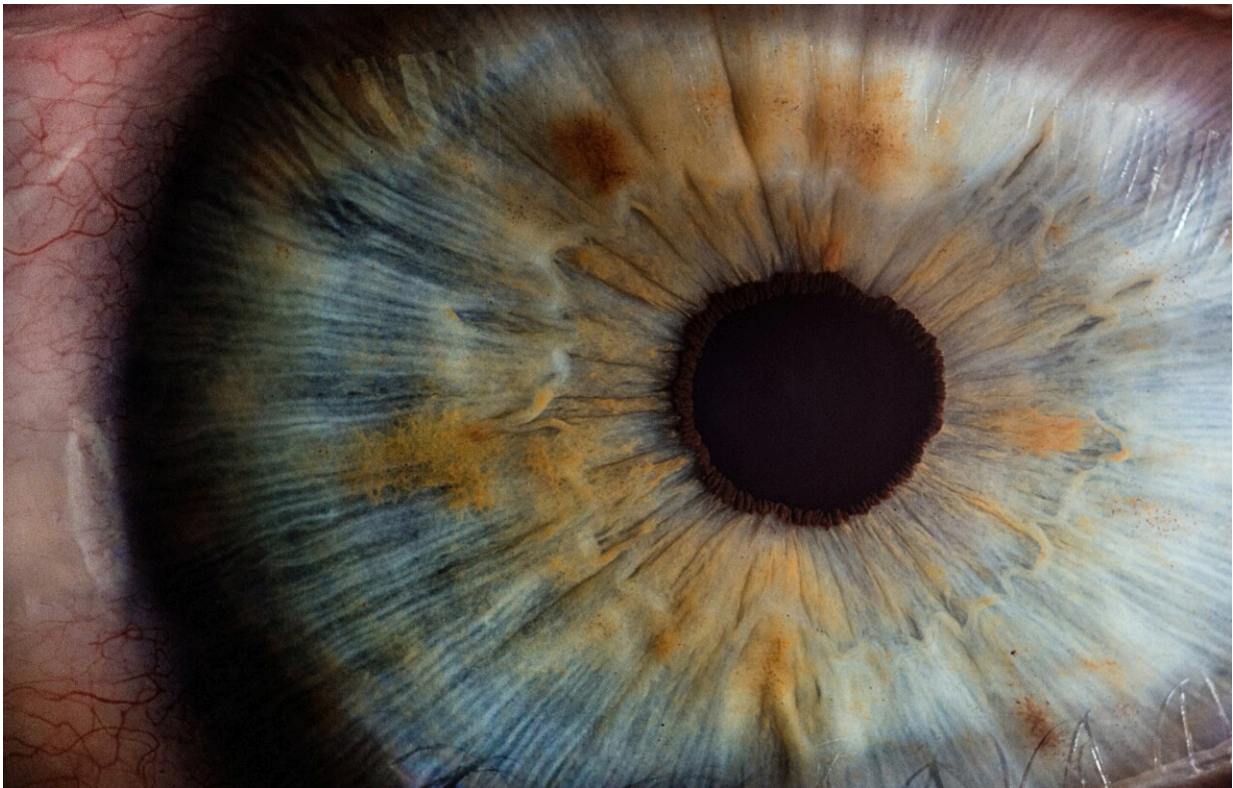


# Not-so private eyes: Eye movements hold clues to how we make decisions

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New research led by scientists at the University of Colorado Boulder suggests that eyes may really be the window to the soul—or, at least, how humans dart their eyes may reveal valuable information about how they make decisions.

The new findings offer researchers a rare opportunity in neuroscience: the chance to observe the inner workings of the human brain from the outside. Doctors could also potentially use the results to, one day, screen their patients for illnesses like depression or Parkinson's Disease.

"Eye movements are incredibly interesting to study," said Colin Korbisch, doctoral student in the Paul M. Rady Department of Mechanical Engineering at CU Boulder and lead author of the study.

"Unlike your arms or legs, the speed of eye movements is almost totally involuntary. It's a much more direct measurement of these unconscious processes happening in your brain."

He and his colleagues, including researchers at Johns Hopkins University in Baltimore, [published their findings in November](#) in the journal *Current Biology*.

In the study, the team asked 22 [human subjects](#) to walk on a treadmill then choose between different settings displayed on a [computer screen](#): a brief walk up a steep grade or a longer walk on flat ground.

Researchers discovered that the subjects' eyes gave them away: Even before they made their choices, the treadmill users tended to move their eyes faster when they looked toward the options they ended up choosing. The more vigorously their eyes moved, the more they seemed to prefer their choice.

"We discovered an accessible measurement that will tell you, in only a few seconds, not just what you prefer but how much you prefer it," said Alaa Ahmed, senior author of the study and associate professor of mechanical engineering at CU Boulder.

## **Shifty eyes**

Ahmed explained that how or why humans make choices (Tea or coffee? Dogs or cats?) is notoriously difficult to study. Researchers don't have many tools that will easily allow them to peer inside the brain. Ahmed, however, believes that our eyes could provide a glimpse into some of our thought processes. She's particularly interested in a type of movement known as a "saccade."

"The primary way our eyes move is through saccades," Ahmed said. "That's when your eyes quickly jump from one fixation point to another."

Quickly is the key word: Saccades usually take just a few dozen milliseconds to complete, making them faster than an average blink.

To find out if these darting motions give clues about how humans come to decisions, Ahmed and her colleagues decided to hit the gym.

In the new study, the team set up a treadmill on the CU Boulder campus. Study subjects exercised on various inclines for a period of time then sat down in front of a monitor and a high-speed, camera-based device that tracked their eye movements. While at the screen, they pondered a series of options, getting 4 seconds to pick between two choices represented by icons: Did they want to walk for 2 minutes at a 10% grade or for 6 minutes at a 4% grade? Once done, they returned to the treadmill to feel the burn based on what they chose.

The team found that subjects' eyes underwent a marathon of activity in just a short span of time. As they considered their options, the individuals flitted their eyes between the icons, first slowly and then faster.

"Initially, the saccades to either option were similarly vigorous," Ahmed said. "Then, as time passed, that vigor increased and it increased even

faster for the option they eventually chose."

The researchers also discovered that people who made the hastiest decisions—the most impulsive members of the group, perhaps—also tended to move their eyes more vigorously. Once the subjects decided on their pick, their eyes slowed again.

"Real-time read-outs of this decision-making process typically require invasive electrodes placed into the brain. Having this more easily measured variable opens a lot of possibilities," Korbisch said.

## Diagnosing illness

Flicks of the eye could matter for a lot more than understanding how humans make decisions. Studies in monkeys, for example, have suggested that some of the same pathways in the brain that help primates pick between this or that may also break down in people with Parkinson's—a neurological illness in which individuals experience tremors, difficulty moving and other issues.

"Slowed movements aren't just a symptom of Parkinson's but also appear in a lot of mental health disorders, such as depression and schizophrenia," Ahmed said. "We think these [eye movements](#) could be something that [medical professionals](#) track as a [diagnostic tool](#), a way to identify the progress of certain illnesses."

Eyes, in other words, could be windows to a lot more than just the soul.

**More information:** Colin C. Korbisch et al, Saccade vigor reflects the rise of decision variables during deliberation, *Current Biology* (2022).

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