

## **Defining the building blocks of pragmatic competence; the social context of language evolution**

Miranda Dickerman<sup>\*1</sup>, Joseph Mine<sup>2</sup>, Simon Townsend<sup>2</sup>, Sabine Stoll<sup>1</sup>

<sup>\*</sup>Corresponding Author: [miranda.dickerman@uzh.ch](mailto:miranda.dickerman@uzh.ch)

<sup>1</sup>Department of Comparative Language Science, University of Zurich, Zurich, Switzerland

<sup>2</sup>Department of Evolutionary Anthropology, University of Zurich, Zurich, Switzerland

Human communication relies on integrating signals with contextually available information, a process known as pragmatic competence. Pragmatic competence is neither fully unique to humans nor exclusive to language use (e.g., Arnold & Zuberbühler 2013). This suggests that language evolved alongside an existing ability to integrate signals and context. In this study, we propose a framework of pragmatic competence and its evolution from a linguistic, psychological, and biological perspective. We aim to delineate the cognitive capacities which underlie pragmatic competence. To understand how these capacities co-evolved, we examine their presence in our closest relatives: the great apes.

We first introduce (a) a typology of information sources, which can be comparatively applied across species. This typology encompasses both signals emitted during communicative acts, (such as gestures, facial expressions, and linguistic signals), and information accessible outside of the communication process (such as knowledge pertaining to the environment or to the state of mind of the signaller). We then establish that, to a large extent, physical information sources are not comparable across species; rather, comparative relevance lies in the ability to access and interpret information sources.

Access to and interpretation of information sources, in turn, relies on different underlying capacities enabling derivation of and reasoning about information from distinct sources. From this point we expand on previous work on the evolutionary origins of pragmatic competence by establishing (b) a broad overview of the necessary cognitive capacities for accessing these information sources. We focus on the mechanisms that are minimally necessary for pragmatic competence. The most prominent of these mechanisms is theory of mind (e.g., Heintz & Phillips, 2023; Bar-On, 2021). We additionally identify and integrate

signal flexibility, or optionality (Watson et al., 2022), and predictive processing literature into the story of the capacities enabling pragmatic competence.

Finally, in (c), we apply the comparative method, examining evidence for the capacities underlying pragmatic competence in our closest relatives, in the domains of signal production and perception. To this end we draw on literature from diverse fields, including from work on primate communication (e.g., Wilke et al., 2017), predictive pre-processing of communicative input (e.g., Heilbron et al. 2022), and other comparative work on these cognitive capacities (e.g., Krupenye & Call, 2019). We find that the roots of the core components underlying pragmatic competence are present in our ape relatives, suggesting their presence in our lineage to be phylogenetically old. Deconstructing the components of pragmatic competence ultimately allows us to better disentangle the evolutionary trajectory of pragmatics, offering insight into the conditions under which language emerged.

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