The eyes have it: Mutual gaze potentially a vital component in social interactions

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Researchers at Japan's National Institute for Physiological Sciencesshowed that eye contact is essential for face-to-face interactions; without it, certain brain activities cannot be stimulated to establish connectivity between people. Credit: NINS/NIPS

A person in love gazes longingly and attentively at the object of his or her desire. When we want to grab another person's attention, we look directly into their eyes. Why do we behave this way? What happens during our gazing?

Researchers at the National Institute of Physiological Science (NIPS) have revealed that mutual eye contact synchronizes spontaneous activity in specific areas of the brains of two interacting parties. The finding indicates that this synchronized brain activity is crucial in establishing and facilitating face-to-face social interaction.

In most cultures, we are taught from a young age to maintain eye contact when we speak. Failure to do so may be considered impolite, and can even risk losing the other party's attention. As it turns out, eye contact is fundamental in all human face-to-face interactions. The mechanisms of visual attention through eye contact maintained between two people (mutual gaze), and toward a third person or an object (joint attention), have been extensively studied. However, the underpinnings of the attention being shared and retained have remained unclear.

To further explore this topic, the NIPS team enrolled 96 volunteers who were not mutually acquainted, and conducted a series of tests to investigate the brain activity during situations with sustained eye contact.

Three sets of experiments were conducted over 2 days. Participants were paired with different partners and instructed to hold each other's gaze in real time under various conditions. The researchers used functional magnetic resonance imagining to monitor the brain activity that took place during mutual gaze. Takahiko Koike, the study's first author, explains: "We expected that eye-blink synchronization would be a sign of shared attention when performing a task requiring joint attention, and the shared attention would be retained as a social memory." They also expected that the right inferior frontal gyrus (IFG) in the brain would be activated by both the initiator and the respondent to the gaze.

Indeed, the researchers detected synchronization of eye-blinks, together with enhanced inter-brain synchronization in the IFG, in the pairs when eye contact was established. Compared with findings from previous studies, these outcomes show that synchronization of eye-blinks is not attributable to a common activity, but rather to mutual gaze. This indicates that mutual eye contact might be a crucial component for human face-to-face social interactions, given its potential to bind two

individuals into a singular connected system. This topic warrants further investigation to truly understand what is at work behind interpersonal communications.

"Based on the enhancement of behavioral and neural synchronization during mutual gaze, we now know that shared attention is hard to establish without eye contact," Norihiro Sadato, senior author of the study, says. "Further investigation into the workings of eye contact may reveal the specific functional roles of neural synchronization between people."

More information: Takahiko Koike et al. Neural substrates of shared attention as social memory: A hyperscanning functional magnetic resonance imaging study, *NeuroImage* (2016). DOI: 10.1016/j.neuroimage.2015.09.076

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