasses the 25th through 75th percentiles, with the median represented by an interior line. Whiskers denote 10th and 90th percentiles.

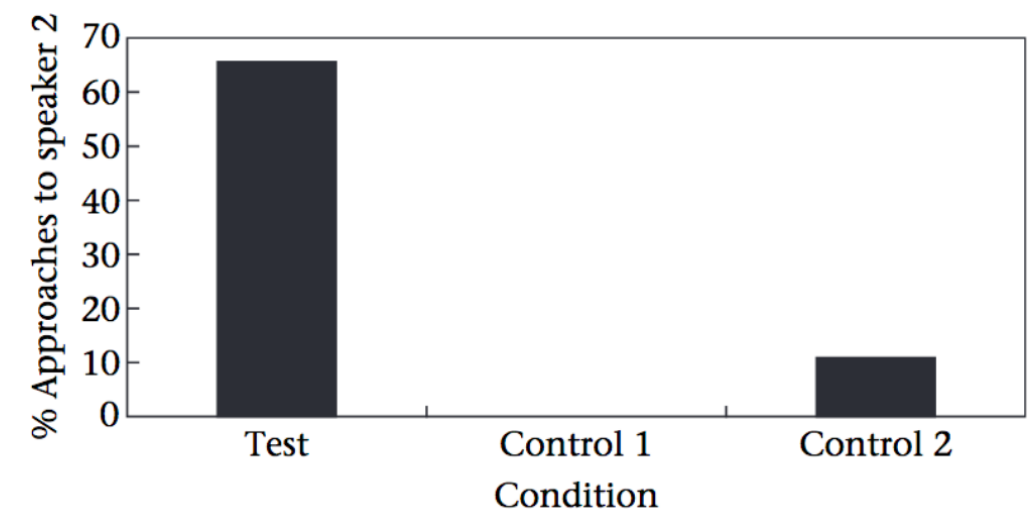


Figure 2. The percentage of approaches made by subjects towards the speaker playing the female copulation call. $N = 9$. Legend as in Fig. 1.

Males show increased interest in information that could lead to a potentially conceptive sneaky mating

KNOWLEDGE THIRD-PARTY DOMINANCE RANKS

- Bonnet macaques solicit coalition partners who outrank their opponent

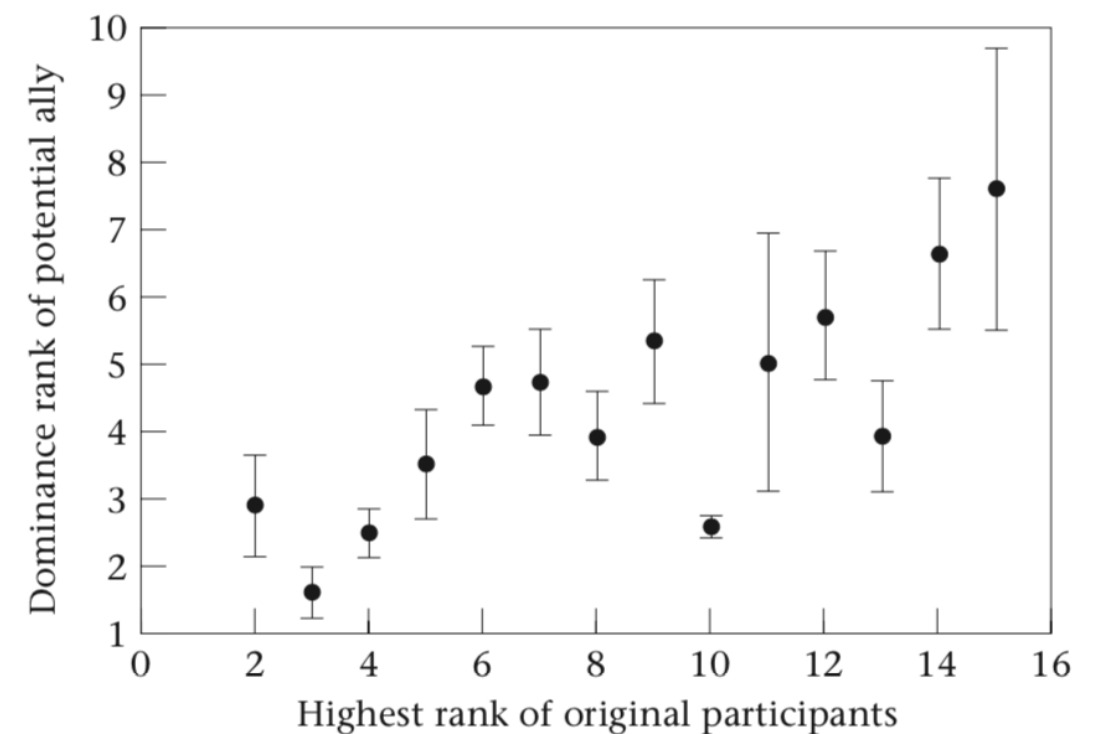


Figure 3. Males chose lower-ranking allies more often when they were involved in conflicts with low-ranking males than when they were involved in conflicts with higher-ranking males. The rank of the higher-ranking of the original participants (SOL, OPP) was positively correlated with the average rank of the potential ally. Means and standard errors are plotted.

‘Violation of expectation’ paradigm

- Non-verbal task, developed for infants
- Test knowledge of X by showing X being false
- Reaction to unexpected outcome
 - Increased arousal/attention



KNOWLEDGE THIRD-PARTY DOMINANCE RANKS

- Baboons exhibit violation of expectation in response simulated rank reversals

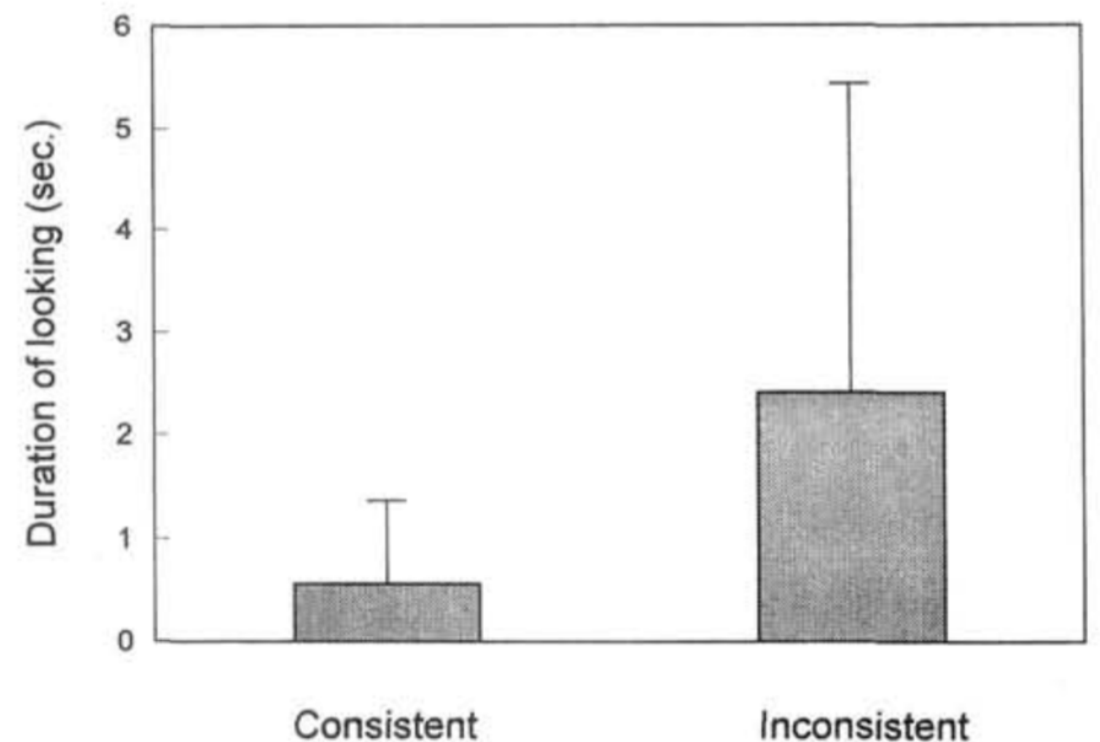
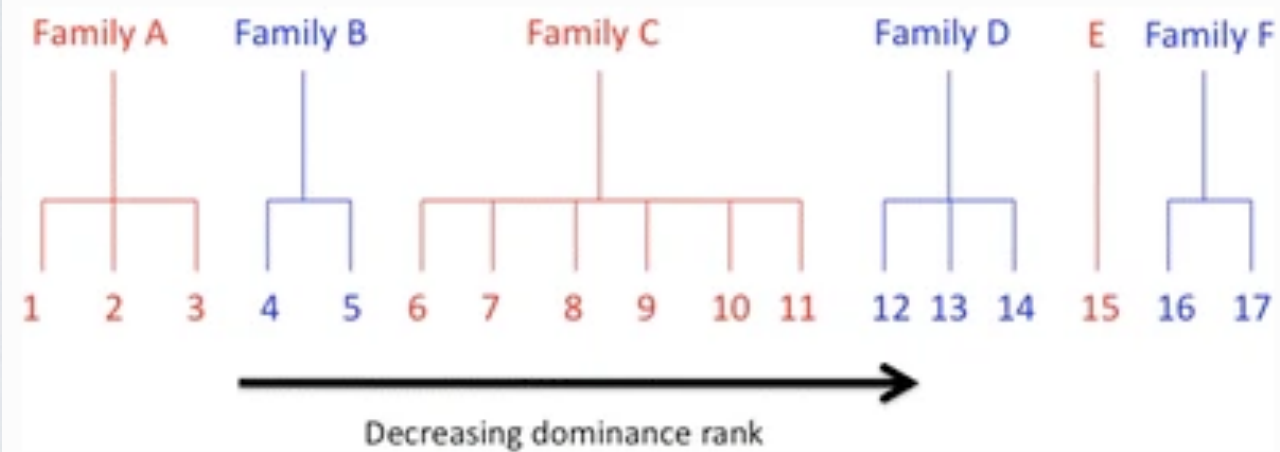


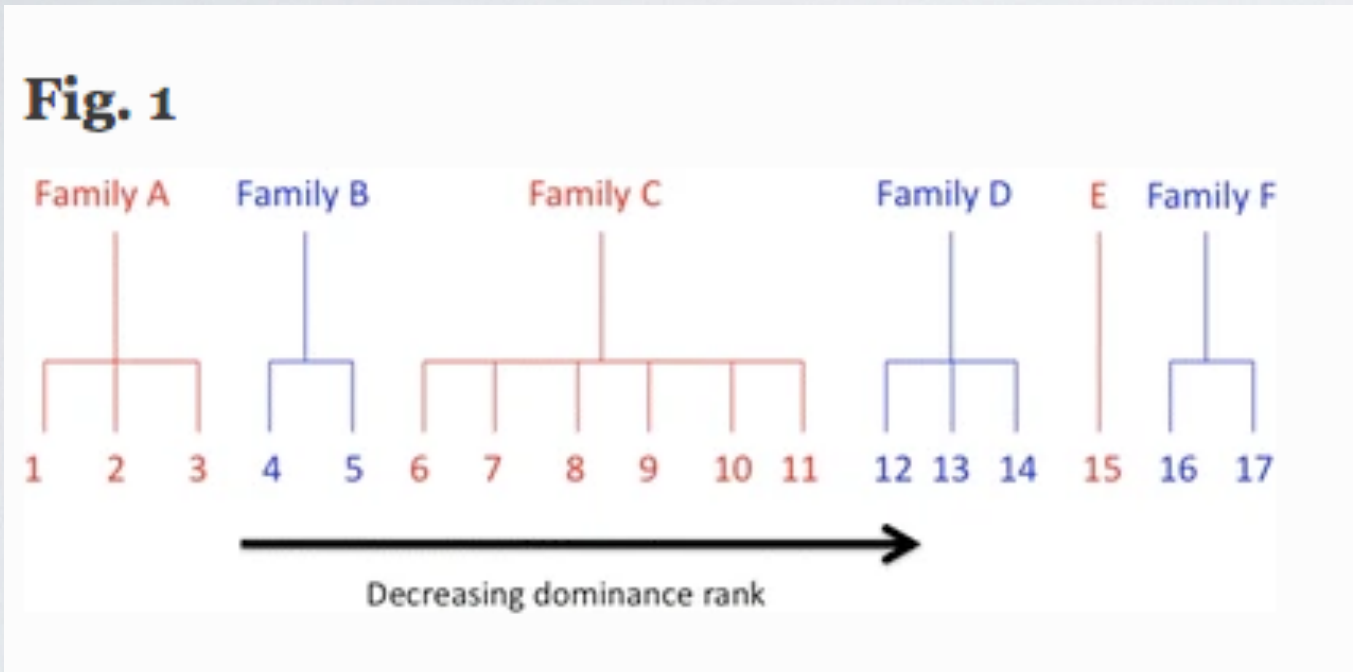
Figure 1. The mean duration of subjects' responses to playbacks of causally inconsistent and causally consistent call sequences. Histograms show means and standard deviations for 21 subjects in each of the two conditions.

SIMULTANEOUS SOCIAL CATEGORIZATION ACCORDING TO KINSHIP AND RANK

Fig. 1



SIMULTANEOUS SOCIAL CATEGORIZATION ACCORDING TO KINSHIP AND RANK



Rank reversal within vs between families?

SIMULTANEOUS SOCIAL CATEGORIZATION ACCORDING TO KINSHIP AND RANK

- Subjects look longer to between family reversal than within family reversals
- Baboons simultaneously categorize individuals according to their rank and kinship

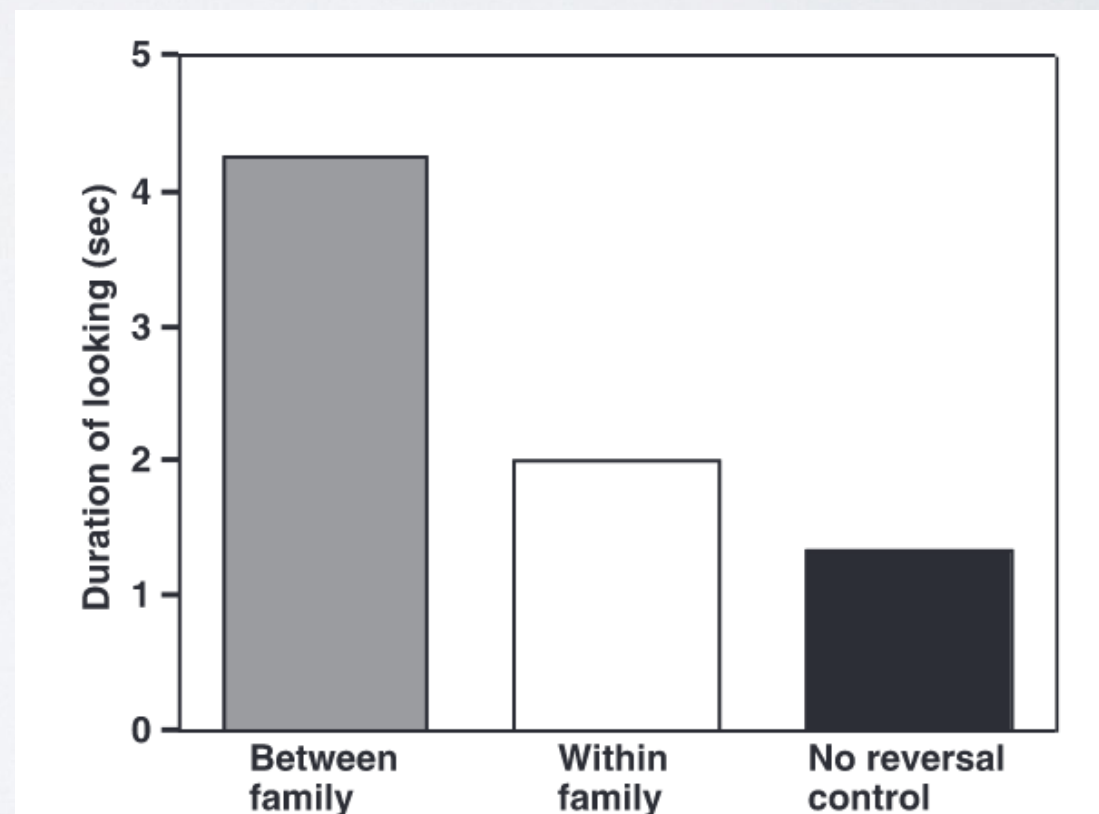
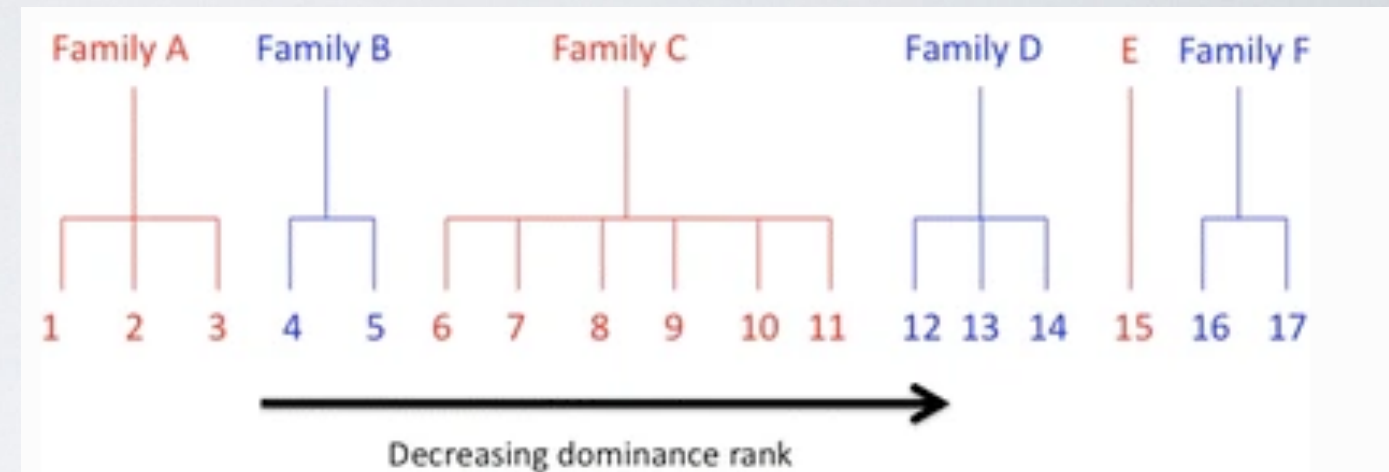


Fig. 1. The mean duration that subjects oriented toward the loudspeaker following playback of each sequence type. Overall, there was a

KNOWLEDGE OF OTHERS' MINDS

- Intentions
- Desires
- Knowledge/ignorance
- False beliefs

KNOWLEDGE OF OTHERS' MINDS

- **Intentions**
- Desires
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YOU TALKING TO ME?

Playback experiment: subjects were played threat-grunt from dominant individual in two conditions:



YOU TALKING TO ME?

Playback experiment: subjects were played threat-grunt from dominant individual in two conditions:

1) after aggression

2) after grooming



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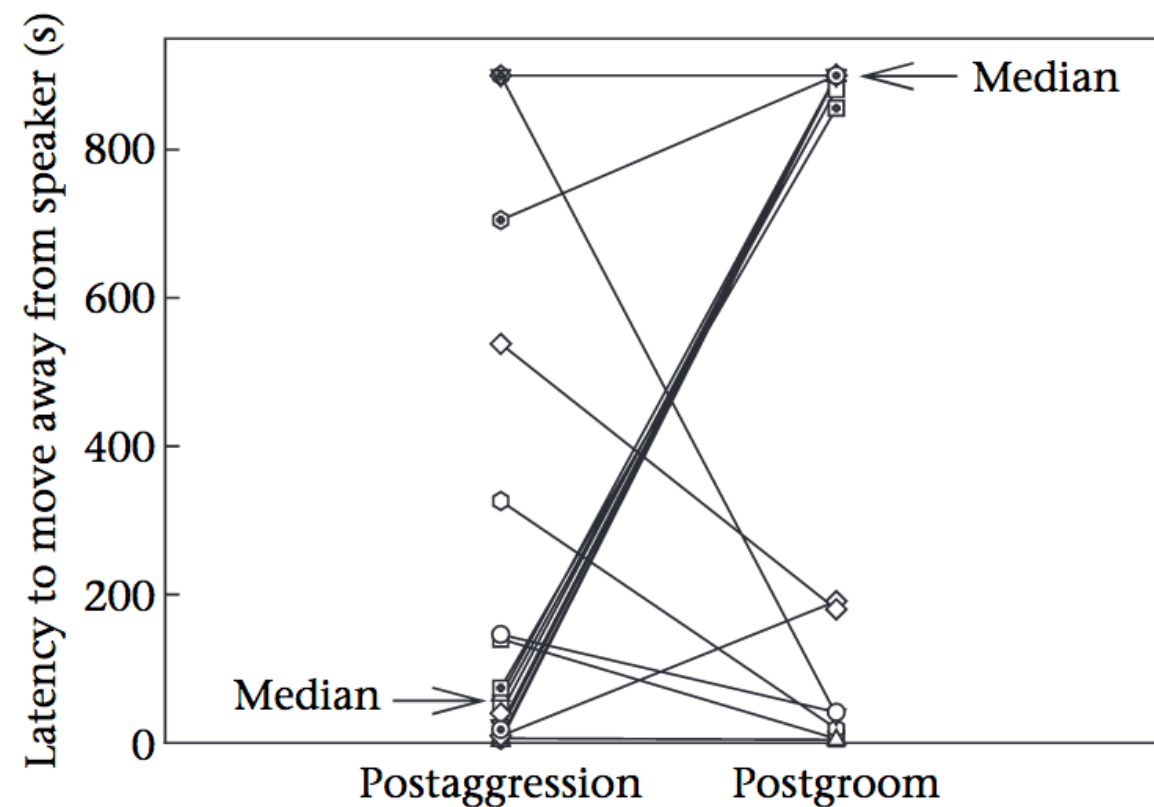


Figure 2. Subjects' latency to move more than 2 m away from the speaker after hearing the threat-grunt of a dominant female who had recently threatened or groomed them. $N = 21$ dyads in each paired trial. Each subject has a unique symbol.

YOU TALKING TO ME?

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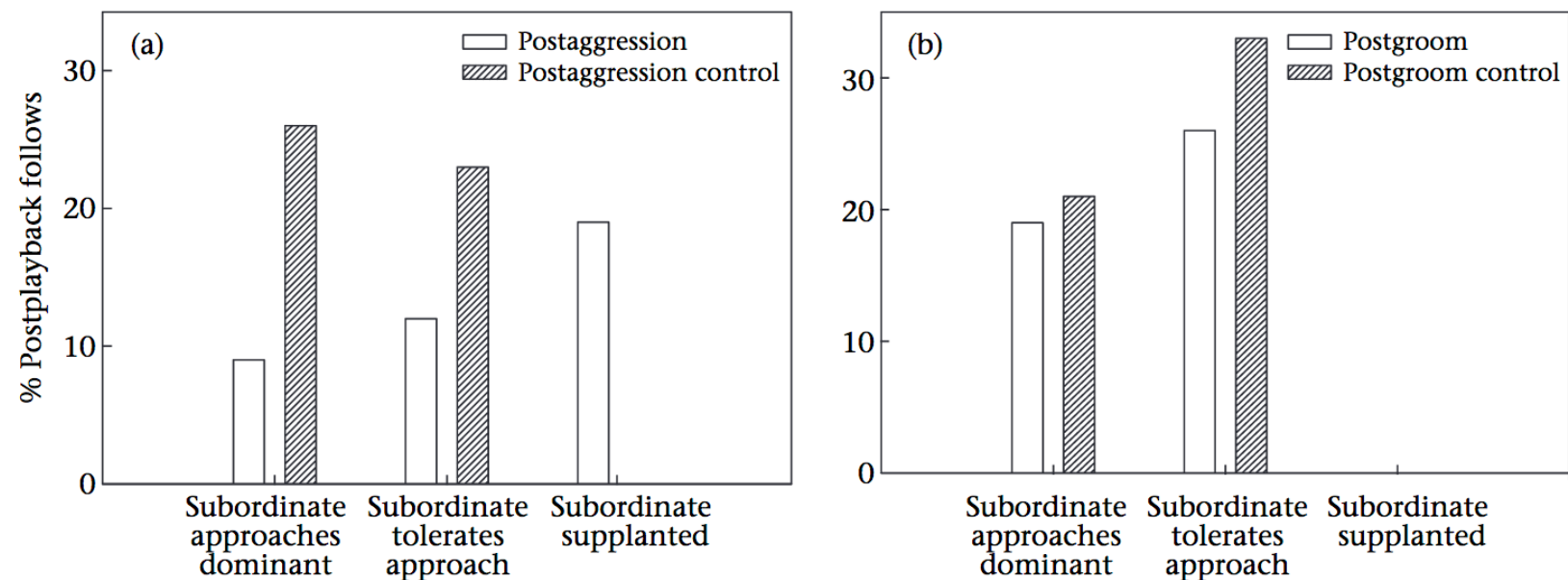


Figure 3. The proportion of postplayback follows in which subordinate subjects approached to within 2 m of the dominant signaller, tolerated the signaller's approach, or were supplanted by the signaller in the 15 min following threat-grunt playbacks. (a) Playbacks conducted after the subject received aggression from the signaller compared to control samples. (b) Playbacks conducted after the subject groomed with the signaller compared to control samples. See text for details about control samples. $N = 43$ dyads.

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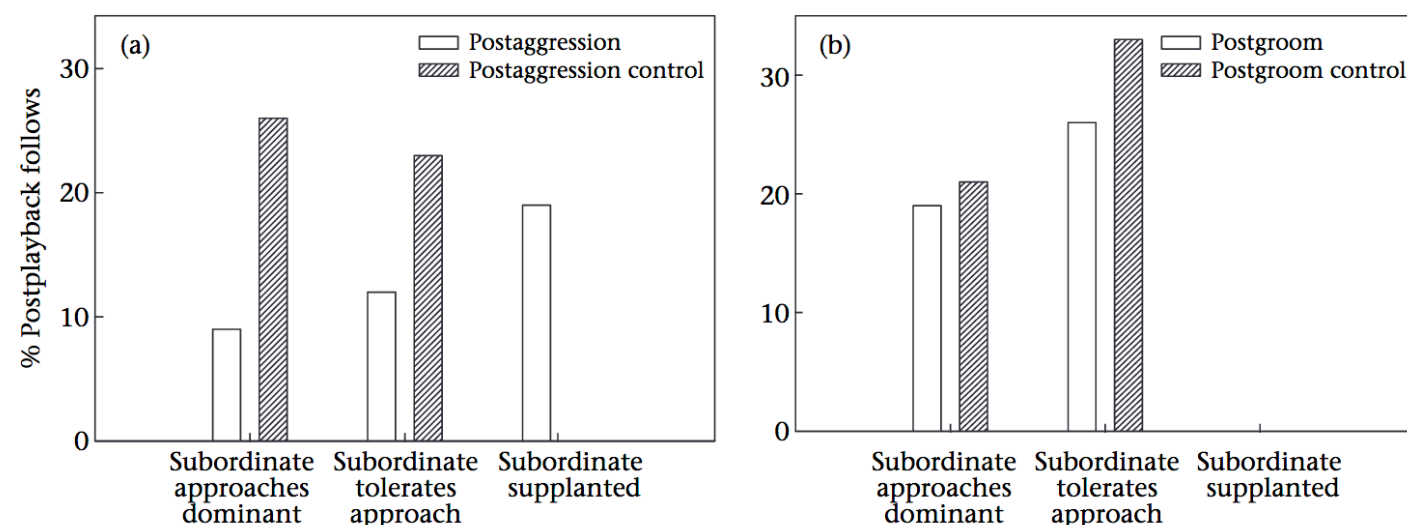


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Subjects likely attribute intentions to callers,
and interpret the calls in light of that attribution

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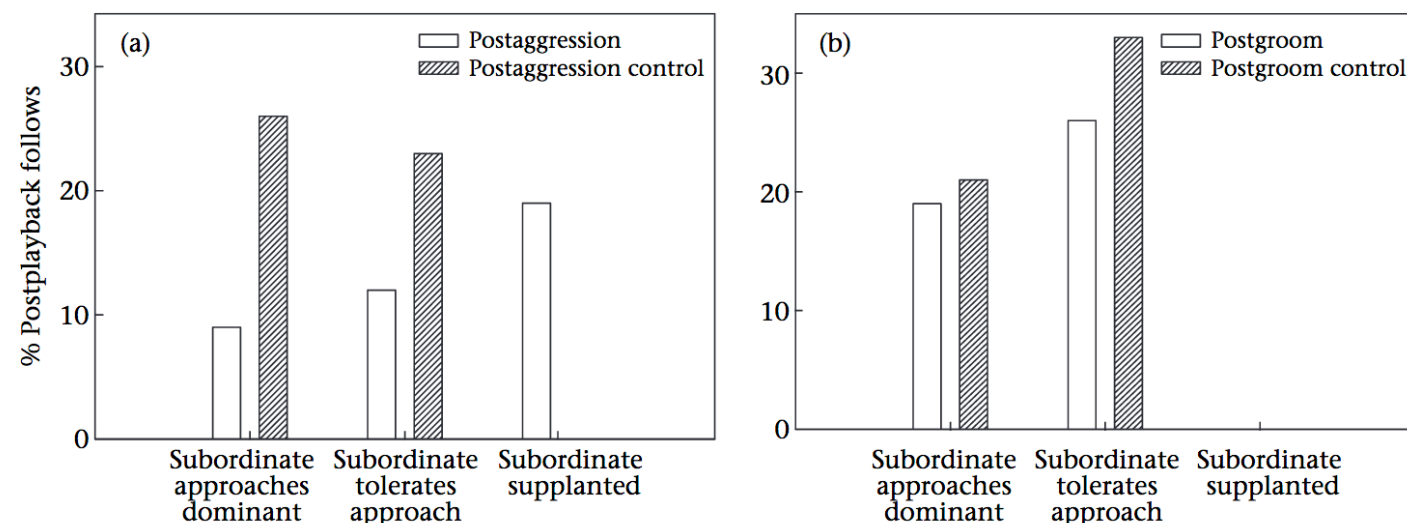


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Alternative non-mentalistic explanation:
subjects use learned contingencies based on past observed behaviors

QUESTIONS?

NEXT ASSIGNMENT

- Edit a Wikipedia article on a primate or primatological concept

WIKIPEDIA TIMELINE

- This week:
 - Meet to discuss topics/pages to edit
 - Compile reading list
 - Complete Wikipedia trainings

WIKIPEDIA TIMELINE

- Next week (Oct 16):
 - Read articles
 - Write a summary of topic (~750 words) and a critique of wikipedia article (~200 words) (20% of assignment grade)

WIKIPEDIA TIMELINE

- Oct 21: Submit proposed edits—to Isaac, not Wikipedia (20% of assignment grade)
- Oct 27: Submit edits—to Isaac and Wikipedia (60% of assignment grade)

Questions?