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In 'reading' a gaze, what we believe changes what we see

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In primates including ourselves, the ability to register where others are looking is key in social circles. And, according to a new report published online on June 25th in *Current Biology*, a Cell Press publication, the way our brains process gaze-direction is much more sophisticated than a simple eyes-right versus eyes-left.

In fact, the way our brains code another's gaze-direction can hinge on what we already believe about that person's mental state, the new evidence shows.

"When we look at a face, it is not just a head or eyes pointing in some direction we see," said Greg Davis of the University of Cambridge. "Rather, our brain is coding another person's attention and intentions."

"It tells us that rather than being a passive process, social perception is very active," added Christoph Teufel, also of the University of Cambridge. "We do perceive social signals. But once we attribute a mental state to them, this in turn changes the sensory processing of that social signal. It's a two-way relationship."

Earlier studies in macaques revealed special neurons in the brain that fire in response to others' specific gaze-direction, Teufel and Davis explained. As evidence that humans share the same capacity, studies showed that people experience what are known as aftereffects, in which exposure to a person looking in a particular direction biases subsequent gaze-direction judgment the opposite way. For instance, if you saw one

person looking left for a period of time and then saw someone looking straight at you, it would appear as if that second individual were looking farther off to the right. Such aftereffects are caused by a process known as adaptation, in which the sensitivity of neurons decreases after prolonged stimulation.

The new study shows that those gaze-direction aftereffects are, in almost all cases, essentially erased when onlookers believe (wrongly) that the person they are watching cannot actually see.

The researchers made the discovery by convincing observers that pre-recorded video sequences of an experimenter gazing left or right were a "live" video link to an adjacent room. The experimenter wore mirrored goggles that observers believed were either transparent, such that the person could see, or opaque, such that the person could not. The effects of adaptation were greatly enhanced when study participants observed experimenters wearing goggles they thought they could see through, they report.

"In summary," the researchers wrote, "our findings indicate a bi-directional relationship between gaze-processing and the system responsible for mental-state attribution. Previous studies have demonstrated that observed gaze-direction can be used to infer another person's mental states such as attention. Here we demonstrate that beliefs about another person's ability to see (and therefore attend) have in turn strong top-down effects on gaze processing." That interplay between social perception and social mentalistic beliefs "might point toward a more general effect of high-level mental-state attribution in facilitating and shaping the way in which social signals are processed on a lower level."

The findings could lead the way to a new understanding of what goes wrong in people with mental disorders such as autism, the researchers

said. "It's going to be important to to understand whether people who are neurally atypical are doing this attribution in the same way," Davis said.

Source: Cell Press (news : web)