

# THE LANDSCAPE OF GESTURAL RESEARCH IN LANGUAGE EVOLUTION: A SYSTEMATIC REVIEW

Evelina D. Rodrigues<sup>\*1</sup>, António J. Santos<sup>1</sup>, Flávia Veppo<sup>2</sup>, Joana Pereira<sup>3</sup>, and Catherine Hobaiter<sup>4</sup>

<sup>\*</sup>Corresponding Author: erodrigues@ispa.pt

<sup>1</sup> William James Center for Research, ISPA–Instituto Universitário, Lisbon, Portugal

<sup>2</sup> Department of Applied Psychology, School of Psychology, University of Minho, Braga, Portugal

<sup>3</sup> Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal

<sup>4</sup> School of Psychology and Neuroscience, University of St Andrews, St Andrews, Scotland, UK

## 1. Introduction

The presence of common features in human and nonhuman primate communication can be used to suggest the evolutionary trajectories of potential precursors to language (Byrne et al., 2017; Fitch, 2010; Tomasello & Call, 1997). However, the overrepresentation of some species or populations<sup>1</sup> and differences in definitions, methodology and context distort our ability to make phylogenetic comparison (Fröhlich & Hobaiter, 2018; Leavens et al., 2019; Scott & Pika, 2012). This systematic review describes the current landscape of data available from studies of spontaneous gestural communication (produced without explicit training<sup>2</sup>) in human and nonhuman primates that make an explicit connection to language evolution.

## 2. Methods

---

<sup>1</sup> For example WEIRD - Western, Educated, Industrialized, Rich, and Democratic – in humans (Henrich et al., 2010); and BIZARRE - Barren Institutional Zoo And other Rare Rearing Environment – in chimpanzees (Leavens et al., 2010).

<sup>2</sup> Studies on home-sign development were included because of its often spontaneous emergence, but we excluded formal signed language studies to avoid explicit teaching of signs and gestures

We investigated how these studies varied in terms of study domains (Table S1), concept of gesture (Bourjade et al., 2020), study scope, inclusion of additional sources, and of research settings and study design (Table S2). In March 2020, we conducted a search of peer-reviewed articles and book chapters in Web of Science and PsycINFO using the search terms “gestur\*,” AND “evolutio\*” OR “origin\*,” AND “languag\*” OR “communicat\*. From the 963 studies identified we retained 163 according to a predefined set of criteria (Figure S1).

### 3. Results

We found a similar number of studies on human (N=80) and nonhuman primates (N=87), but very few studies included data on both human and nonhuman primates (N=4). As a result, evolutionary inferences remain restricted to comparison across studies. We identified areas of focus, bias, and apparent gaps within the field. Of the nonhuman primate species studied, the majority focused on great apes (N=75/87), but no studies were found in small apes, monkeys of the Americas, or strepsirrhines (Figure S2). Most human participants were from WEIRD societies (N=68/80). There were few nonhuman primate studies of ontogeny and relatively few human studies of gesture form (Figure S3). We found variation in the conceptual and methodological approaches used between human and nonhuman primate studies. Definitions of gesture and criteria for intentional use are absent in most human studies (Table S3). Human studies focused more on specific gesture types or contexts (N=65/80) and were more likely to include additional sources to gesture (N=53/80). Studies of nonhuman primates were conducted more often in familiar settings (N=71/87) and using observational designs (N=61/87), whereas studies with humans were conducted more often in laboratories (N=53/80) using experimental designs (N=58/80; Table S4).

### 4. Discussion

Diversity in focus, methods, and socio-ecological context fill important gaps and provide nuanced understanding, but only where the source of any difference between studies is transparent. We highlight important areas in a call to action through which we can strengthen our ability to investigate gestural communication's contribution within the evolutionary roots of human language, including the need for: i) explicitly testing evolutionary hypotheses in our empirical work; ii) more data from diverse species, social groups, and environments, iii) studies exploring the spontaneous use of gesture forms in humans and gesture ontogeny in non-human primates.

## Acknowledgements

EDR was supported by the Portuguese Foundation for Science and Technology (SFRH/BD/138406/2018). CH is funded by the European Union's 8th Framework Programme, Horizon 2020, under grant agreement no 802719.

## References

- Bourjade, M., Cochet, H., Molesti, S., & Guidetti, M. (2020). Is Conceptual Diversity an Advantage for Scientific Inquiry? A Case Study on the Concept of ‘Gesture’ in Comparative Psychology. *Integrative Psychological and Behavioral Science*, 54(4), 805–832. <https://doi.org/10.1007/s12124-020-09516-5>
- Byrne, R. W., Cartmill, E. A., Genty, E., Graham, K. E., Hobaiter, C., & Tanner, J. E. (2017). Great ape gestures: Intentional communication with a rich set of innate signals. *Animal Cognition*, 20(4), 755–769. <https://doi.org/10.1007/s10071-017-1096-4>
- Fitch, W. T. (2010). *The Evolution of Language*. Cambridge University Press.
- Fröhlich, M., & Hobaiter, C. (2018). The development of gestural communication in great apes. *Behavioral Ecology and Sociobiology*, 72(12), 194. <https://doi.org/10.1007/s00265-018-2619-y>
- Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, 33(2–3), 61–83. <https://doi.org/10.1017/S0140525X0999152X>
- Leavens, D. A., Bard, K. A., & Hopkins, W. D. (2010). BIZARRE chimpanzees do not represent “the chimpanzee.” *Behavioral and Brain Sciences*, 33(2–3), 100–101. <https://doi.org/10.1017/S0140525X10000166>
- Leavens, D. A., Bard, K. A., & Hopkins, W. D. (2019). The mismeasure of ape social cognition. *Animal Cognition*, 22(4), 487–504. <https://doi.org/10.1007/s10071-017-1119-1>
- Scott, N. M., & Pika, S. (2012). A call for conformity: Gesture studies in human and non-human primates. *Developments in Primate Gesture Research*, 147–163.
- Tomasello, M., & Call, J. (1997). *Primate cognition*. Oxford University Press, USA.