



Caught in the middle:

Variation in the physical and behavioral development of male olive baboons (*Papio anubis*)

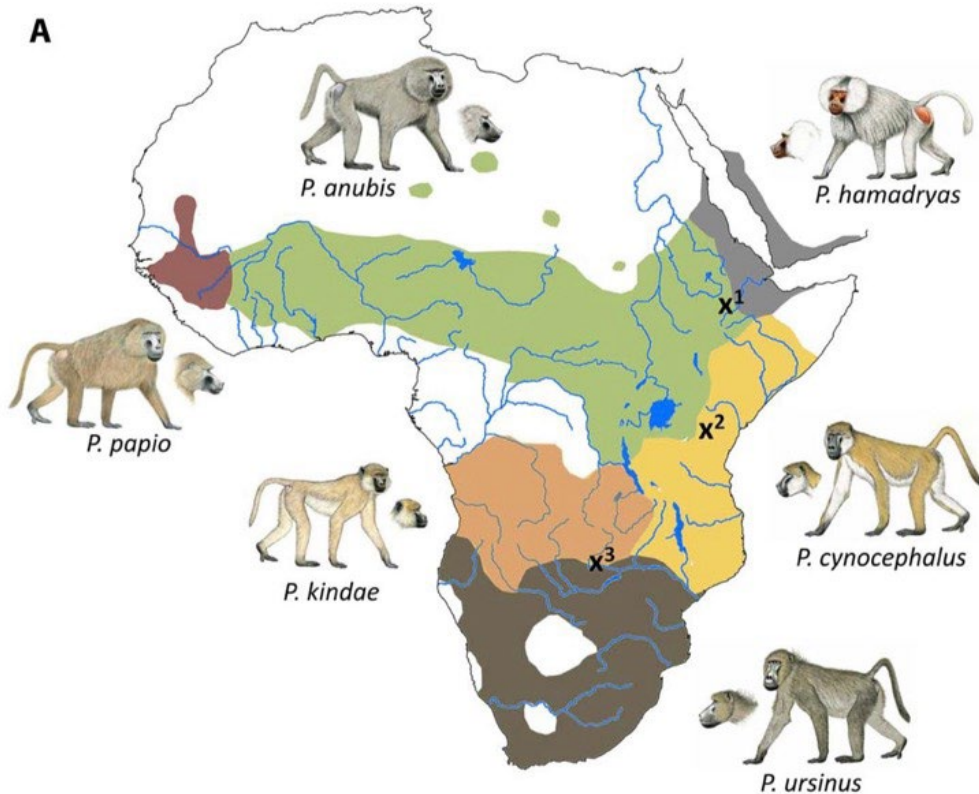
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Iowa State University

Uaso Ngiro Baboon Project, Kenya



Background



Olive baboons (*Papio anubis*)

- Savannah-dwelling
- Multi-male / multi-female society
- Troops are large: 30 - 200 individuals
- Female philopatric with male dispersal
- Female's rank is inherited
- Male hierarchy is dynamic

Rogers, J., et al. (2019). The comparative genomics and complex population history of *Papio* baboons. *Science Advances*, 5.

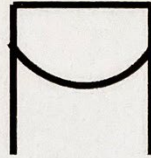
Strum, S.C. (1987). *Almost Human*. New York: Random House.

Background

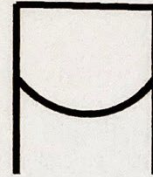
SUBADULT TO ADULT MALES

1. Proportion of leg to body:
Subadults have long legged look

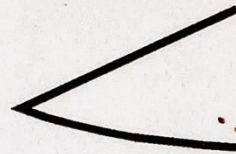
Subadult



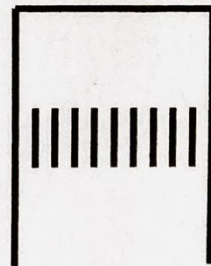
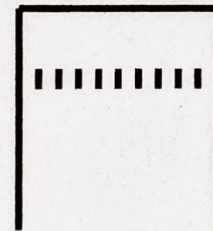
Adult



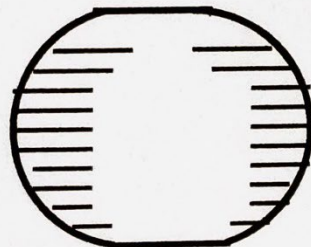
2. Shape of muzzle
Subadults have boat shaped muzzle



3. Length of cape
Subadults have hair around face that
Looks more like an adult female



HEAD



- Females promoted to sub-adult at menarche (4-6 years) and to adult at first live birth (6-8 years)
- Males are promoted to sub-adult 1 (SA1) when testes enlarge and descend (5-7 years)
- Promotions to SA2 and SA3 according to growth and body proportions
- Males promoted to adult after cessation of growth (9-11 years)

Charpentier, M.J.E., Tung, J., Altmann, J., & Alberts, S. (2008). Age at maturity in wild baboons: genetics, environmental and demographic influence. *Molecular ecology*, 17, 2026-2040.

Background

- Males compete directly for access to mating opportunities
- Some males may rely on friendships with females and coalitions with other males to gain access to reproductive opportunities
- These strategies can change over time

Alberts, S.C., Watts, H.E., Altmann, J. (2003). Queuing and queue-jumping: long-term patterns of reproductive skew in male savannah baboons, *Papio cynocephalus*. *Animal Behaviour*, 65, 821-840.

Städele, V., Roberts, E.R., Barrett, B.J., Strum, S.C., Vigilant, L., Silk, J.B. (2019). Male-female relationships in olive baboons (*Papio anubis*): Parenting or mating effort? *Journal of Human Evolution*, 127, 81-92.

Strum, S.C. (1994). Reconciling aggression and social manipulation as means of competition. 1. Life-history perspective. *International Journal of Primatology*, 15(5), 739-765.



Research Questions

- When do maturing male baboons start displaying social behaviors typical of adults?
- What are the effects of puberty on male baboon social behavior?



Left: juvenile male, Right: subadult male.

Methods

Uaso Ngiro Baboon Project (UNBP):

- Founded in Laikipia, Kenya in 1984 by Dr. Shirley Strum
- Since 2022, co-directed by Drs. Federico Rossano (UC San Diego), Monica Wakefield (Northern Kentucky U), and Corinna Most (Iowa State U)
- Life history data for all individuals born in research troops as well as behavioral and ecological longitudinal data



Strum, S.C. (1987). *Almost Human*. New York: Random House.

Strum, S.C. (2023). Confessions of a baboon watcher: From inside to outside the paradigm. *Primates*, 64(4), 393-406.

Methods

- Longitudinal grooming data from 2018-2023
 - One-zero daily record of grooming dyads
 - 48 natal males
- Eight weeks of observation (June-July 2023)
 - Focal follows (~1h) with one-zero recording of social behaviors at one-minute intervals
 - 14 natal males:
 - Juveniles (n = 5): pre-puberty, 4.5-7 years
 - SA1 (n = 4): recently went through puberty, 6-7 years
 - SA2/SA3 (n = 5): more than a year past puberty, 7-10 years

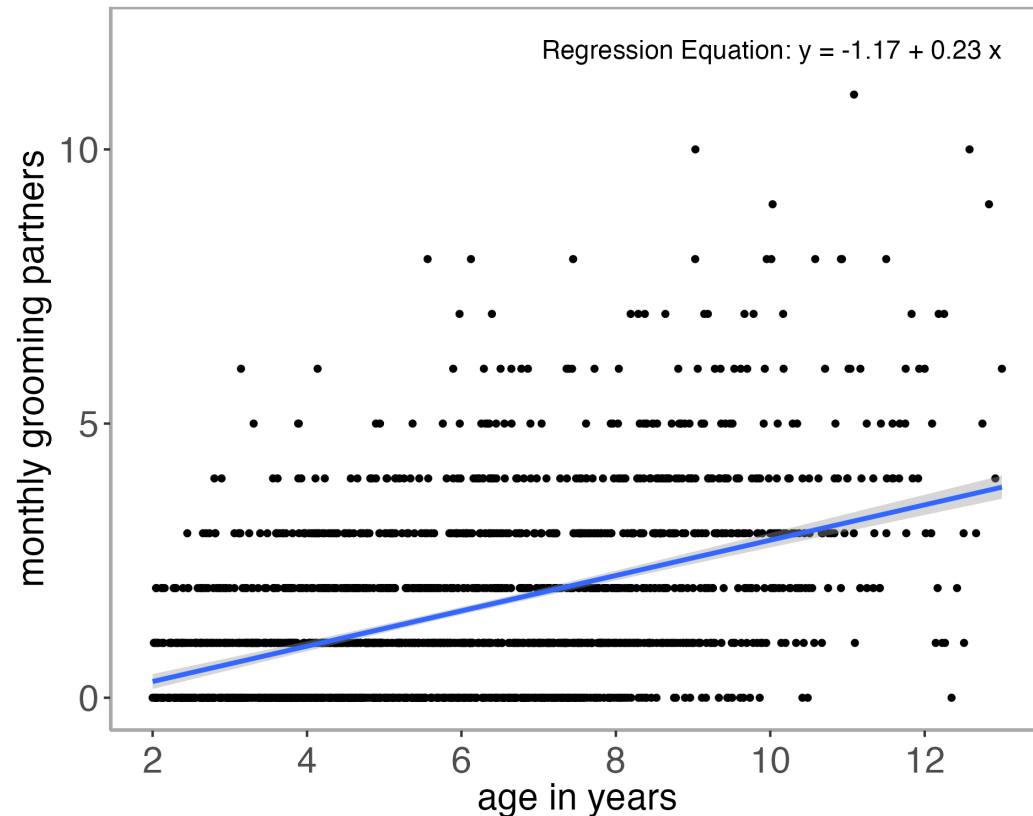


Results

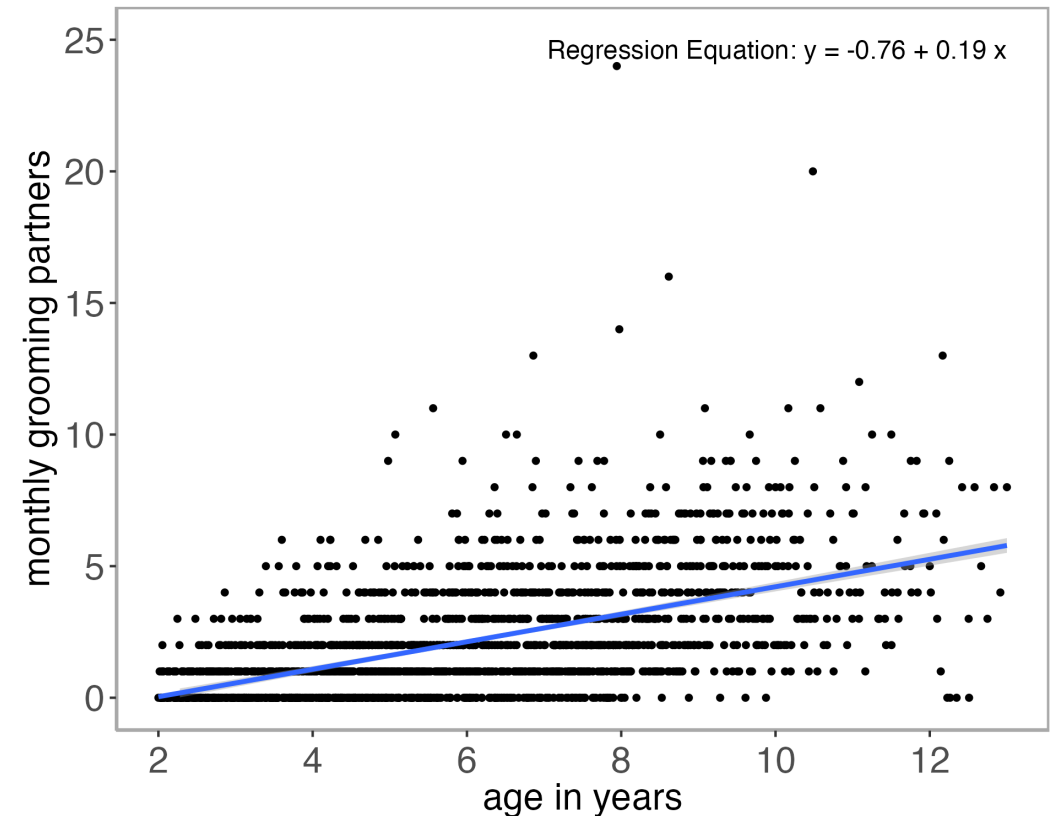
- Longitudinal grooming data 2018-2023
- Non-kin: estimated relatedness < .0625
- GLMM with ID as random factor

Outcome	Predictor	Significance
Non-kin partners groomed	Age * 0.226	$z = 19.26, p < .001$
Non-kin partners groomed by	Age * 0.09	$z = 11.1, p < .001$

Monthly Non-Kin Partners (subject groomer)

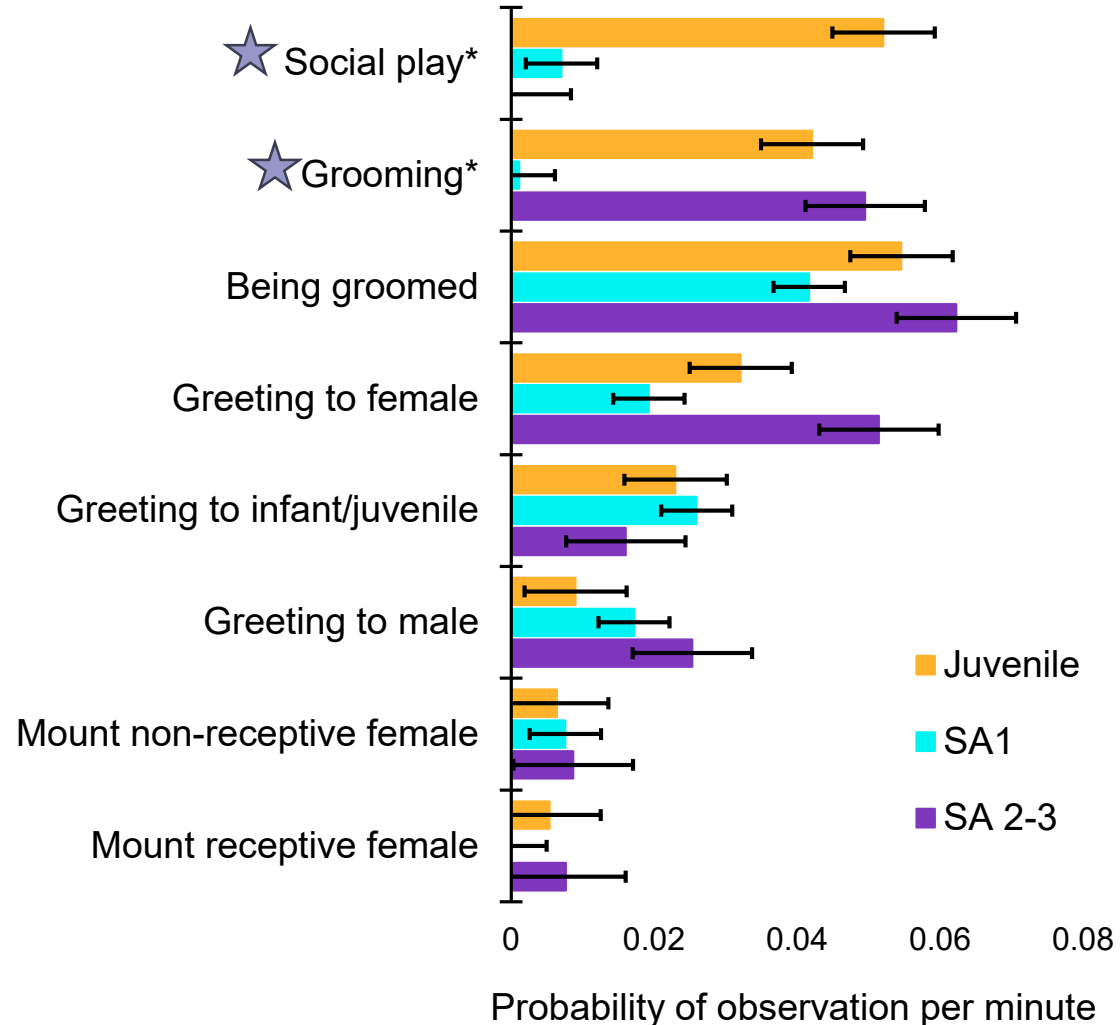


Monthly Non-Kin Partners (subject groomee)



Results

Social Behaviors of Adolescent Males in Different Stages

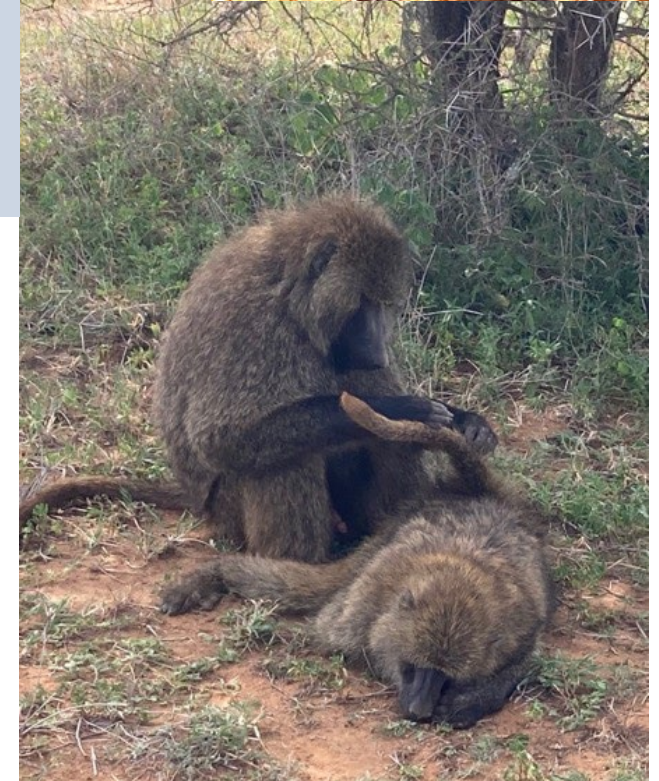


Stage	Mean age	Observation
JUV	5.6 yrs	756 min
SA1	6.8 yrs	852 min
SA2-3	8.3 yrs	858 min

Kruskal-Wallis test

Social Play : $p = .006$

Grooming : $p = .091$



Results



Padfoot (age 7, born 5/16/16)



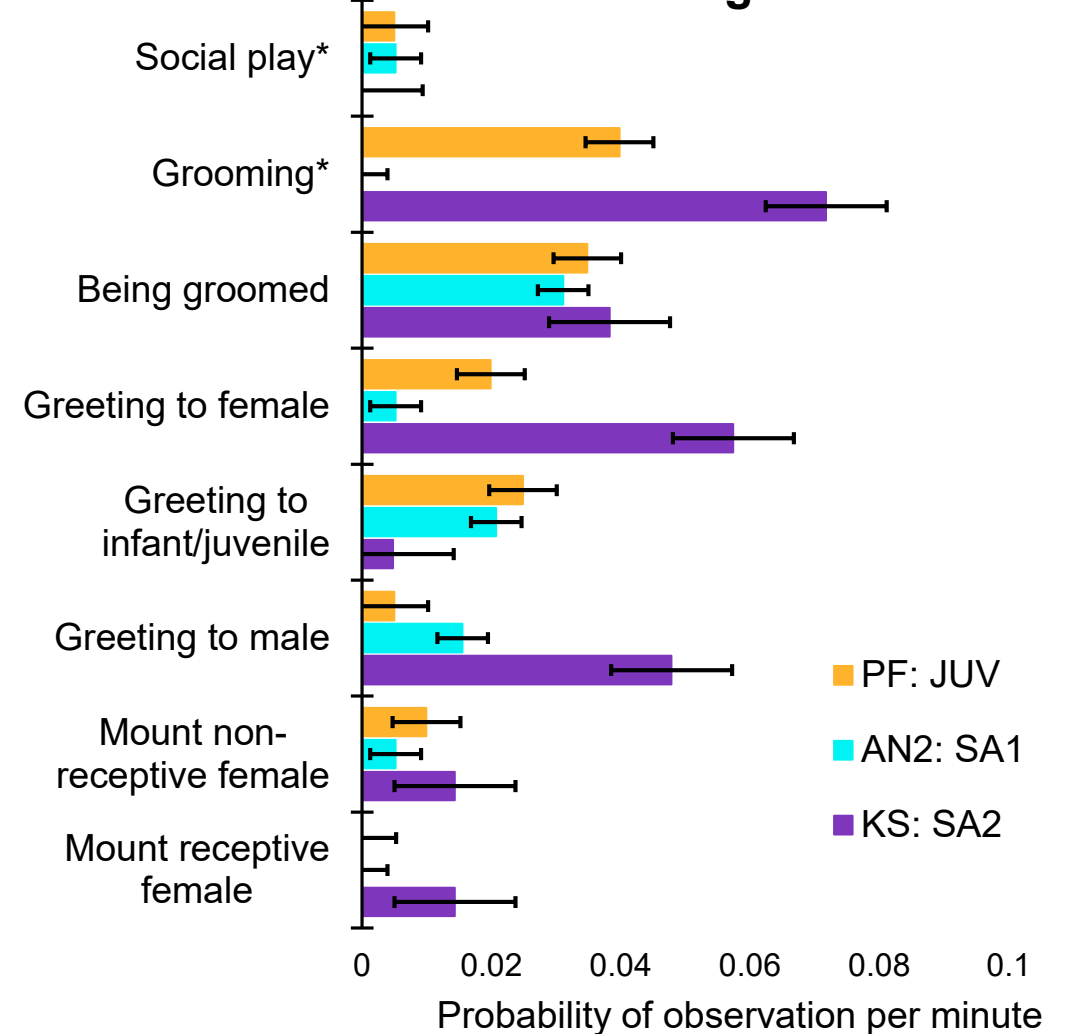
Ant (age 7, born 8/21/16)



Kestrel (age 7, born 3/10/16)

Padfoot (PF)	observed 204 min
Ant (AN2)	observed 192 min
Kestrel (KS)	observed 210 min

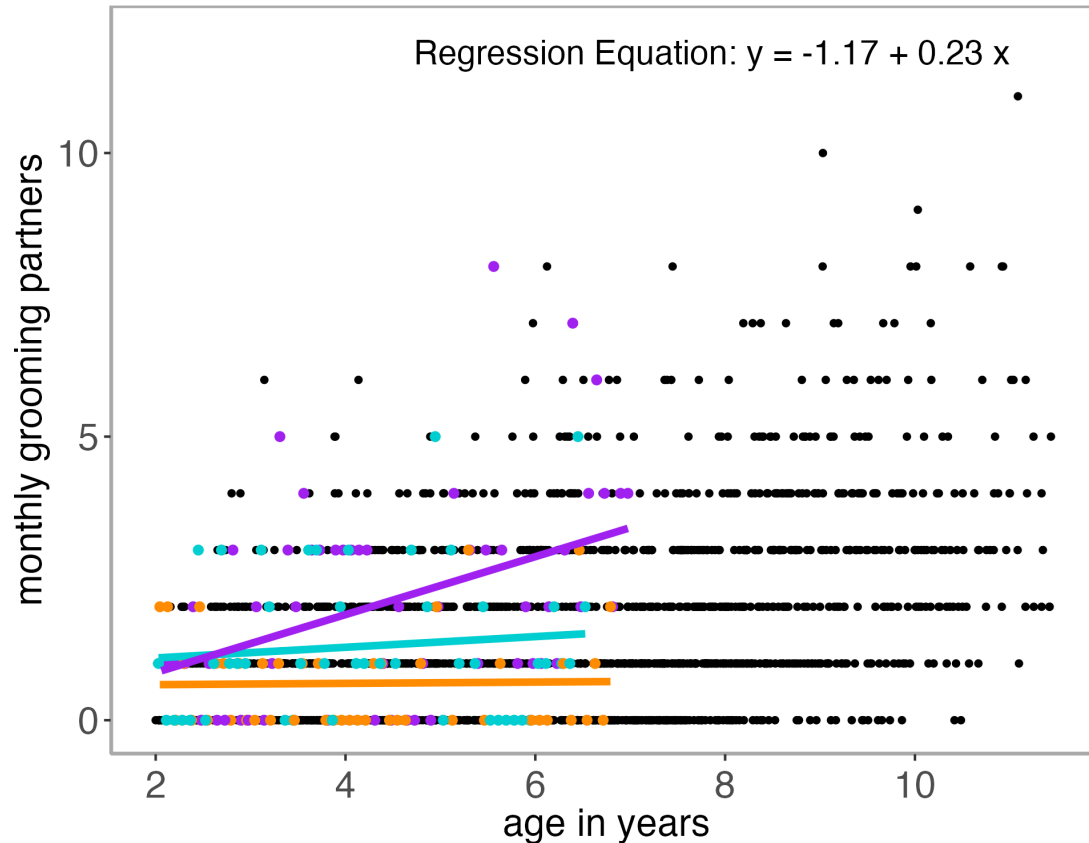
Social Behaviors of Adolescent Males in Different Stages



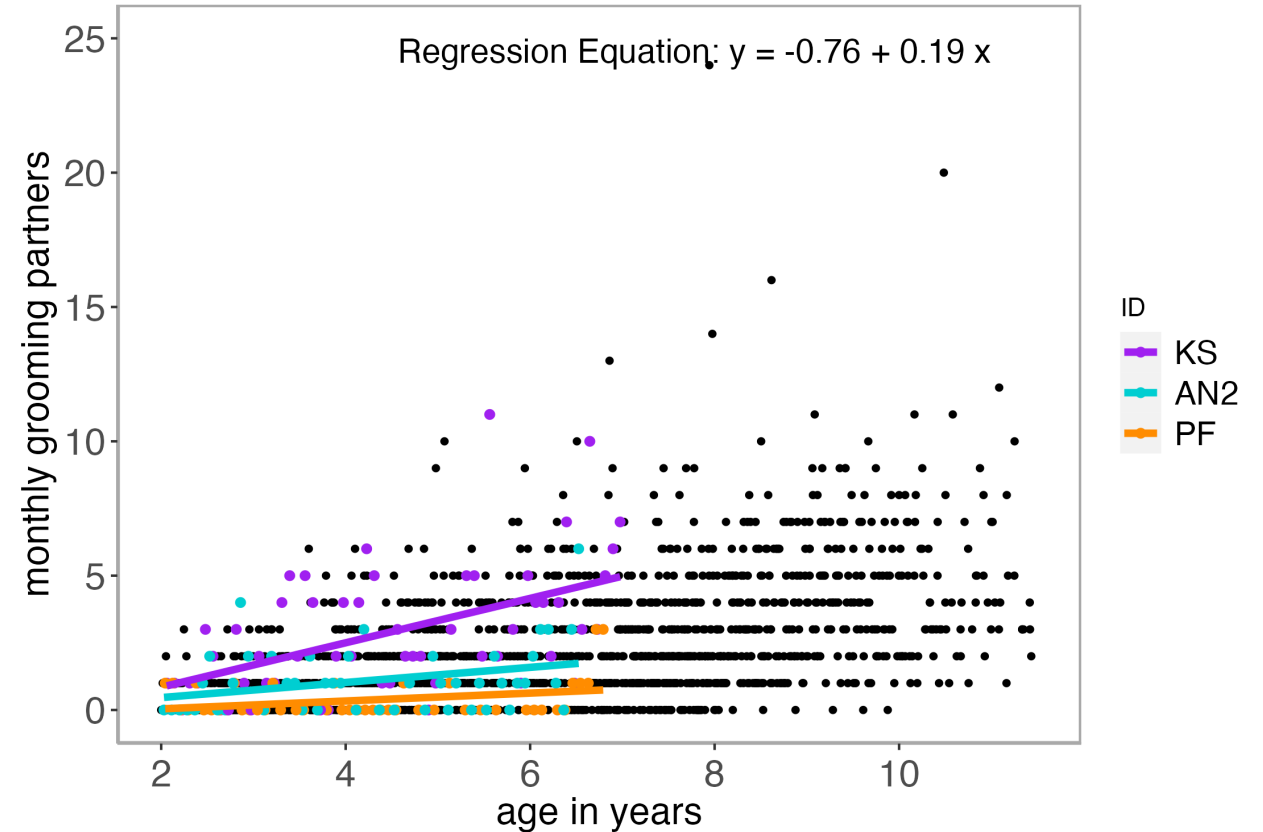
Results

Another look at longitudinal grooming data – variation in developmental stage reflected in long-term grooming patterns:

Monthly Non-Kin Partners (subject groomer)



Monthly Non-Kin Partners (subject groomee)



Discussion

When do maturing male baboons start displaying social behaviors typical of adults?

- Juveniles can already be observed in the same types of social behaviors displayed by older sub-adult males.

What are the effects of puberty on male social behavior?

- SA1 males were observed grooming others less than either juvenile and SA2/SA3 males.

Most importantly: Individuals mature at different rates, and developmental stage matters more than chronological age.

Future Directions

- Explore individual variation in timing of developmental milestones
- Hormonal components of developmental stage and behaviors:
Fecal hormone analysis of testosterone and glucocorticoids
- Do differences in development affect migration or reproductive success?
- Compare behaviors of natal subadults to non-natal subadults.

Acknowledgments



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- Patrick Mwangi



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