Animal Cognitive Ecology

05 Cognition:

Conflict resolution

Individual Factors

Cognitive Abilities
Empathy
Cooperation
Policing
Conflict resolution

Social Factors

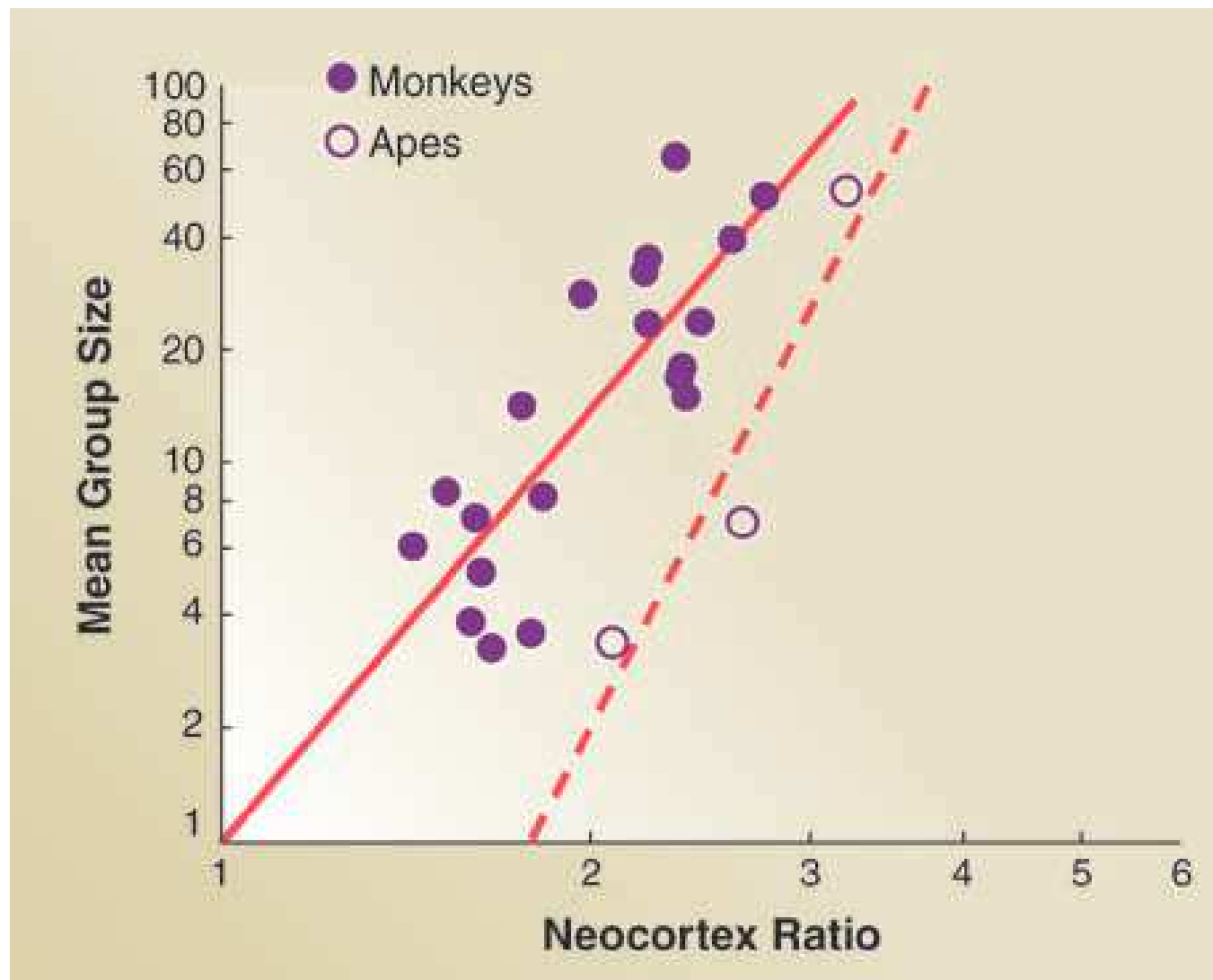Environmental Factors
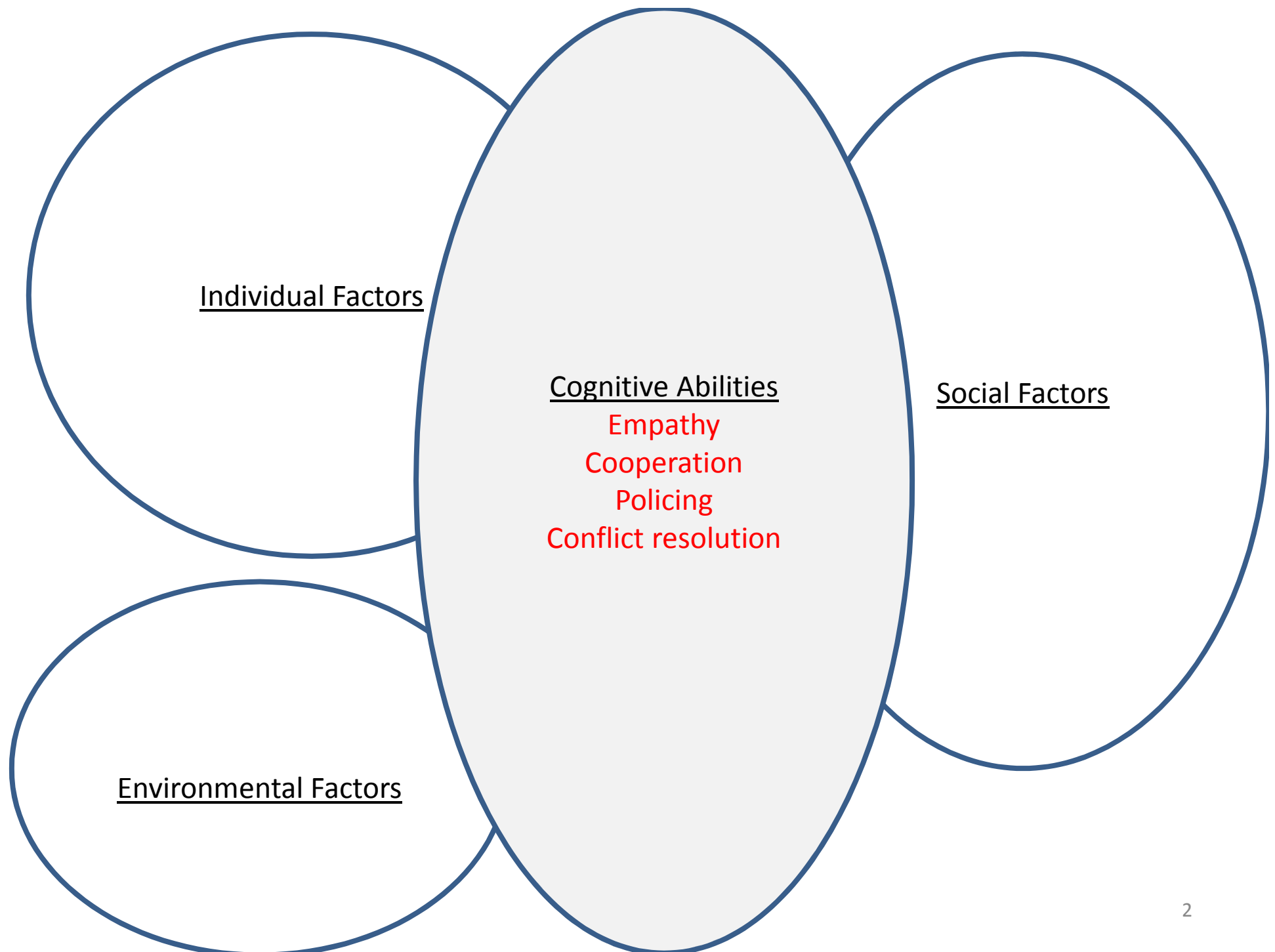
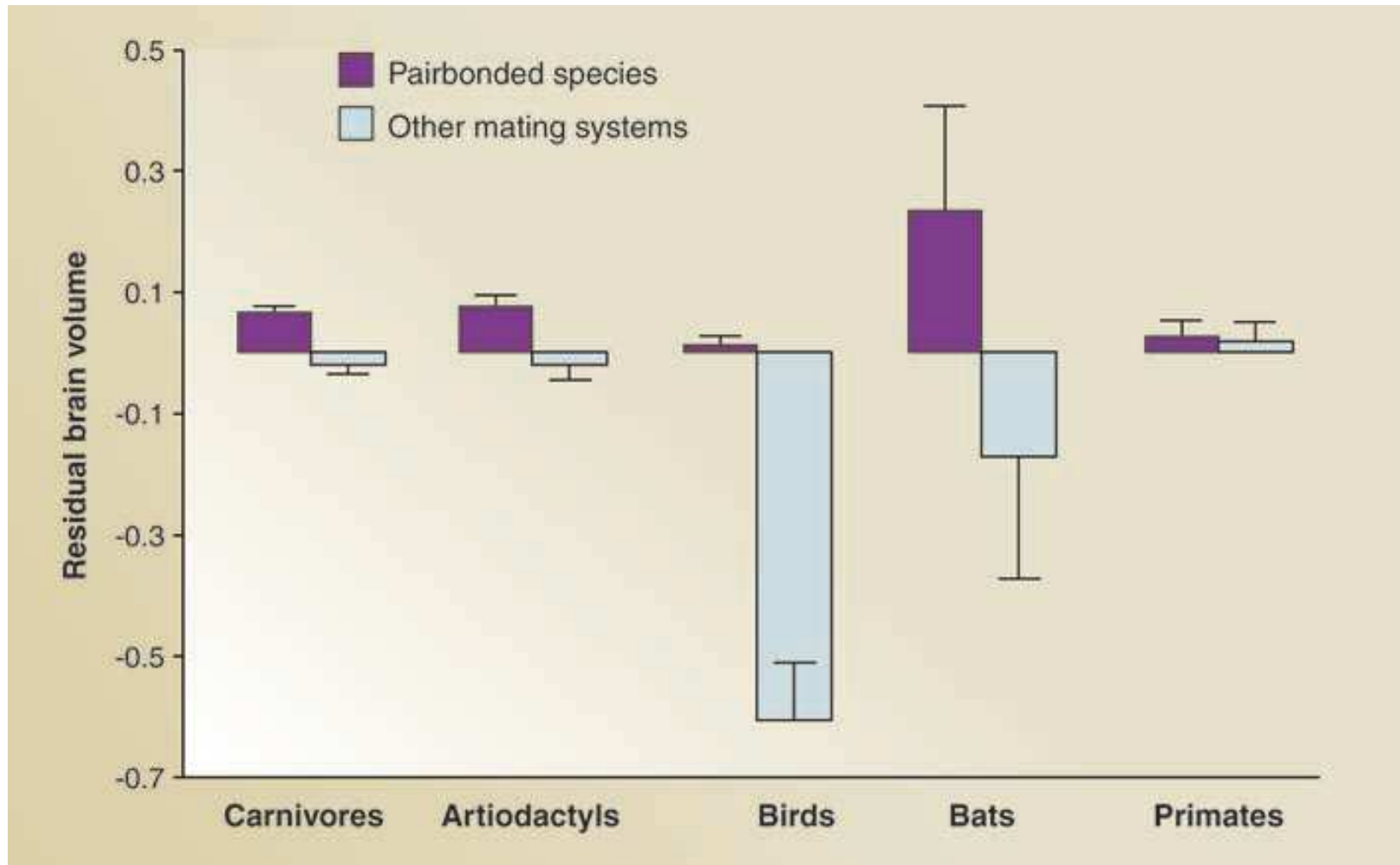# "High order" cognitive capacities often in social context

- Living in groups raises conflicts

Neocortex volume depends on group size in primates

(Dunbar and Shultz 2003)

brain volume depends on mating strategy

(Dunbar and Shultz, 2003).

Empathy

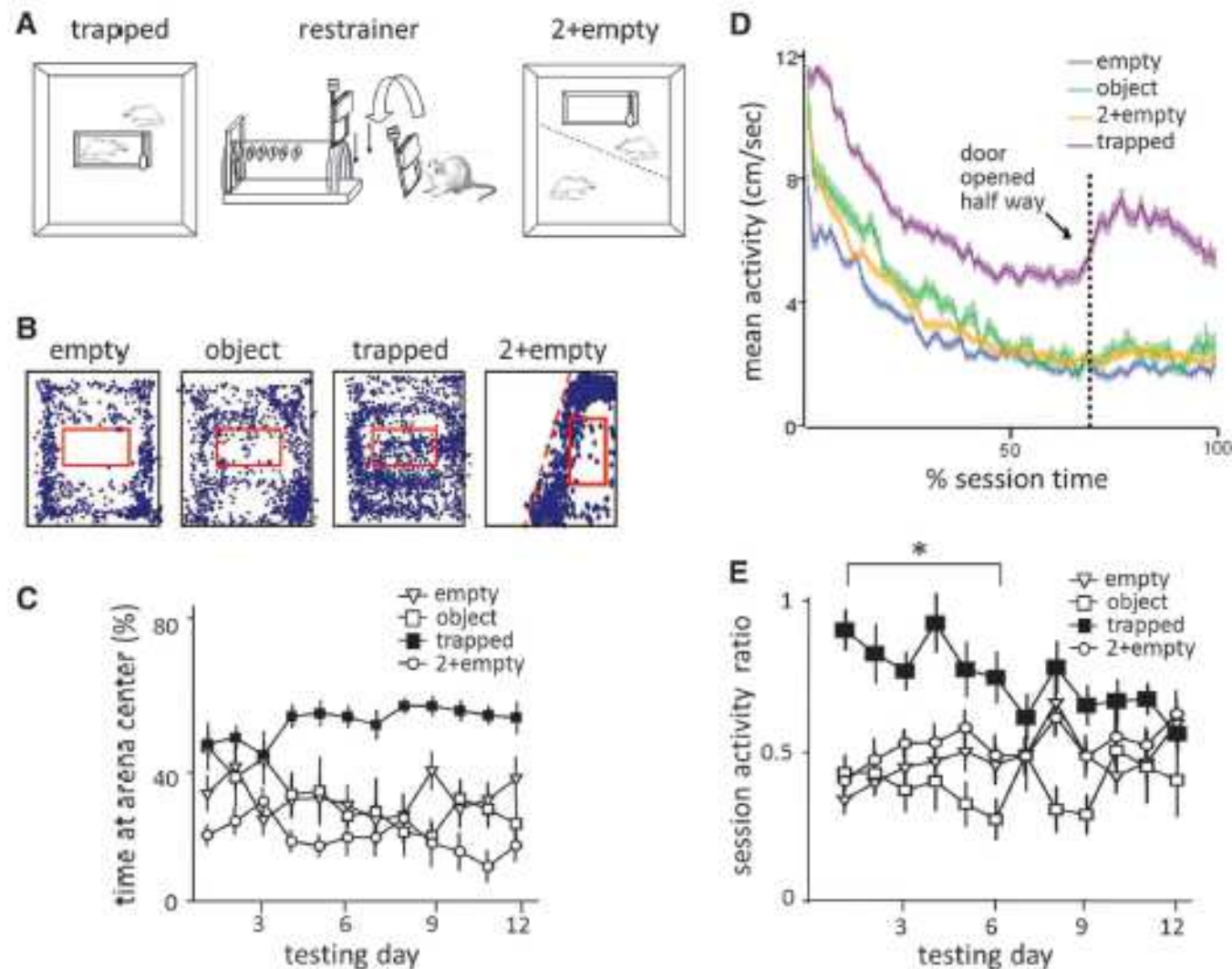Empathy and Pro-Social Behavior in Rats (Bartal et al. 2011)

Fig. 1. (A) Top views of the trapped and 2+empty conditions and side views of the restrainer and door. (B) The locations (0.5 frames per second) of representative free rats with respect to the restrainer (red box) are plotted for each condition on day 1 of testing. (C) Rats in the trapped condition spent more time (mean ± SEM) in the arena center (>5 cm away from the wall) than did rats in control conditions. (D) The velocity (mean ± SEM) of rats in the trapped condition was greater than that of control rats throughout the session. (E) The ratio of the average activity during the second half of sessions relative to the average activity during the first half (mean ± SEM) was greater for rats in the trapped condition on days 1 to 6 than for rats in control conditions.

Do Elephants Show Empathy? *(Bates et al. 2008)*

- Amboseli elephant population

- Collection of behaviour case reports

- Reported by members of the Amboseli Trust for Elephants (ATE)

Do Elephants Show Empathy? *(Bates et al. 2008)*

Table 2: Summary of behaviours observed and the implications for cognition

Behaviour	Context	Requirement	Empathic attribution
Anticipatory coalitions	Competition with other elephants	Recognition of threat from third parties to allies	Animacy Goal directedness Emotion
Protection	Pre-empting and preventing injury/danger	Recognition of danger to others	Animacy Goal directedness Emotion
	Response to injury/danger	Recognition that another has been hurt	Animacy Emotion
Comfort	Physical reassurance	Recognition of physical distress of calf	Animacy Emotion
	Social reassurance	Recognition of emotional distress of calf	Animacy Emotion
	Refusal of allosuckling	Recognition of identity of calf	Animacy Goal directedness
Babysitting	Related calves	Recognition that calf is not with its mother	Animacy Emotion
	Unrelated calves	Recognition that calf is not with its mother	Animacy Emotion

Do Elephants Show Empathy? *(Bates et al. 2008)*

Retrievals	Calf left alone	Remembering that calf should be present	Animacy Emotion
	Calf with individuals it wandered towards	Recognition of calf and that it should be present	Animacy Emotion
	Calf with individuals that drew it away	Recognition of calf and that it should be present	Animacy Goal directedness Emotion

Do Elephants Show Empathy? *(Bates et al. 2008)*

Behaviour	Context	Requirement	Empathic attribution
Assisting Mobility	Leading	Recognition that calf cannot negotiate certain terrain	Animacy Physical competence
	Helping to stand	Recognition that calf cannot stand	Animacy Physical competence Emotion
	Pulling out of ditches etc.	Recognition that calf distressed because lacks ability to join mother	Animacy Physical competence Emotion
	Pushing out of ditches etc.	Recognition that calf wants to get out of ditch but lacks ability	Animacy Physical competence Intention
	Leading by a third party	Recognition that mother's efforts will be insufficient to overcome calf's physical inability	Animacy Physical competence Intention
Removing foreign objects	Darts, spears, rubbish	Recognition that object is unusual and dangerous	Animacy Emotion

Cooperation

Cooperation
String pulling in wolves
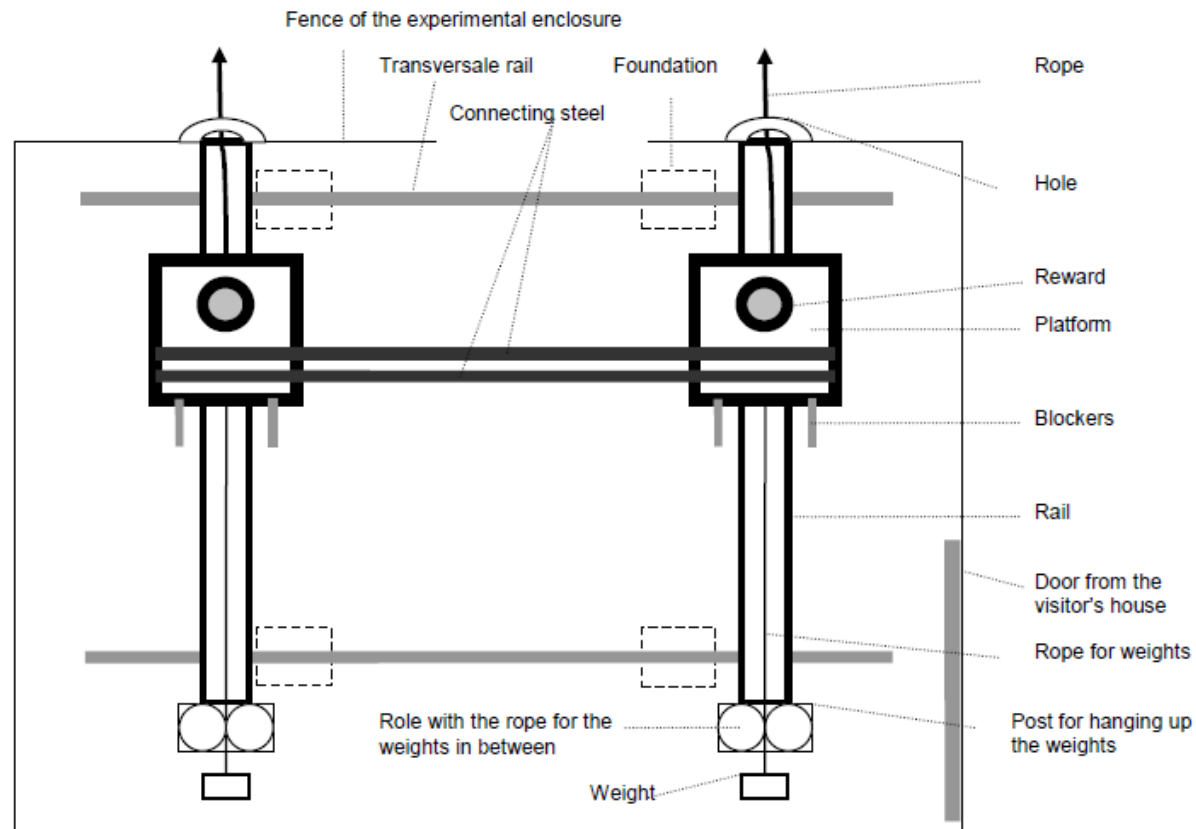

White   Grey   Black
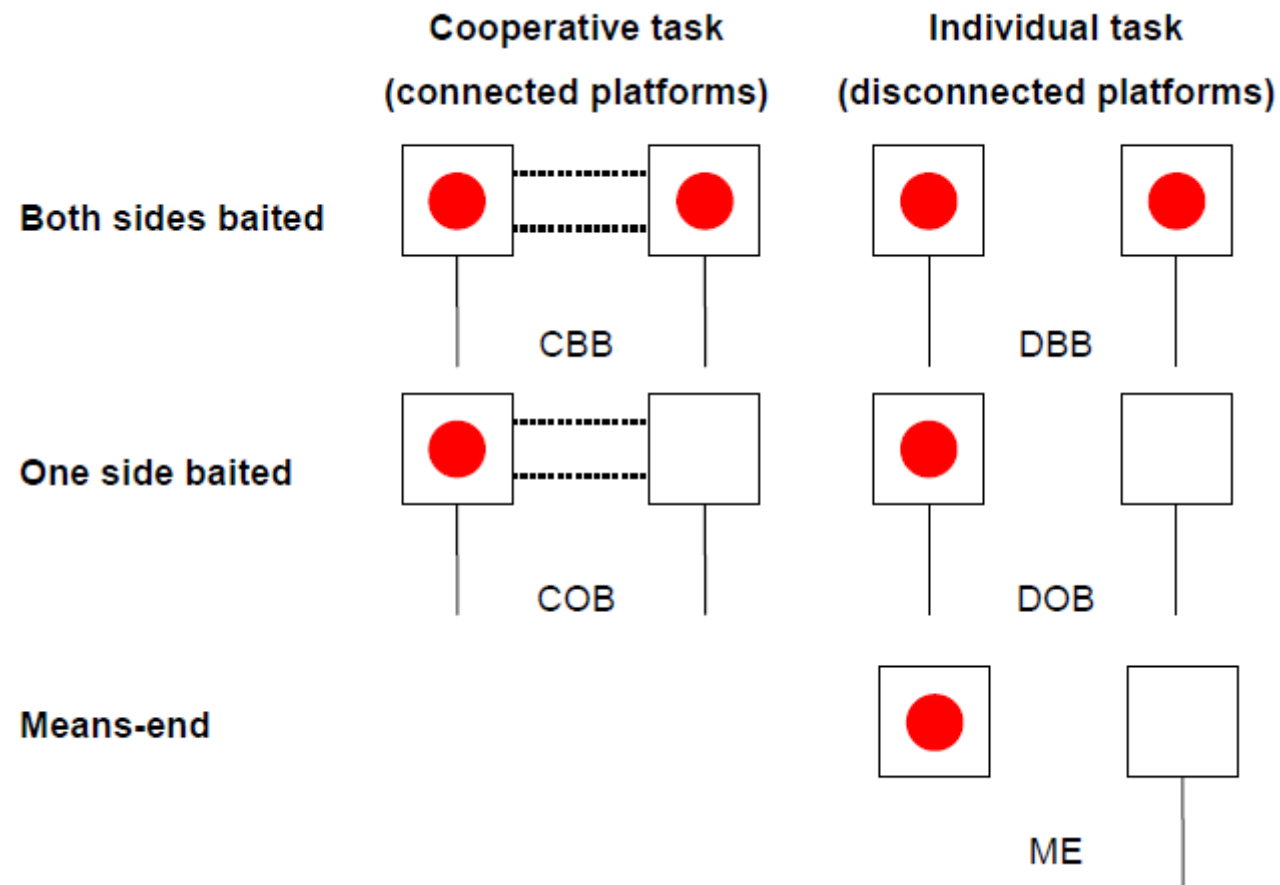
String pulling in wolves

White   Grey   Black

Experimental apparatus

Fence of the experimental enclosure

Transversale rail   Foundation   Rope

Connecting steel

Hole

Reward

Platform

Blockers

Rail

Door from the visitor's house

Rope for weights

Role with the rope for the weights in between   Post for hanging up the weights

Weight

String pulling in wolves

String pulling in wolves

a)   b)   c)

d)   e)   f)

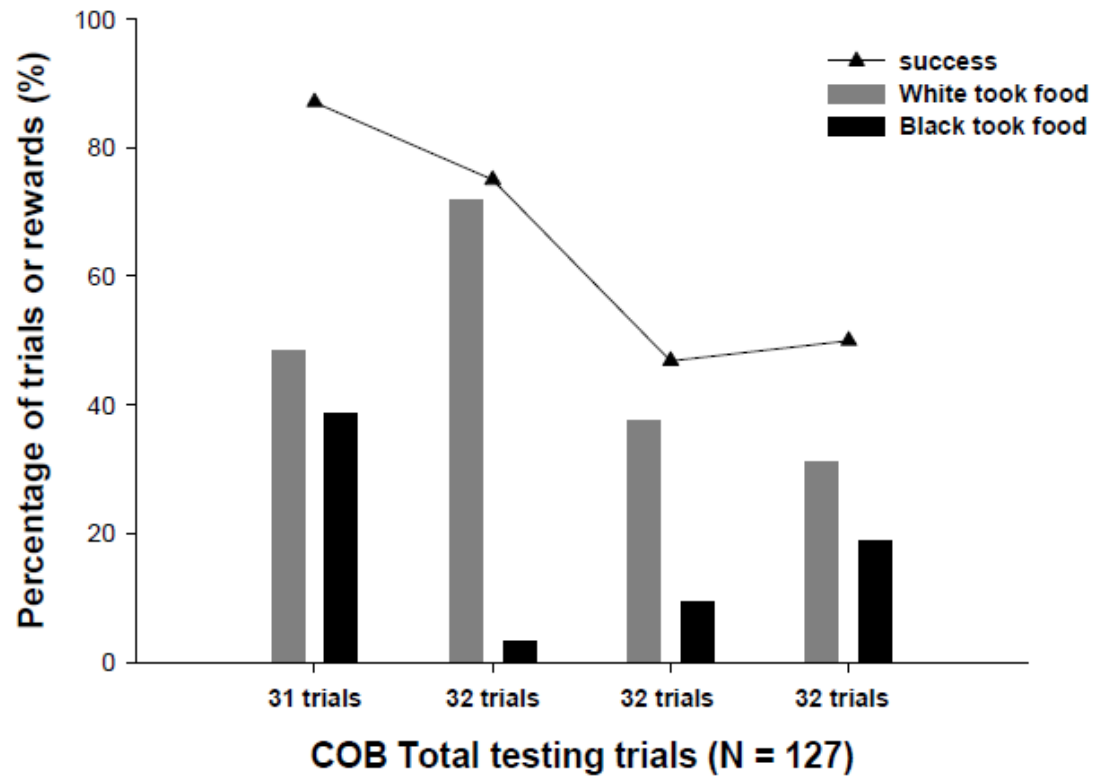# String pulling in wolves

White   Grey   Black

Results

Conflict resolution

conflict resolution
3rd party intervention
3rd party (uninvolved animal)
intervenes into affiliative or agonistic encounters
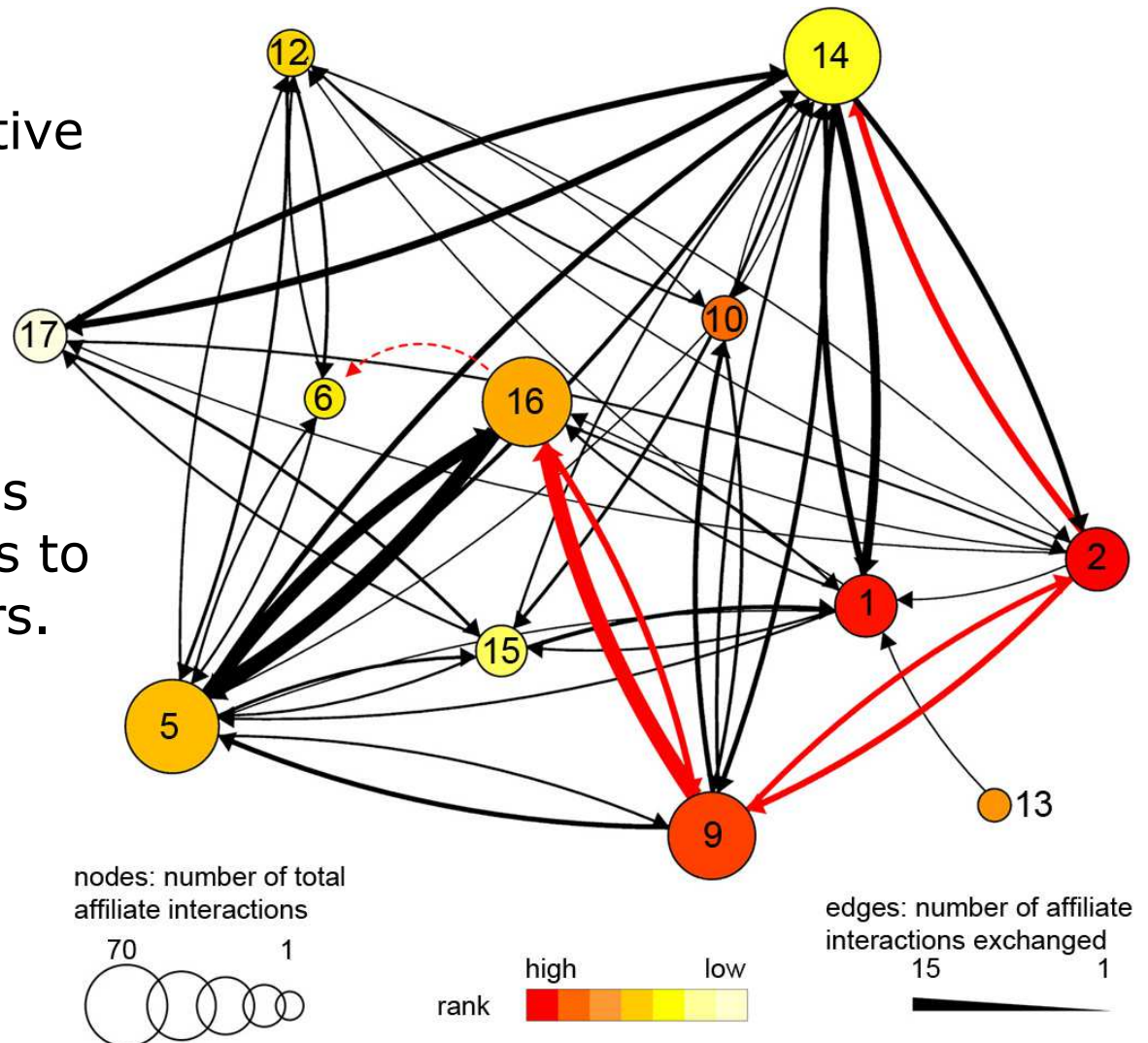
intervention into affiliative encounters
protection of social bonds

protection of social bonds

Mares intervene in affilative interaction of group members.
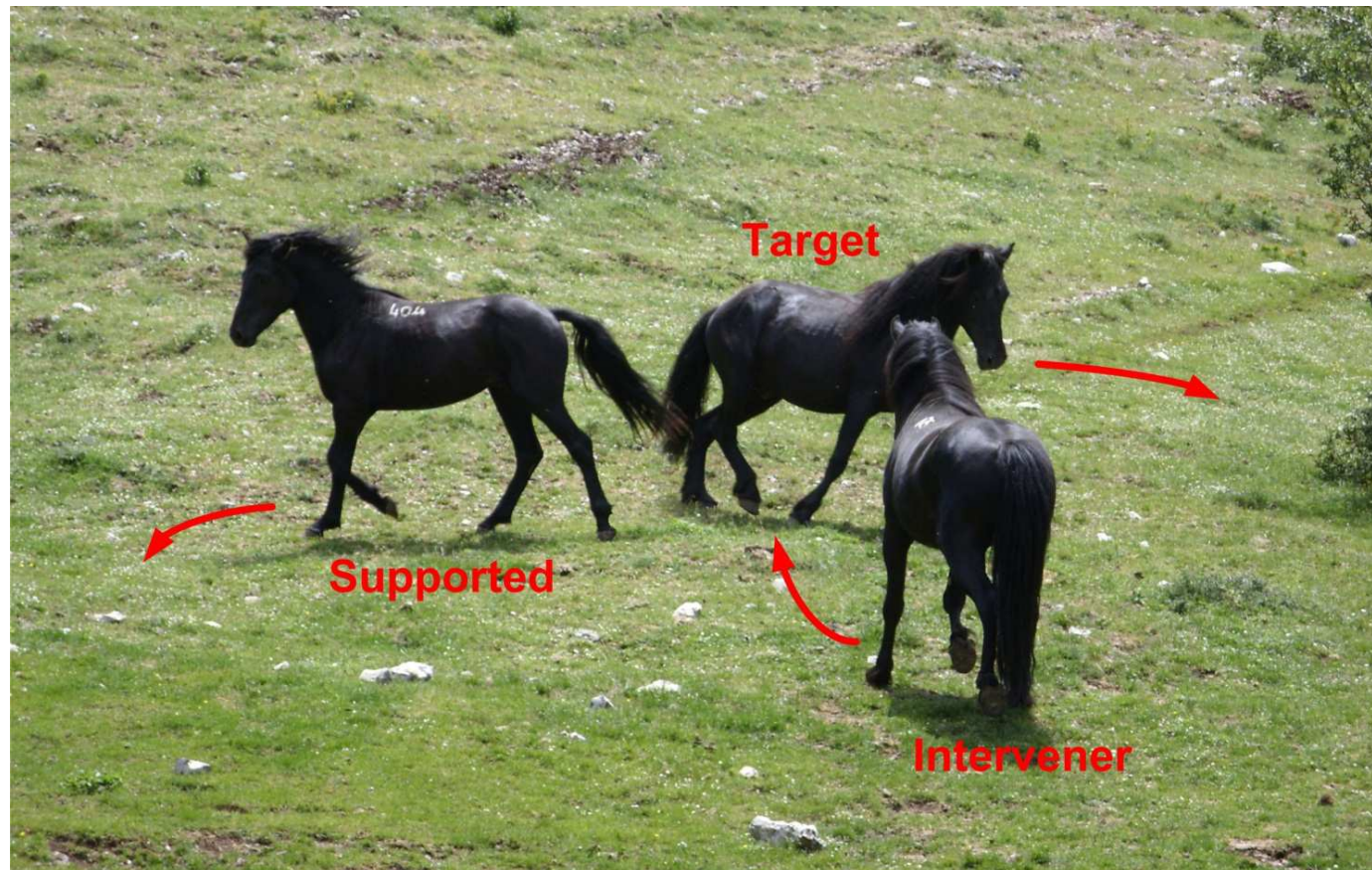
Old, high ranking animals protect their social bonds to preferred group members.

(Schneider und Krüger, 2012)

nodes: number of total affiliate interactions

70   1

rank

high   low

edges: number of affiliate interactions exchanged
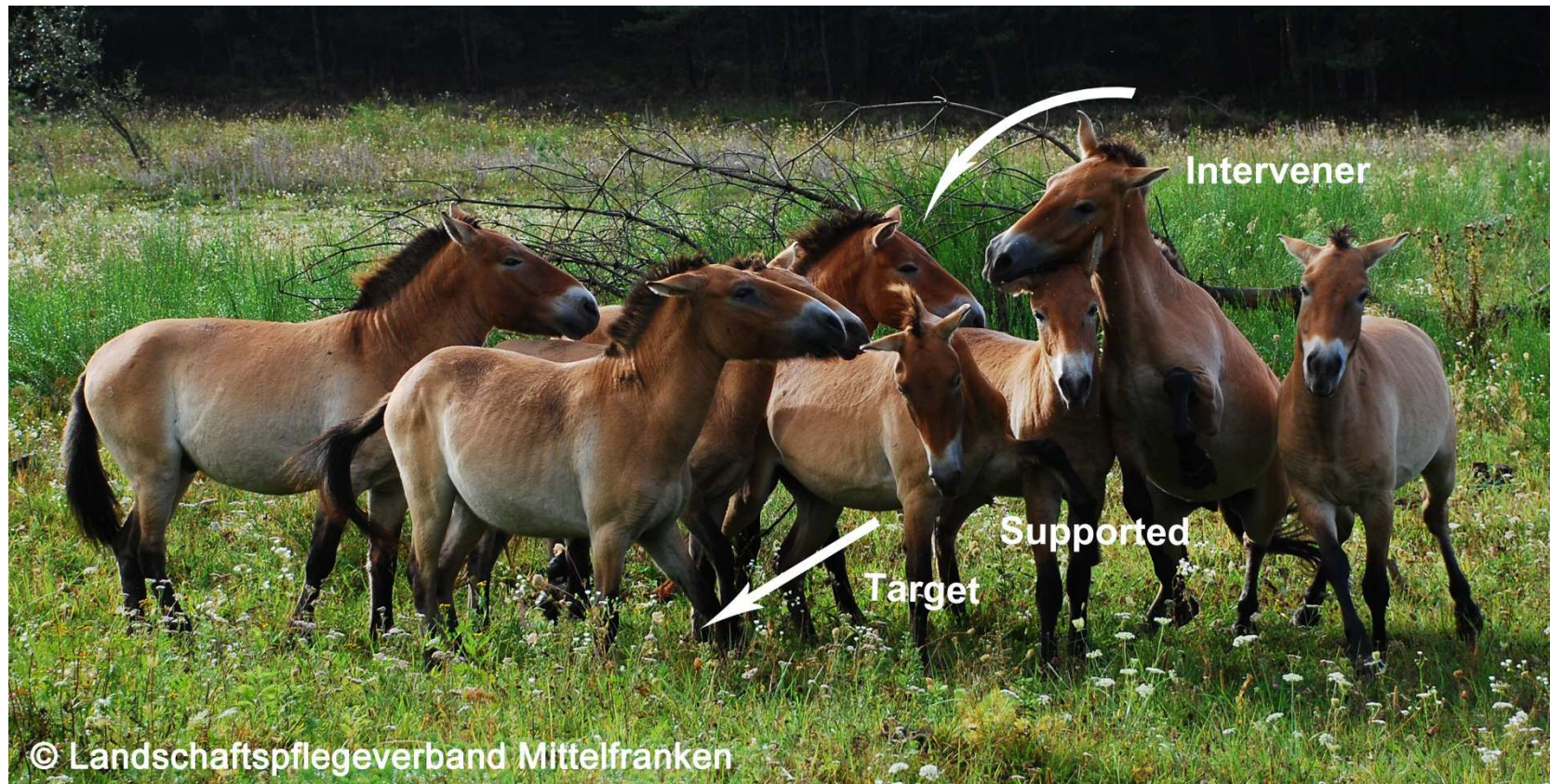
15   1

Austausch von freundliche Verhaltensweisen

3rd party intervention into agonistic encounters

3rd party intervention into agonistic encounters (Krueger et al. 2015)

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3rd party intervention into
agonistic encounters (Krueger et al. 2015)

- Interveners are higher ranking than the target animal in standard social situations

➢ **Reduction of Aggression**

- Interveners are not higher ranking than the target animal in intervention situations

➢ **?**
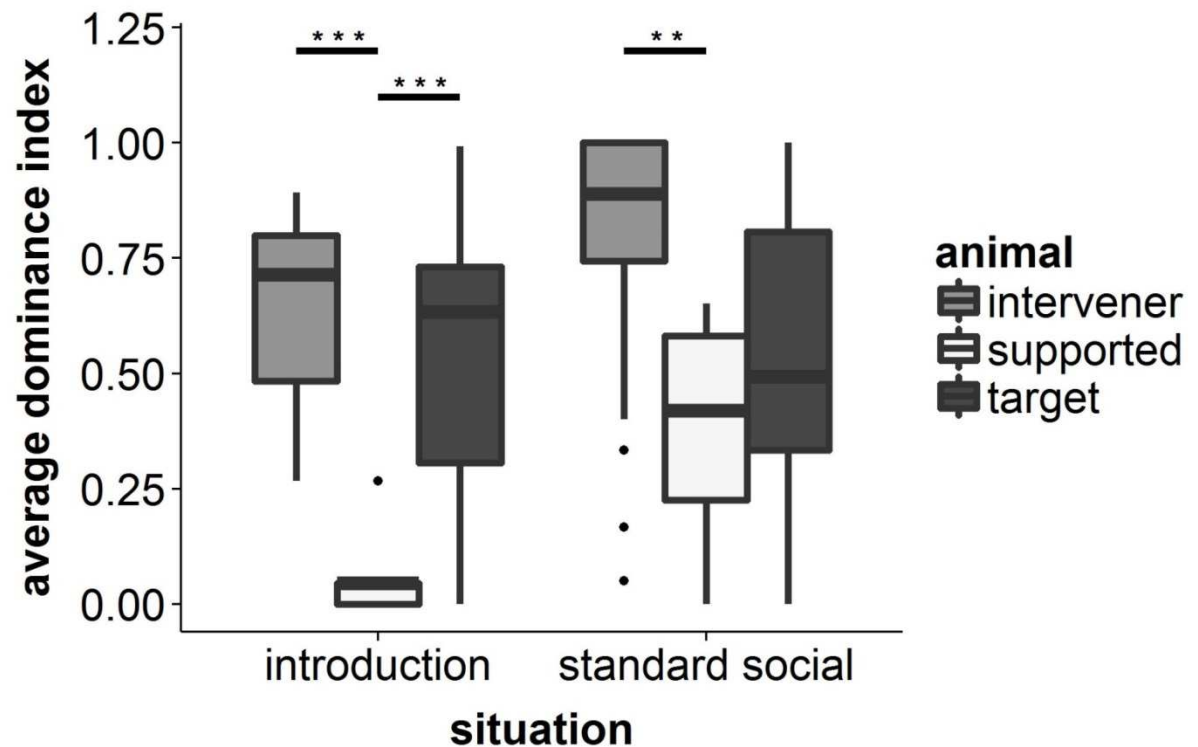
3rd party intervention into agonistic encounters (Krueger et al. 2015)

- Interveners receive socio positive behaviour from supported animals
- Recruitment of newcomers
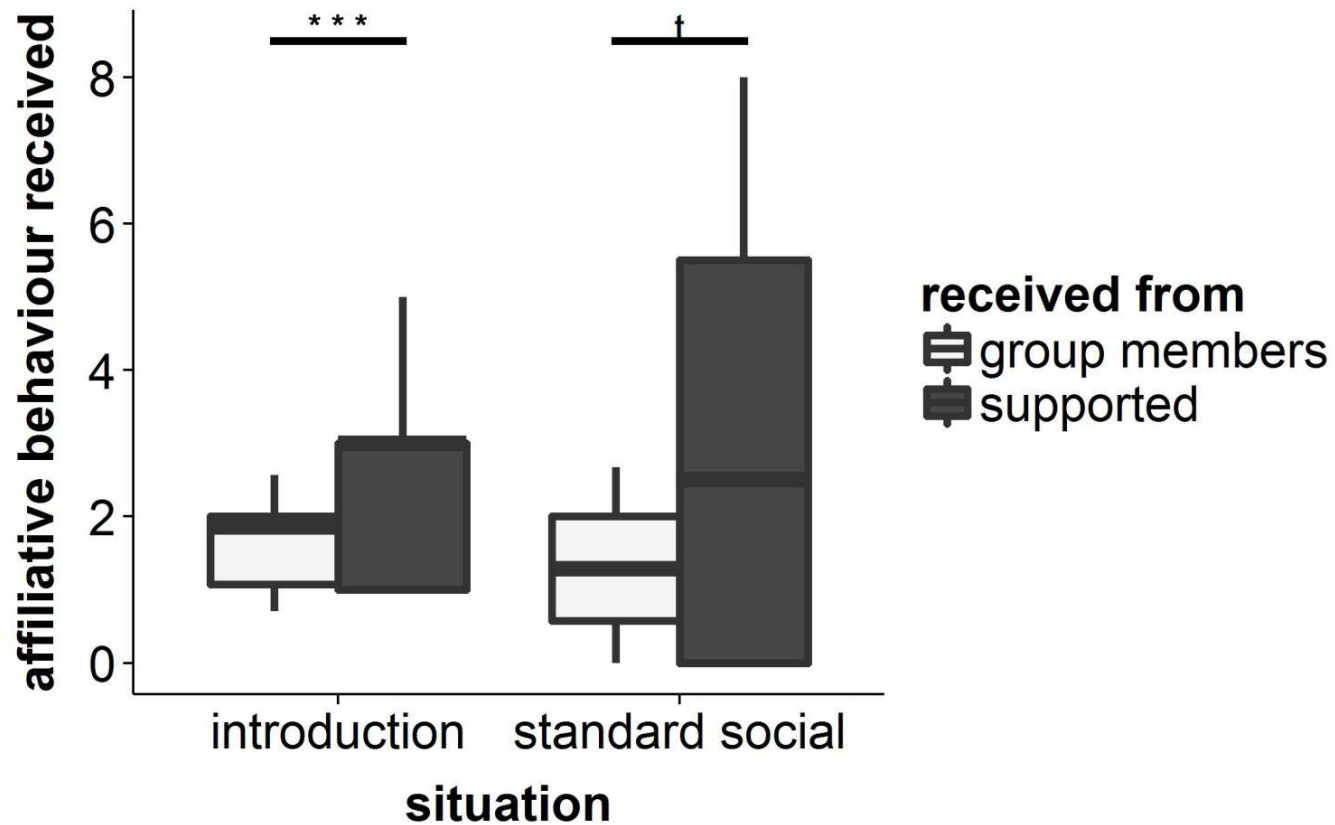
Policing

- Alpha males stabilize social groups in macaques (Flack et al. 2005, 2006)

Family Ceropithecidae
Macaca nemestrina
C. M. Francis
ASM - MII

Networks in macaques in stable, only when alpha male is present: due to „Policing" (Flack et al. 2005, 2006)

OC = network whole group

TK = network without α male

EK = network α male in sight
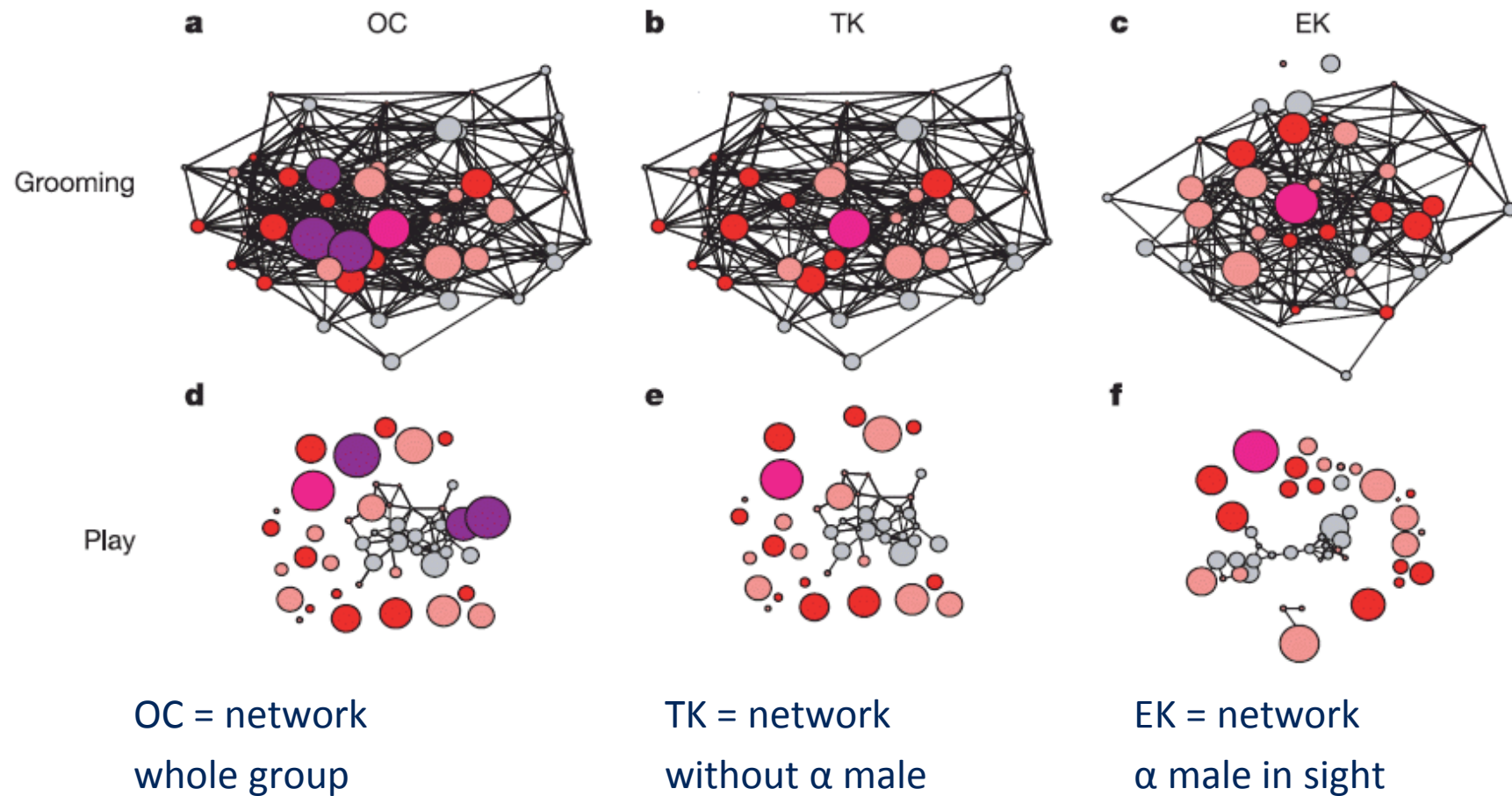
conflict resolution

consolidation / appeasement / reconciliation

Aureli and de Waal 2000 „Conflict Resolution"

Consolidation (primates, ravens, dogs, horses)

3rd parties (uninvolved animals)
stay close to / or look for body contact with
animals which received aggressions

Appeasement (primates, ravens, dogs, horses)

3rd parties (uninvolved animals)
approach aggressor and
show submissive behavior

Reconciliation (primates, Aureli and de Waal 2002)

3d party (uninvolved animals)
punish aggressors, but show „friendly behaviour"
towards aggressors, when they shows submissive
behaviour

Table 1. Evidence for postconflict (PC) friendly reunions and selective attraction between former opponents in nonhuman primates and other mammals

Species	Location	PC reunion	Selective attraction
Prosimians			
Ringtailed lemur, *Lemur catta*[1,2]	Captivity	No, Yes	
Redfronted lemur, *Eulemur fulvus rufus*[1]	Captivity	Yes	Yes
New World monkeys			
Brown capuchin, *Cebus apella*[3]	Captivity	Yes	Yes
White-faced capuchin, *Cebus capucinus*[4]	Captivity	Yes	Yes
Squirrel monkey, *Saimiri sciureus*[5]	Captivity	Yes	
Red-bellied tamarin, *Saguinus labiatus*[6]	Captivity	No	
Common marmoset, *Callithrix jacchus*[7]	Captivity	Yes	Yes
Old World monkeys			
Sooty mangabey, *Cercocebus torquatus atys*[8]	Captivity	Yes	
Vervet monkey, *Cercopithecus aethiops*[9]	Wild	Yes	
Patas monkey, *Erythrocebus patas*[10]	Captivity	Yes	Yes
Golden monkey, *Rhinopithecus roxellanae*[11]	Captivity	Yes	
Spectacled langur, *Trachypithecus obscura*[12]	Captivity	Yes	Yes
Black-and-white colobus, *Colobus guereza*[13]	Captivity	Yes	Yes
Gelada baboon, *Theropithecus gelada*[14]	Captivity	Yes	
Olive baboon, *Papio anubis*[15]	Wild	Yes	Yes
Guinea baboon, *Papio papio*[16]	Captivity	Yes	
Chacma baboon, *Papio ursinus*[17]	Wild	Yes	
Stumptailed macaque, *Macaca arctoides*[18–20]	Captivity	Yes	Yes
Longtailed macaque, *Macaca fascicularis*[21–23]	Captivity/Wild	Yes	Yes
Japanese macaque, *Macaca fuscata*[24–29]	Captivity/Wild	Yes	Yes
Moor macaque, *Macaca maurus*[30]	Wild	Yes	
Rhesus macaque, *Macaca mulatta*[31–33]	Captivity	Yes	Yes
Pigtailed macaque, *Macaca nemestrina*[34,35]	Captivity	Yes	Yes
Black macaque, *Macaca nigra*[36]	Captivity	Yes	Yes
Lion-tailed macaque, *Macaca silenus*[37]	Captivity	Yes	Yes
Barbary macaque, *Macaca sylvanus*[38]	Captivity	Yes	Yes
Tonkean macaque, *Macaca tonkeana*[33]	Captivity	Yes	
Great apes			
Mountain gorilla, *Gorilla gorilla beringei*[39]	Wild	Yes	Yes
Bonobo, *Pan paniscus*[40,41]	Captivity/Wild	Yes	Yes
Chimpanzee, *Pan troglodytes*[42–44]	Captivity/Wild	Yes	Yes
Other mammals			
Domestic goat, *Capra hircus*[45]	Captivity	Yes	
Bottlenose dolphin, *Tursiops truncatus*[46]	Captivity	Yes	
Spotted hyaena, *Crocuta crocuta*[47,48]	Wild	Yes	

(Aureli et al. 2002)

33

Reconciliation patterns among stumptailed macaques: a multivariate approach (Call et al. 1999)

Table 1. Names and description of the variables included in the stepwise logistic regression analysis

Name	Type
Dependent variable	
Reconciliation	Categorical (no, yes)
Independent variables	
Kinship	Ordinal (0=nonkin, 1=distant kin, 2=mother–offspring, siblings)
Friendship	Continuous (number of scan samples in contact sitting)
Initial PC interopponent distance	Ordinal (0=0–0.5 m, 1=0.6–2 m, 2=2.1–5 m, 3=5.1–10 m, 4=+10 m)
Initial MC interopponent distance	Ordinal (same as above)
PC–MC interopponent distance	Ordinal
Focal animal's rank	Continuous
Opponent's rank	Continuous
Rank difference	Continuous
Focal animal's age	Categorical (immature, adult)
Opponent's age	Same as above
Focal/opponent age	Categorical (immature–immature, immature–adult, adult–adult)
Focal animal's sex	Categorical (female, male)
Opponent's sex	Same as above
Focal/opponent sex	Categorical (female–female, female–male, male–male)
Intensity of aggression	Ordinal (1=chasing, 2=slapping or grabbing, 3=biting)
Focal animal's role	Categorical (aggressor, victim, unclear)
Type of conflict	Categorical (dyadic, polyadic)
Vocalization present	Categorical (no, yes)

PC: Postconflict; MC: matched control.

34

Reconciliation patterns among stumptailed macaques: a multivariate approach (Call et al. 1999)
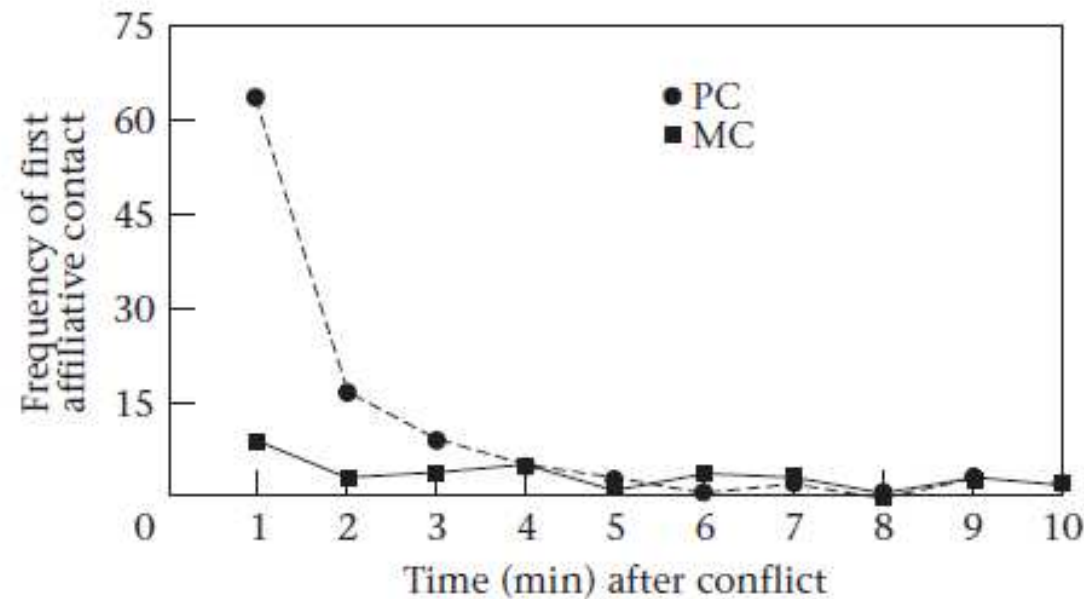

Figure 1. Temporal distribution of first contacts between opponents in postconflict (PC) and matched control (MC) periods.

Table 2. Entry order, coefficients, significance and contribution of the variables entered into the model

Variable	Entry order	β	P	R	Exp (β)
Initial interopponent distance in PC	1	−0.3091	0.0044	−0.1355	0.7341
Kinship	2	0.5484	0.0429	0.0794	1.7305
Friendship	3	0.2843	0.0420	0.0801	1.3289
Constant		−0.2252	0.3898		

PC: Postconflict.

35

Postconflict Third-Party Affiliation in Rooks, *Corvus frugilegus*
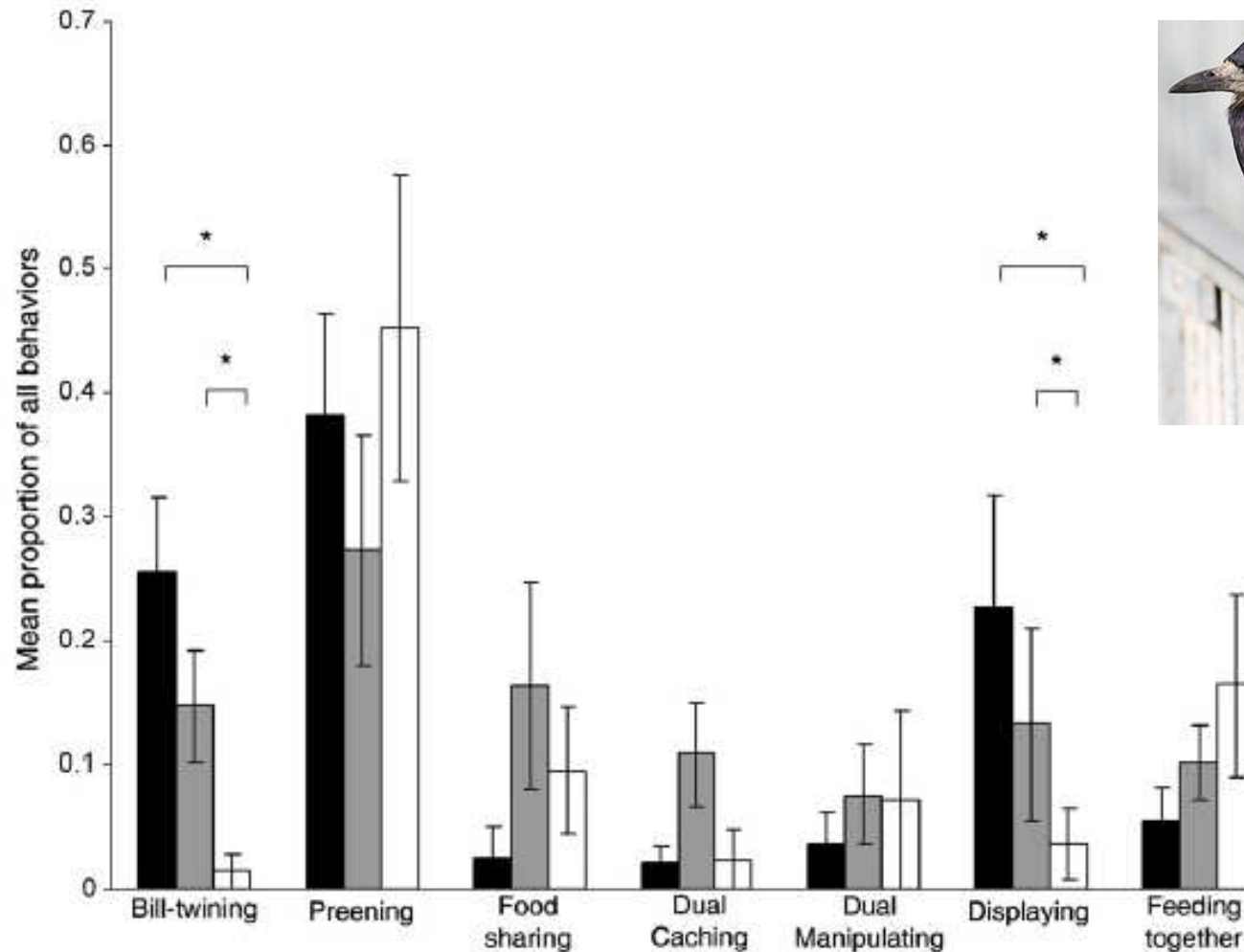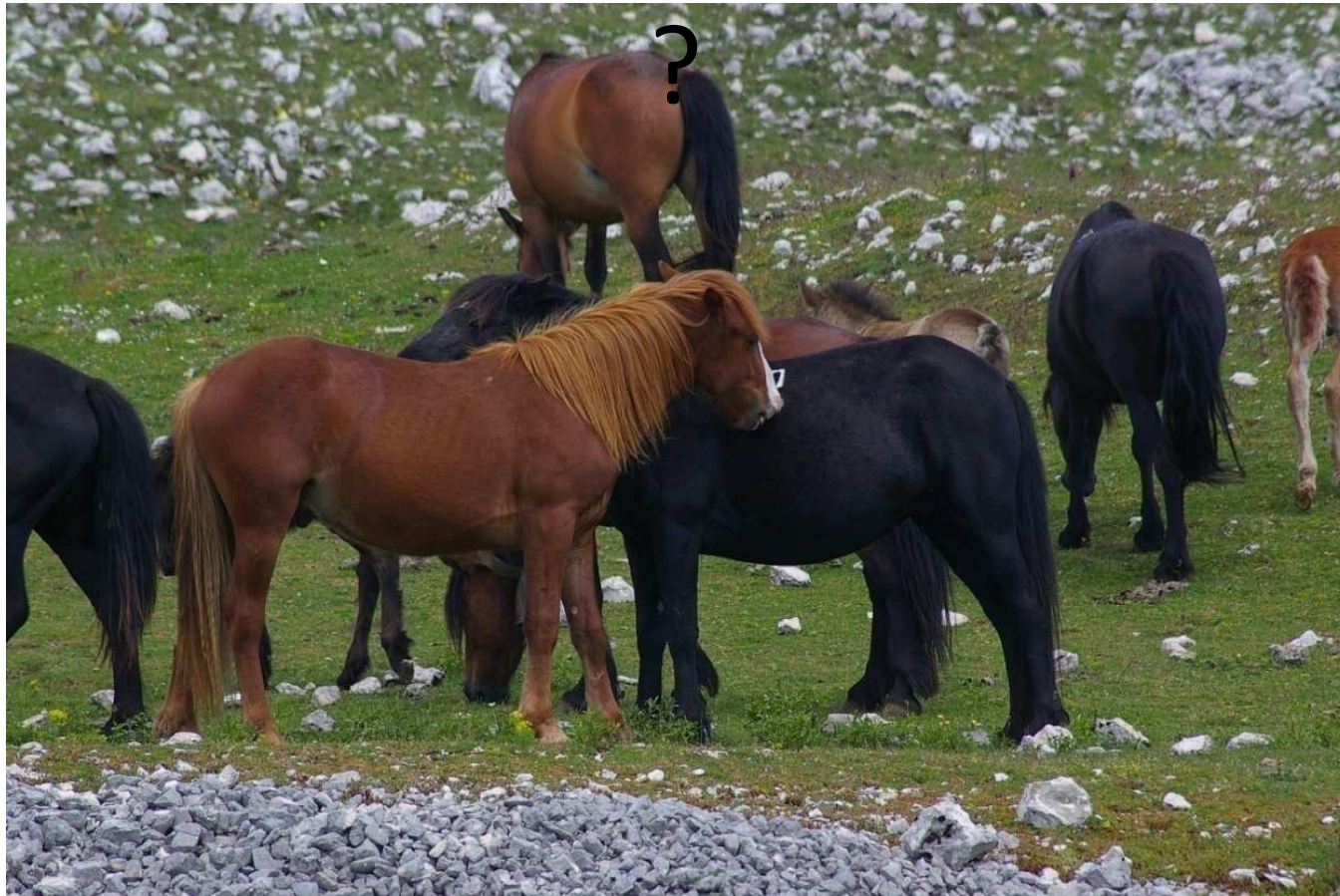(Seed at al. 2007)

Figure 2. Proportions of Specific Affiliative Behaviors

Proportions of specific affiliative behaviors (bill twining, allopreening, food sharing, dual caching, dual manipulating, displaying, and feeding together) between combatants and their social partners, which were not involved in the conflict. Data shown for postconflict period for aggressors (black bars) and victims (gray bars) and during matched-control periods (clear bars). Error bars represent SEM. * indicates $p < 0.05$ (Wilcoxon signed ranks).

Post-conflict friendly reunion in a permanent group of horses (*Equus caballus*) (Cozzi et al. 2010)

Post-conflict friendly reunion in a permanent group of horses (*Equus caballus*) (Cozzi et al. 2010)

Post Conflict Interactions

Not interactions 14.7 %

Dyadic reconciliation 25.5 %

Triadic affiliation 59.8 %

Triadic affiliation

Triadic reconciliation 22.9 %

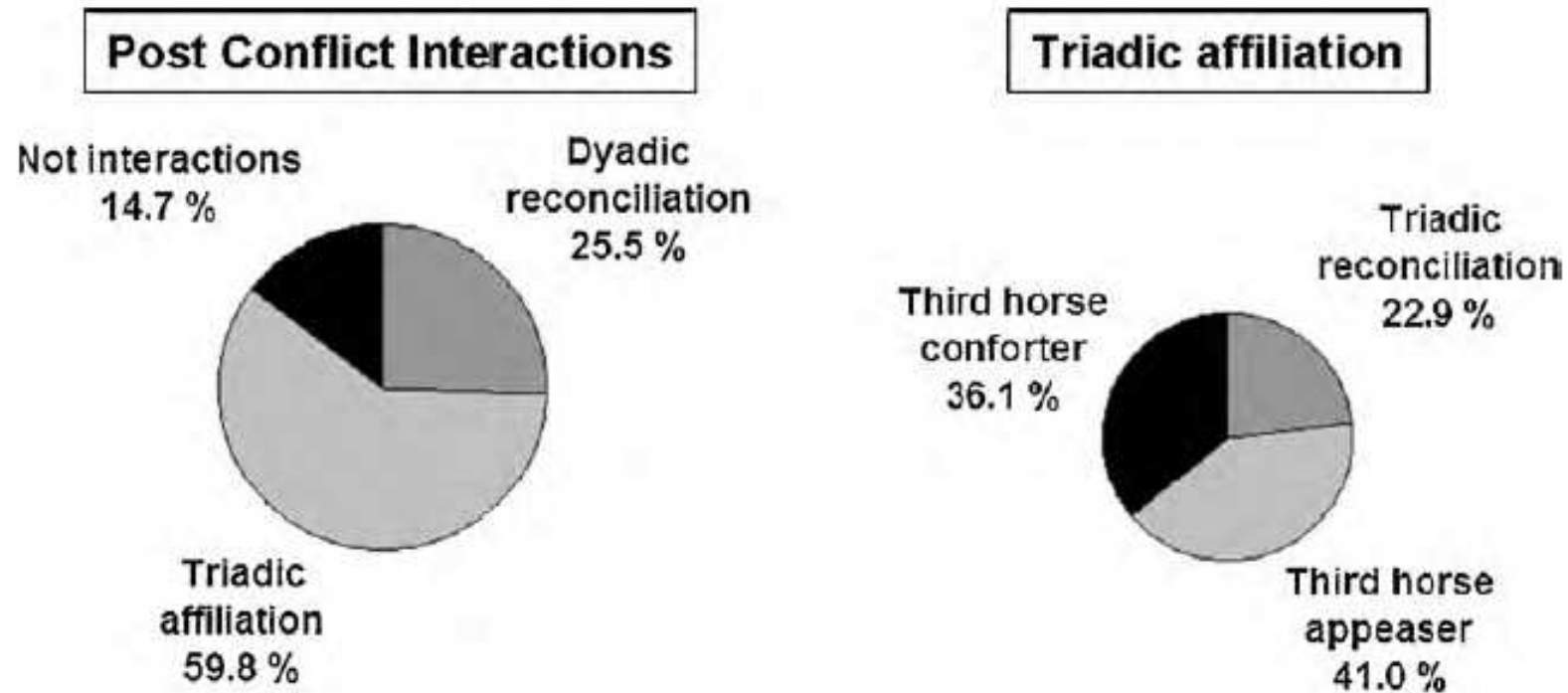Third horse conforter 36.1 %

Third horse appeaser 41.0 %

Fig. 1. Post conflict interactions in the group of horses (on the left) and details of triadic affiliation (on the right).

- 3rd parties stay close to attacked animals (**consolation**) – 36%
- 3rd parties stay close to attackers (**appeasement**) – 41%
- 3rd parties approach aggressors after a delay (**reconciliation**) - 23%

Individual Factors

?

Environmental Factors

?

Cognitive Abilities
Movement decisions
Coordinated decisions
Leadership decisions
Individual recognition
Self recognition
Understanding - using social cues
Communication
Understanding Object Permanence
Memory
Generalization
Spatial orientation
Habitat protection
Predator avoidance
Individual learning
Social learning
Innovation
Conflict resolution
Empathy
Cooperation
Policing

Social Factors

?