Communicative & Integrative Biology 4:3, 315-317; May/June 2011; ©2011 Landes Bioscience

Pantomime in great apes

Evidence and implications

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We recently demonstrated, by mining observational data, that forest-living orangutans can communicate using gestures that qualify as pantomime.[1] Pantomimes, like other iconic gestures, physically resemble their referents.[2,3] More elaborately, pantomimes involve enacting their referents.[4] Holding thumb and finger together at the lips and blowing between them to mean "balloon" is one example.[5] Here we sketch evidence of pantomime in other great apes, methodological concerns and sophisticated cognitive capabilities that great ape pantomimes suggest.

Key words: pantomime, great apes, gesture, orangutan, language origins, cognition, narrative, communication

Submitted: 01/13/11

Accepted: 01/13/11

DOI: 10.4161/cib.4.3/14809

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Addendum to: Russon A, Andrews K. Orangutan pantomime: Elaborating the message. Biol Letters 2010; 7:627-30; PMID: 20702451; DOI: 10.1098/rsbl.2010.0564.

Pantomime in Other Great Apes

We subsequently identified credible reports of pantomime in other great apes. These extend the distribution of pantomime in nonhuman species. Resemblances they share with our orangutan pantomimes, in their contexts and messages, also contribute to showing up patterns and enhancing validity. We offer several examples.

Orangutans groomed a partner briefly to solicit grooming; so do chimpanzees and gorillas.[6-8] Orangutans feigned eating, seemingly to express benign interactive intent to a reluctant partner.[9] Wild mountain gorillas, orangutans and other primates also use ritualized eating to notify their interactive intentions; in some species, it can indicate benign intent.[10-13] In one such case, both partners feigned interest in the same non-food item that they "ate." This tactic has been detected in chimpanzee reconciliation and likened to a collective lie that helps break tension and bring adversaries back together, with one deceiving and the other acting as if deceived.[14]

Orangutans feigned inability to solve a task to solicit help. So did a home-reared chimpanzee, Viki, when about 18 months old.[15] Viki often pretend-dragged an imaginary pull toy and got its imaginary cord "stuck" on a handle. She usually "freed" it herself and then resumed her pretend-dragging. One day, in front of Hayes, Viki made a weaker attempt than usual to "free" the "stuck" cord, "failed" and gave up, looked up at Hayes and called "Mama." Hayes interpreted this as asking for help, so she "freed" Viki's "stuck" cord. Viki watched closely, accepted the "freed" cord and resumed pretend-dragging.

Some orangutan pantomimes showed the partner how to do something. So does a chimpanzee event reported as demonstration teaching.[16,17] While resting, Ricci, an adult female, noticed her daughter Nina trying unsuccessfully to crack nuts with an odd-shaped stone hammer. Ricci joined Nina, who immediately sat in front of Ricci and handed her the stone. With Nina watching closely, Ricci turned the stone to its best position for nut cracking—much more slowly and deliberately than usual, cracked 10 nuts with it and let Nina eat almost all of them, then dropped the stone and left. Nina resumed cracking, holding the stone the way Ricci had shown, and cracked nuts successfully within 15 minutes. Boesch interpreted this as Ricci's recognizing Nina's difficulties and helping her correct the hammering technique by showing her how to grip and use the stone effectively, in a very conspicuous fashion. His interpretation of this event as teaching was hotly contested, partly because it is the

only such case. Interpreted as pantomime, it is less anomalous. Importantly here, it shares the "show how" feature we identified in several orangutan pantomimes.

Eye of the Beholder

Critics have claimed that these orangutan pantomimes and other great ape iconic gestures exist only in the eye of the beholder.[18-20] We agree in part, but in a different way than critics probably intended: we argue that only certain beholders can identify and interpret these gestures. Gestural meaning is context-dependent for humans[2,21-25] and great apes.[26-30] This is especially true for pantomime and other iconic gestures, which are often idiosyncratic rather than standardized and sometimes created in the moment from the actor's mental content.[31-33] Thus interpreting and even detecting pantomimes requires beholders who share the actor's immediate and broader context, because this shared understanding is the basis for identifying the contingencies linking the pantomime's imagery with the eliciting communicative encounter.

Beholders who do not share this knowledge are not equipped to recognize the localized references expressed, let alone interpret them. Scientifically, this problem is not insurmountable. Observers who are highly knowledgeable about the actor and communicative partners, the specifics of the communicative exchanges that elicited pantomime, and the broader living context that participants share are equipped to identify and interpret some pantomimes. For great apes, experienced researchers collecting observational field data within a framework of lengthy sampling periods are examples. The orangutan and other great ape evidence we presented meets these requirements.

These pantomimes are also liable to dismissal as anecdotes. We agree that anecdotes should be viewed with caution. However, the pantomimes we identified in great apes are not anecdotes. "Anecdotes" refer to isolated incidents reported because their unusual nature attracted attention; they are commonly reported by observers whose motives, observational expertise and knowledge of the species and/or actors involved limited credibility and without the concurrent and historical contextual data needed for interpretation.[34,35] All the cases we identified were obtained from systematically collected data, reported by observers trained in scientific observation and knowledgeable about these events' current and historical context, and supported with extensive background information. We also note that the interpretations of critics who are insufficiently knowledgeable about the species, individuals and situations involved suffer the same weaknesses as anecdotes, and should be viewed with equal caution.

Implications for Language and Cognition

Gesture-first theories of language origins propose that ancestral hominids went through a pantomime stage that enabled the evolution of spoken language.[36] Gesture-first advocates consider several properties of pantomime as critical stepping stones to language: it is productive (enables creation of novel messages) and it serves as an entryway to syntax and narrative.[18,36-38] Even this limited data set on great ape pantomime shows these properties.

In orangutan pantomimes, we identified productivity, compositionality (creation of large meaningful units by combining smaller ones) and systematicity (gesture order contributes to meaning).[1] These and other great ape pantomimes also show triadic communication (i.e., communication involving self, other and object) in a wider range of situations than other evidence suggests.[39-43] They communicated messages as complex as what tool to use, what action to perform with it and on what target, and who should perform it (e.g., "assistant" use "machete" to "chop" open "coconut"). In a few cases, the tool action enacted was itself a complex, sequentially organized combination of behaviors (e.g., how to hold an awkward hammer rock, including rotating it into the best position, and how to crack nuts with it). These complex pantomimes suggest understanding the semantic relations expressed, so they imply corresponding cognitive abilities; this is consistent with other evidence on great ape language and cognition.[44,45]

In addition, one orangutan pantomimed complex and sequential information that portrays a story. Kikan re-enacted part of a past event: a caregiver had used a pencil to remove a sliver from the sole of Kikan's foot and then daubed latex from a fig leaf stem on the wound to dry it. A week later, after gaining this caregiver's attention, Kikan picked a leaf and poked its stem at the sole of her (now healed) foot in similar fashion. This suggests rudimentary narrative abilities, where narrative is defined minimally as "the representation of an event or a series of events."[46] This case counters the common view that narrative is a uniquely human capacity.[46] It also shows some of the components of episodic memory or reconstructing one's own past experiences as situated in time,[47,48] in that Kikan reconstructed key elements of a personally important experience. She was only an infant (three years old), so older orangutans may be expected to show greater sophistication.

Finally, some orangutans pantomimed to themselves. An adult female re-enacted a human's whittling a stick and cutting hair with scissors to herself.[49] Similar re-enactments by human children are considered part of understanding the actions involved[50-52] and pantomime, like language, may contribute to externalizing cognition.[53] Thus this orangutan's pantomiming to herself may serve as a way of explaining the event that she re-enacted. Linking self-pantomime to explanation is important because it has been suggested that chimpanzees, unlike humans, do not develop a general explanatory drive, and that while they make use of empirical generalizations, they are not interested in uncovering the causal relations that underlie them.[54]

Conclusions

This evidence suggests pantomime could have been within the grasp of the common human-great ape ancestor, so it could have emerged prior to the emergence of the human lineage. Its emergence before the human lineage does not weaken the likelihood that it set the stage for the evolution of language. This evidence also suggests cognitive abilities commonly considered beyond great apes' reach. Thus

pantomime offers a valuable window on great ape mentality, especially since patterns emerging from the observational reports we mined open the door to systematic study.

Acknowledgements

Russon's orangutan studies were funded by Glendon College, York University, the Natural Sciences and Engineering Research Council (Canada) and the LSB Leakey Foundation (USA), authorized by Indonesia's Science Institute (LIPI) and sponsored by PHKA, the Orangutan Research and Conservation Project (Tanjung Puting), and Borneo Orangutan Survival Foundation Orangutan Reintroduction Projects (Wanariset, Samboja Lestari, Nyaru Menteng). Andrews's contribution was supported by grants from the Social Sciences and Humanities Research Council and York University (Canada). Studies complied with current laws in Indonesia, where they were conducted.

References

1. Russon A, Andrews K. Orangutan pantomime: Elaborating the message. Biol Letters 2010; 7:627-30; DOI: 10.1098/rsbl.2010.0564.
2. Bates E, Benigni L, Bretherton I, Camaioni L, Volterra V. The Emergence of Symbols: Cognition and Communication in Infancy. New York: Academic Press 1979.
3. Tanner JE, Byrne RW. Representation of action through iconic gesture in a captive lowland gorilla. Curr Anthrop 1996; 37:162-73.
4. McNeill D. Hand and Mind: What Gestures Reveal about Thought. Chicago: Chicago University Press 1992.
5. Miles HL, Mitchell RW, Harper SE. Simon says: The development of imitation in an enculturated orangutan. In: Russon AE, Bard KA, Parker ST, Eds. Reaching into Thought: The Minds of the Great Apes. Cambridge, UK: Cambridge University Press 1996; 278-99.
6. Matsuzawa T. A hard nut to crack: Tool use of wild chimpanzees at Bossou. ANC/NHK video 1998.
7. Pika S, Mitani JC. Referential gesturing in wild chimpanzees (*Pan troglodytes*). Curr Biol 2006; 16:191-2.
8. Tanner JE, Patterson FG, Byrne RW. The development of spontaneous gestures in zoo-living gorillas and sign-taught gorillas: From action and location to object representation. J Dev Proc 2006; 1:69-103.
9. Russon AE. Pretending in free-ranging rehabilitant orangutans. In: Mitchell RW, Ed. Pretending in Animals, Children and Adult Humans. Cambridge, UK: Cambridge University Press 2002; 229-40.
10. Cords M, Killen M. Conflict resolution in human and non-human primates. In: Langer J, Killen M, Ed. Piaget, Evolution and Development. Mahwah NJ: Lawrence Erlbaum Assoc 1998; 193-218.
11. Schaller GB. The Mountain Gorilla: Ecology and Behavior. Chicago: University of Chicago Press 1963.
12. Schürmann C. Mating behavior of wild orang utans. In: de Boer LEM, Ed. The Orang Utan. Its Biology and Conservation. The Hague: Dr. W. Junk Publishers 1982; 269-84.
13. Silk JB. Why do primates reconcile? Evol Anthrop 1996; 5:39-42.
14. de Waal FBM. Deception in the natural communication of chimpanzees. In: Mitchell RW, Thompson NS, Eds. Deception: Perspectives on Human and Nonhuman Deceit. Albany: State University of New York Press 1986; 221-44.
15. Hayes C. The Ape in Our House. New York: Harper & Brothers 1951.
16. Boesch C. Teaching among wild chimpanzees. Anim Behav 1991; 41:530-2.
17. Boesch C. Aspects of transmission of tool-use in wild chimpanzees. In: Gibson KR, Ingold T, Eds. Tools, Language and Cognition in Human Evolution. Cambridge, UK: Cambridge University Press 1993; 171-83.
18. Arbib MA, Liebal K, Pika S. Primate vocalization, gesture and the evolution of language. Curr Anthrop 2008; 49:1053-76.
19. Guldberg H. Can orang-utans really mime? Great apes cannot remotely communicate like human beings. Psychol Today 2010; In press. Available at: www.psychologytoday.com/blog/reclaiming-childhood/201008/can-orang-utans-really-mime.
20. Tomasello M, Zuberbühler K. Primate vocal and gestural communication. In: Bekoff M, Allen CS, Burghardt G, Eds. The Cognitive Animal: Empirical and Theoretical Perspectives on Animal Cognition. Cambridge, MA: MIT Press 2002; 293-9.
21. Bruner J. Nature and uses of immaturity. Amer Psychol 1972; 27:687-708.
22. Goffman E. Encounters: Two Studies in the Sociology of Interaction. Indianapolis: Bobbs-Merrill 1961.
23. Goffman E. Behavior in Public Places: Notes on the Social Organization of Gatherings. New York: Free Press 1963.
24. Goffman E. Frame Analysis: An Essay on the Organization of Experience. London: Harper and Row 1974.
25. LeBaron C, Streeck J. Gestures, knowledge and the world. In: McNeill D, Ed. Gesture and Language: Window into Thought and Action. Cambridge UK: Cambridge University Press 2000; 118-38.
26. Genty E, Breuer T, Hobaiter C, Byrne RW. Gestural communication of the gorilla (*Gorilla gorilla*): repertoire, intentionality and possible origins. Anim Cog 2009; 12:527-47.
27. Leavens DA, Russell JL, Hopkins WD. Intentionality as measured in the persistence and elaboration of communication by chimpanzees (*Pan troglodytes*). Child Dev 2005; 76:291-306.
28. Pollick AS, de Waal FBM. Ape gestures and language evolution. Proc Natl Acad Sci USA 2007; 104:8184-9.
29. Tanner JE. Gestural phrases and exchanges by a pair of zoo-living lowland gorillas. Gesture 2004; 4:1-24.
30. Tomasello M, Call J. Introduction: Intentional communication in nonhuman primates. In: Call J, Tomasello M, Eds. The Gestural Communication of Apes and Monkeys. Mahwah NJ: Lawrence Erlbaum Associated 2007:1-15.
31. McNeill D. Growth points cross-linguistically. In: Nuyts J, Pederson E, Eds. Language and Conceptualization. Cambridge, UK: Cambridge University Press 1997:190-212.
32. McNeill D. Introduction. In: McNeill D, Ed. Language and Gesture: Window into Thought and Action. Cambridge, UK: Cambridge University Press 2000:1-10.
33. Tanner JE. Commentary. Curr Anthrop 2008; 49:1067-8.
34. Bates L, Byrne RW. Creative or created: Using anecdotes to investigate animal cognition. Methods 2007; 42:12-21.
35. Washburn MF. The Animal Mind, 3rd edition. New York: Macmillan 1926.
36. Corballis MC. From Hand to Mouth, the Origins of Language. Princeton: Princeton University Press 2002.
37. Arbib MA. The mirror system, imitation and the evolution of language. In: Dautenhahn K, Nehaniv CL, Eds. Imitation in Animals and Artifacts: Complex Adaptive Systems. Cambridge MA: MIT Press 2002:229-80.
38. Stokoe WC. Language in Hand: Why Sign Came before Speech. Washington, DC: Gallaudet University Press 2001.
39. Bard K. Intentional behavior and intentional communication in young free-ranging orangutans. Child Dev 1992; 63:1186-97.
40. Liebal K, Pika S, Tomasello M. Gestural communication of orangutans (*Pongo pygmaeus*). Gesture 2006; 6:1-38.
41. Pika S, Liebal K, Call J. Gestural communication of apes. Gesture 2005; 5:41-56.
42. Tomasello M, Call J, Nagell K, Olguin R, Carpenter M. The learning and use of gestural signs by young chimpanzees: A trans-generational study. Primates 1994; 35:137-54.
43. Tomasello M, Camaioni L. A comparison of the gestural communication of apes and human infants. Human Dev 1997; 40:7-24.
44. Blake J. Gestural communication in the great apes. In: Russon AE, Begun DR, Eds. The Evolution of Thought: Evolutionary Origins of Great Ape Intelligence. Cambridge UK: Cambridge University Press 2004; 61-75.
45. Gentner D, Christie S. Relational language supports relational cognition in humans and apes. Behav Brain Sci 2008; 31:136-7.
46. Abbott HP. The Cambridge Introduction to Narrative. Cambridge UK: Cambridge University Press 2002.
47. Suddendorf T, Corballis M. The evolution of foresight: What is mental time travel and is it unique to human? Behav Brain Sci 2007; 30:299-351.
48. Tulving E. Episodic Memory and Autonoesis: Uniquely Human? In: Terrace HS, Metcalfe J, Eds. The Missing Link in Cognition: Origins of Self-Reflective Consciousness. New York: Oxford University Press 2005:3-55.
49. Russon AE. Imitation in everyday use: the nature of spontaneous imitation in free-ranging rehabilitant orangutans. In: Russon AE, Bard KA, Parker ST, Eds. Reaching into Thought: The Minds of the Great Apes. Cambridge, UK: Cambridge University Press 1996:152-76.
50. Meltzoff AN, Moore MK. Early imitation within a functional framework: The importance of person identity, movement and development. Infant Behav Dev 1992; 15:479-505.
51. Piaget J. The Origins of Intelligence in Children. New York: Norton 1952.
52. Speidel GE, Nelson KE, Eds. The Many Faces of Imitation in Language Learning. New York: Springer-Verlag 1989.
53. Clark A, Chalmers D. The extended mind. Analysis 1998; 58:10-23.
54. Povinelli D, Dunphy-Lelii S. Do chimpanzees seek explanations? Preliminary comparative investigations. Can J Exper Psychol 2001; 55:185-93.