

Investigating the Function of Mutual Grooming in Captive Bonobos (*Pan paniscus*) and Chimpanzees (*Pan troglodytes*)

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Abstract

Social grooming is often exchanged between individuals in many primate species. Rates of bidirectional (or simultaneous mutual) grooming vary across primate species, and its function is not yet fully understood. For example, mutual grooming is frequent in chimpanzees but rare in most primate species including wild bonobos. There are, however, no quantitative data available in captive bonobos.

Therefore, through the direct comparison between captive bonobos and chimpanzees, this study aimed to:

- (i) compare the frequency of mutual grooming between *Pan* species,
- (ii) explore and compare the function of mutual grooming, and
- (iii) discuss the rarity of this behavior in wild bonobo populations.

We tested three hypotheses following the previous literature in wild chimpanzees. The social bonding hypothesis states that mutual grooming facilitates the maintenance of strong dyadic bonds. The immediate investment hypothesis states that it serves to signal willingness to invest in the interaction. The switching hypothesis states that mutual grooming serves no function but only occurs as an overlap to change the direction of unidirectional grooming.

Our findings strongly supported the immediate investment hypothesis, but not the others. Grooming bouts that included mutual grooming were longer and more equitable than bouts without, illustrating that captive *Pan* species use mutual grooming to maximize their short-term benefits and increase the social value of their interaction. Captive bonobos performed mutual grooming in similar proportions and for similar functions as captive and wild chimpanzees do. This contrasts with wild bonobos who engage in this behavior only rarely.

We suggest that the differences in patterns of mutual grooming between captive and wild bonobos might be explained by different degrees of kinship or by a potential intraspecies variation.

Keywords:

Pan species, Social grooming, Reciprocity, Cooperation, Short-term benefits

References

1. Akinyi MY, Tung J, Jeneby M, Patel NB, Altmann J, Alberts SC (2013). Role of grooming in reducing tick load in wild baboons (*Papio cynocephalus*). *Animal Behaviour* 85: 559–568.
2. Barrett L, Henzi SP, Weingrill T, Lycett JE, Hill RA (1999). Market forces predict grooming reciprocity in female baboons. *Proceedings of the Royal Society of London B: Biological Sciences* 266: 665–670.
3. Boesch C, Boesch-Achermann H (2000). *The Chimpanzees of the Taï Forest: Behavioural Ecology and Evolution*. New York, Oxford University Press.
4. Borries C, Sommer V, Srivastava A (1994). Weaving a tight social net: allogrooming in free-ranging female langurs (*Presbytis entellus*). *International Journal of Primatology* 15: 421–443.
5. Cheney DL (1992). Intragroup cohesion and intergroup hostility: the relation between grooming distributions and intergroup competition among female primates. *Behavioral Ecology* 3: 334–345.
6. Cooper MA, Bernstein IS (2000). Social grooming in Assamese macaques (*Macaca assamensis*). *American Journal of Primatology* 50: 77–85.
7. De Waal FB (1997). The chimpanzee's service economy: food for grooming. *Evolution and Human Behavior* 18: 375–386.
8. De Waal FB, Seres M (1997). Propagation of handclasp grooming among captive chimpanzees. *American Journal of Primatology* 43: 339–346.
9. Dunbar RI (1991). Functional significance of social grooming in primates. *Folia Primatologica* 57: 121–131.
10. Fedurek P, Dunbar RI (2009). What does mutual grooming tell us about why chimpanzees groom? *Ethology* 115: 566–575.
11. Fedurek P, Slocombe KE, Hartel JA, Zuberbühler K (2015). Chimpanzee lip-smacking facilitates cooperative behaviour. *Scientific Reports* 5: 13460.
12. Furuya Y (1957). Grooming behavior in the wild Japanese monkeys. *Primates* 1: 47–72.
13. Gilby IC (2006). Meat sharing among the Gombe chimpanzees: harassment and reciprocal exchange. *Animal Behaviour* 71: 953–963.
14. Gomes CM, Mundry R, Boesch C (2009). Long-term reciprocation of grooming in wild West African chimpanzees. *Proceedings of the Royal Society B: Biological Sciences* 276: 699–706.
15. Goodall J (1986). *The Chimpanzees of Gombe: Patterns of Behavior*. Cambridge, Harvard University Press.

16. Hare B, Yamamoto S (2017).
Bonobos: Unique in Mind, Brain, and Behavior.
Oxford, Oxford University Press.
17. Hohmann G, Gerloff U, Tautz D, Fruth B (1999).
Social bonds and genetic ties: kinship association and affiliation in a community of bonobos (*Pan paniscus*).
Behaviour 136: 1219–1235.
18. Kaburu SS, Newton-Fisher NE (2015).
Egalitarian despots: hierarchy steepness, reciprocity and the grooming-trade model in wild chimpanzees, *Pan troglodytes*.
Animal Behaviour 99: 61–71.
19. Kaburu SS, Newton-Fisher NE (2016).
Bystanders, parcelling, and an absence of trust in the grooming interactions of wild male chimpanzees.
Scientific Reports 6: 20634.
20. Kano T (1992).
The Last Ape: Pygmy Chimpanzee Behavior and Ecology.
Stanford, Stanford University Press.
21. Kano T (1998).
A preliminary glossary of bonobo behaviors at Wamba.
In *Comparative Study of the Behavior of the Genus Pan by Compiling Video Ethogram* (Nishida T, ed.), pp 39–81. Kyoto, Nissho Printer.
22. Kaufman IC, Rosenblum LA (1966).
A behavioral taxonomy for *Macaca nemestrina* and *Macaca radiata*: based on longitudinal observation of family groups in the laboratory.
Primates 7: 205–258.
23. Machanda ZP, Gilby IC, Wrangham RW (2014).
24. Mutual grooming among adult male chimpanzees: the immediate investment hypothesis.
Animal Behaviour 87: 165–174.
25. McKenna JJ (1978).
Biosocial functions of grooming behavior among the common Indian langur monkey (*Presbytis entellus*).
American Journal of Physical Anthropology 48: 503–509.
26. Mitani JC (2009).
Male chimpanzees form enduring and equitable social bonds.
Animal Behaviour 77: 633–640.
27. Nakamura M (2000).
Is human conversation more efficient than chimpanzee grooming?
Human Nature 11: 281–297.
28. Nakamura M (2003).
“Gatherings” of social grooming among wild chimpanzees: implications for evolution of sociality.
Journal of Human Evolution 44: 59–71.
29. Newton-Fisher NE, Kaburu SS (2017).
Grooming decisions under structural despotism: the impact of social rank and bystanders among wild male chimpanzees.
Animal Behaviour 128: 153–164.
30. Palombit RA (1996).
Pair bonds in monogamous apes: a comparison of the siamang *Hylobates syndactylus* and the white-handed gibbon *Hylobates lar*. *Behaviour* 133: 321–356.

31. Reynolds V (2005).
The Chimpanzees of the Budongo Forest: Ecology, Behaviour, and Conservation. Oxford, Oxford University Press.
32. Sade DS (1965).
Some aspects of parent-offspring and sibling relations in a group of rhesus monkeys, with a discussion of grooming.
American Journal of Physical Anthropology 23: 1–17.
33. Sakamaki T (2013).
Social grooming among wild bonobos (*Pan paniscus*) at Wamba in the Luo Scientific Reserve, DR Congo, with special reference to the formation of grooming gatherings.
Primates 54: 349–359.
34. Seyfarth RM (1977).
A model of social grooming among adult female monkeys.
Journal of Theoretical Biology 65: 671–698.
35. Seyfarth RM (1980).
The distribution of grooming and related behaviours among adult female vervet monkeys.
Animal Behaviour 28: 798–813.
36. Seyfarth RM, Cheney DL (1984).
Grooming, alliances and reciprocal altruism in vervet monkeys.
Nature 308: 541.
37. Surbeck M, Hohmann G (2015).
Social preferences influence the short-term exchange of social grooming among male bonobos.
Animal Cognition 18: 573–579.
38. Tanaka I, Takefushi H (1993).
Elimination of external parasites (lice) is the primary function of grooming in free-ranging Japanese macaques.
Anthropological Science 101: 187–193.
39. R Core Team (2019).
R: a language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing, 2012.
<https://www.R-project.org>.
40. Terry RL (1970).
Primate grooming as a tension reduction mechanism.
The Journal of Psychology 76: 129–136.
41. Whiten A, Arnold K (2003).
Grooming interactions among the chimpanzees of the Budongo Forest, Uganda: tests of five explanatory models.
Behaviour 140: 519–552.
42. Wrangham RW (1999). Evolution of coalitionary killing.
American Journal of Physical Anthropology 110: 1–30.
43. Yamanashi Y, Nogami E, Teramoto M, Morimura N, Hirata S (2018). Adult-adult social play in captive chimpanzees: is it indicative of positive animal welfare?
Applied Animal Behaviour Science 199: 75–83.
44. Zamma K (2002). Grooming site preferences determined by lice infection among Japanese macaques in Arashiyama.
Primates 43: 41–49.