

# 12

## Measuring emotional response and emotion sharing

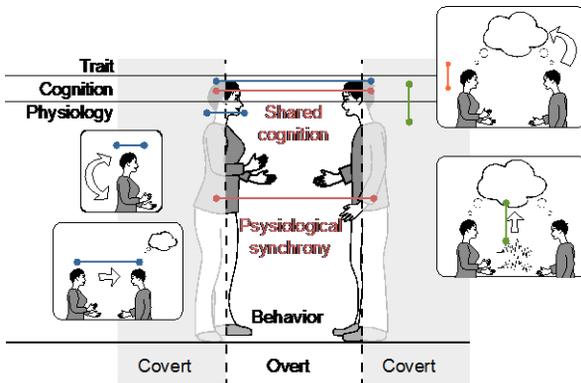
### - Quantitative assessment of empathic communication -

#### Abstract

Empathy is the basis of people's social lives. However, the mechanism has not yet been fully elucidated because it is a complex phenomenon consisting of subjectivity, physiology, and behavior. The purpose of this study is to quantify empathy from a multifaceted point of view considering individual differences. We examined how physiology, behavior and cognition are related in an individual, and how they are shared with other individuals. In order to deal with the large individual difference in the subjective judgment, we built a computational model that explains the individual difference from their personality traits, exploiting the wisdom of the group approach which aggregates the judgment of multiple individuals. This kind of framework for quantitative measurement of empathy including individual differences will make it possible to assess and predict the effects of interventions that promote empathy tailored to individuals. We believe this is an essential step toward improving human well-being.



Empathy involves a variety of phenomena, from the low-level phenomenon (e.g. physiological synchronization) to the higher-level phenomenon (e.g. cognitive sharing). We try to understand these from various aspects.



#### Individual's physiology and behavior [1]

\* joint research with Tsukuba University

In the task of distinguishing between posed and spontaneous faces, we directly compared humans with machines using video or EMG signal in terms of accuracy.

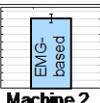
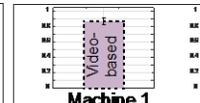
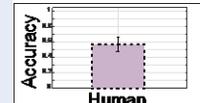
Is facial expression (FE) of this person spontaneous or posed?

Target :



FE was measured using  
Video & Electromyography

Respondents :



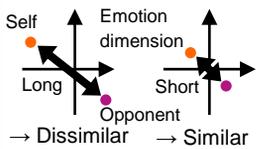
Accuracy: human < Video  $\approx$  EMG



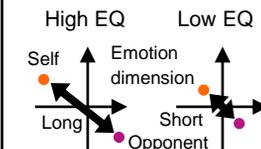
#### Cognition and personality trait on emotion sharing [2]

Based on the similarity judgment theory, we clarified which types of people tend to have emotion similar to others and to recognize their emotional similarities accurately.

The higher Systemizing Quotient, the more accurately people answer the degree of emotional similarity with others.

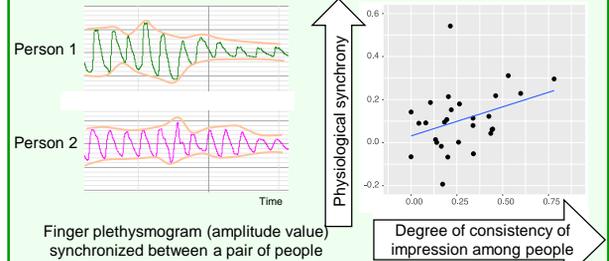


People with a higher (lower) Empathizing Quotient (EQ) are less (more) likely to have similar emotions.



#### Physiological synchrony and cognitive sharing

We found that the physiological response is synchronized during cooperative work, and that the higher the physiological synchrony, the more consistent the impression of the interaction.



#### References

- [1] M. Perusquia-Hernandez, S. Ayabe-Kanamura, K. Suzuki, S. Kumano, "The Invisible Potential of Facial Electromyography: a Comparison of EMG and Computer Vision when Distinguishing Posed from Spontaneous Smiles," in Proc. Conf. Human Factors in Computing Systems (CHI), 2019.
- [2] L. Antaket, M. Matsuda, K. Otsuka, S. Kumano, "Analyzing Generation and Cognition of Emotional Congruence using Empathizing Systemizing Quotient," *International Journal of Affective Engineering*, Vol. 17, No. 3, pp. 183-192, 2018.

#### Contact

**Shiro Kumano** Email: cs-liaison-ml at hco.ntt.co.jp  
Sensory Resonance Research Group, Human Information Science Laboratory



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