

# Filling a gap between pre-linguistic and linguistic pragmatics: An experimental semiotic approach to the formation of symbolic communication systems with intention sharing

Takashi Hashimoto

School of Knowledge Science, Japan Advanced Institute of Science and Technology  
hash@jaist.ac.jp

Keywords: Intention sharing, Symbolic communication, Denotation and connotation, Pragmatics

While the understanding intention is critical in human communication, the intention is not always expressed literally as denotation but implied as connotation. The mirror neuron system is a candidate of the underlying neural mechanism of understanding intention through actions (Iacoboni et al. 2005) such as facial expressions, gestures, and prosody. Deductive reasoning plays a role in the understanding of connotation including intention (Grice 1975; Sperber and Wilson 1986). A gap, however, exists between these two levels, namely, between pre-linguistic pragmatics including embodiment and linguistic pragmatics premised upon semantics and syntax (Hurford 2007).

An experimental semiotic approach (Galuntucci 2009) to the formation of symbolic communication systems (Konno et al. 2012) can help clarify the mechanisms of intention understanding. In this experiment, two participants in separate sites conducted a coordination task with symbolic message exchange. The message was composed of abstract graphics with no predefined and shared meaning. While the participants must share referential meanings of symbols (denotation), the task was fabricated so that symbol sharing alone was not enough. The participants needed to mutually understand whether the partners' messages meant to declare the sender's states or to demand the receiver's action, namely, connotations representing partners' intentions.

We found that symbolic communication systems with intention sharing developed from making common ground (pre-linguistic pragmatics) to sharing symbol systems (semantics), and then to establishing role division indicating intentions (basic linguistic pragmatics) (Konno et al. 2014). This result means that our experimental semiotic paradigm is effective to explore the developmental process from pre-linguistic to linguistic pragmatics. It was suggested that the mirror neuron system worked as a neural substrate as the pre-linguistic pragmatics, not by associating embodied actions with intention of the actions but by contributing in the tendency toward embodied simulation of other's intention since the task included no apparent embodied action (Li et al. under review). Additionally, front-parietal functional connectivity in the brain seemed to integrate symbolic and intentional meanings (Fujiwara et al. 2018). This functional connectivity may fill the gap between pre-linguistic and basic linguistic pragmatics.

## References

- Fujiwara, M., T. Hashimoto, G. Li, J. Okuda, T. Konno, K. Samejima, & J. Morita (2018). Changes in phase synchronization of EEG during development of symbolic communication systems. In J. M. Delgado-García, et al. (eds.), *Advances in Cognitive Neurodynamics (VI)*, Springer, 327-333.
- Galuntucci, B. (2009). Experimental semiotics: a new approach for studying communication as a form of joint action. *Topics in Cognitive Science*, 1(2): 393-410.
- Grice H. P. (1975). Logic and conversation. In P. Cole & J. L. Morgan (eds.), *Syntax and Semantics, Vol. 3, Speech Acts*, Cambridge, MA: Academic Press, 41-58.
- Hurford, J. R. (2007). *The Origins of Meaning: Language in the Light of Evolution*. Oxford: Oxford University Press.
- Iacoboni, M, I. Molnar-Szakacs, V. Gallese, G. Buccino, J. C. Mazziotta, & G. Rizzolatti (2005). Grasping the intentions of others with one's own mirror neuron system. *PLoS Biology*, 3(3): e79.
- Konno, T, J. Morita & T. Hashimoto (2012). How is pragmatic grounding formed in the symbolic communication systems? *The Evolution of Language: Proceedings of the 9th International Conference*, World Scientific, 482-483.
- Konno, T, J. Morita & T. Hashimoto (2014). Experimental approach to emergence of linguistic communication systems (in Japanese). *Journal of the Society of Instrument and Control Engineers*, 53(9), 801-807.
- Li, G., T. Hashimoto, T. Konno, J. Okuda, K. Samejima, J. Morita & M. Fujiwara (under review). Empathetic symbols: An EEG study on the role of mirroring in the formation of symbolic communication systems.
- Sperber, D. & D. Wilson (1986). *Relevance: Communication and Cognition*. Oxford: Blackwell.