

Laterality of Grooming and Tool Use in a Group of Captive Bonobos (*Pan paniscus*)

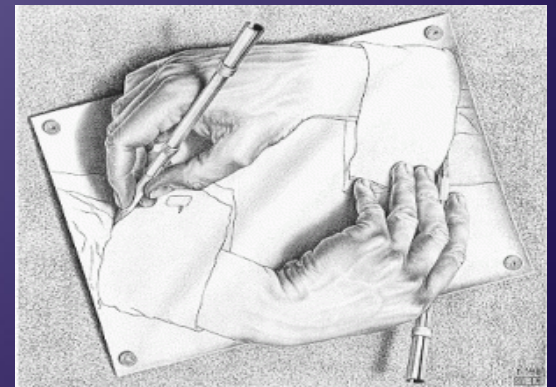


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Human Handedness

- ~ 90% of humans are right handed
- Behavioral phenotype for *Homo sapiens*
- Complex actions, e.g. tool-use, fine-motor manipulation, population-level bias
- Some cultural variation – suppression of left-handed persons



Evolution of Laterality in Humans

- Bipedalism, tool use, throwing, gestural communication, language, bimanual tasks with complementary roles - all proposed selective pressure(s)
- Presence in early hominins - e.g. Volpato *et al.*, 2012

Concepts

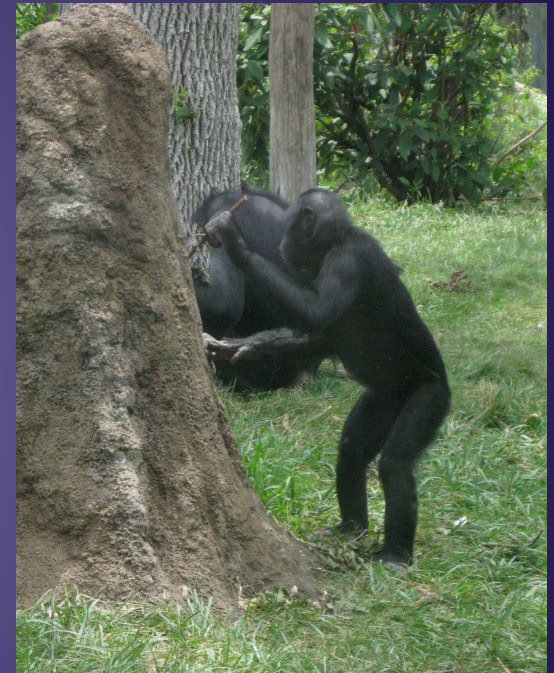
- What is laterality?

		SUBJECT(S)	
		WITHIN	ACROSS
TASK(S)	WITHIN	Hand Preference	Task Specialization
	ACROSS	Manual Specialization	Handedness

From Marchant and McGrew 1994

Laterality in Non-human Primates

- Can NHPs provide any insight into the human “condition”?
- Is there evidence of departures from ambilaterality?
- If so, in what context(s)?
- Genus *Pan* an obvious candidate given phylogenetic proximity; ‘sister’ taxon with two species, chimpanzee and bonobo



Laterality in Chimpanzees

- Studied extensively in both captive and wild chimpanzees
- In the wild, non-tool use behavior is often ambilateral, while tool use behavior elicits hand preference

Chimpanzee Termite Fishing

- Some termite fishing reportedly lateralized in wild chimpanzees (e.g., Lonsdorf & Hopkins 2005)
- Other studies say otherwise (Sanz et al. 2015)

Non-Tool Use in Captive Bonobos

- Certain behaviors, e.g., carrying and leading-limb, described as lateralized in captive bonobos (Hopkins 1993)
- Carrying - left-bias; leading-limb - right-bias

Tool Use in Captive Bonobos

- Chapelain et al. (2011) examined bimanual coordination using a tube task - dominant and subordinate hand coded (N=77)
- Found strong individual preferences but no population-level bias (L 35; R 33; A 9)

This Study

- To investigate hand laterality or lack thereof, we compared a non-tool use behavior that was expected to be unlateralized (grooming) with a pattern of tool use (termite fishing) that predictably elicits hand bias



Methods

- Grooming data - collected using scan sampling between May and August 2012
- 5 minute intervals, 15 minute sample
- If individual was grooming during scan, the hand used to groom was recorded



Methods



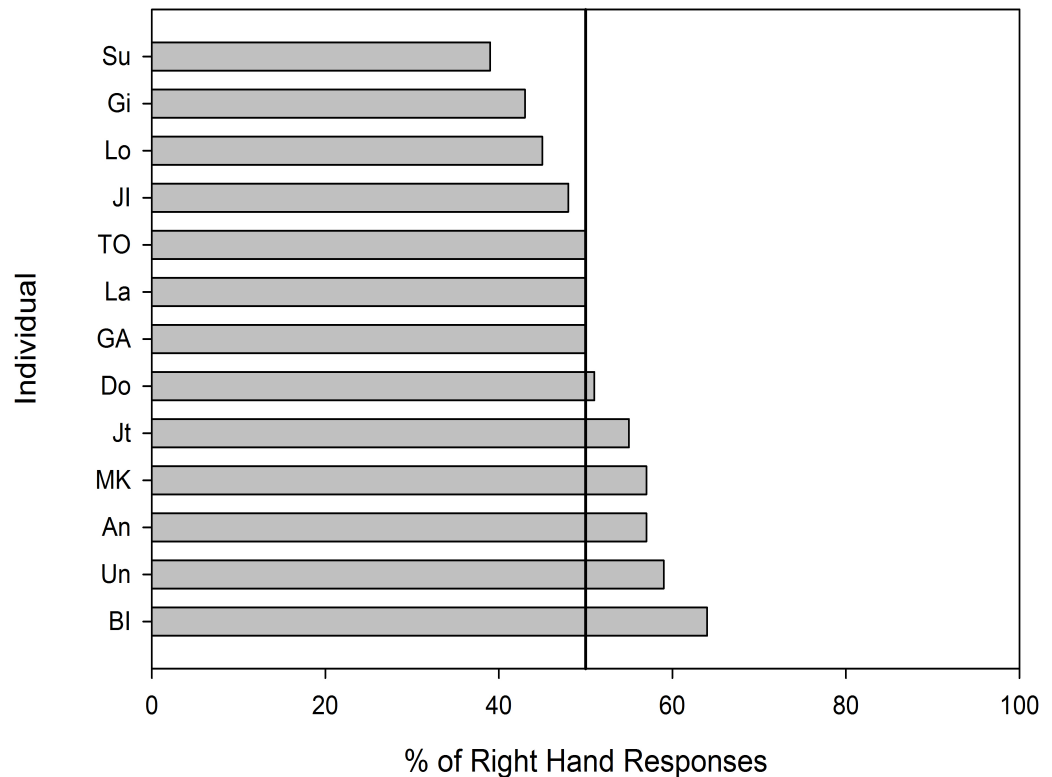
- Collected between June and August 2011
- Tool use videotaped all occurrence
- Videos analyzed and coded for hand used to insert probe

Data Analysis

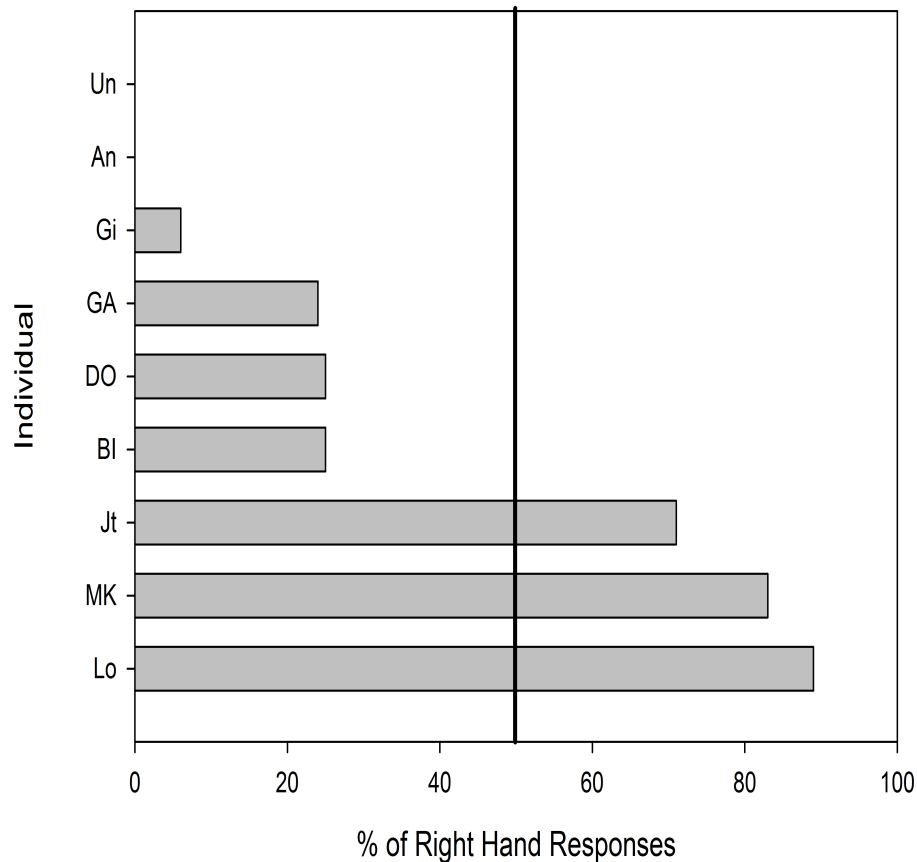
- The Binomial test used to evaluate if there were statistically significant differences in hand choice and direction of laterality

Grooming Results

- Grooming
Total $p = 0.293$
- Unimanual $p = 0.711$
- Bimanual $p = 0.719$



Tool Use Results



- All individuals exhibited significant hand preference
- 6 Left Hand, 3 Right Hand
- $p < 0.01$

Discussion

- Grooming was not lateralized, i.e. this is an ambilateral behavior in this group of captive bonobos
- This result mirrors that for wild chimpanzees



Discussion

- However, we observed strong individual hand preference for a tool use behavior, termite-fishing
- Replicates Chapelain *et al.*'s result for another tool-use task (the bimanual tube task) - i.e. no group-bias

Conclusion

- As one of the two species in the sister taxon, *Pan paniscus* is understudied with respect to the investigation of laterality
- Despite modest reports of tool use in wild bonobos, the captive born individuals became adept at termite fishing, *and* as in the few other studies of tool use in bonobos, they expressed strong individual hand preference

Acknowledgements

- Congo Expedition Staff and the Columbus Zoo and Aquarium
- Miami University Department of Anthropology and College of Arts and Science
- University of Oregon Department of Anthropology



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