

Trading decisions are observable in the eye movements of buyers and sellers

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In a new collaborative study, PIK Professor Michael Platt models how the decision-making process unfolds in the brains of buyers and sellers considering a deal. These decisions were observable in eye movements and pupil dilation.

Trading makes the world go 'round. From goods and services to stocks to

[intellectual property](#), the [modern economy](#) relies on buying and selling, but people are often reluctant to trade what they have for what they do not have, even when doing so is objectively irrational. This phenomenon is known as the "endowment effect," and it limits trade efficiency.

In a new study in the journal *Science Advances*, Penn Integrates Knowledge University Professor Michael Platt and collaborators at Zhejiang University have developed a framework to describe how buyers and [sellers](#) make decisions during trading.

"People often make irrational decisions, and we're interested in understanding why," says Platt, the senior author on the study.

The team also identified distinct physiological mechanisms that underlie this [decision-making process](#). Specifically, they found links between the likelihood that a deal would be struck and where (and how long) the buyers and sellers focused their gaze and the degree to which their pupils were dilated. A deal was more likely to be struck when both buyers and sellers attended to potential gains rather than losses and when the pupils of both buyer and seller dilated.

The underlying mechanisms behind the endowment effect are unclear, though it has been demonstrated in both real-world settings and lab studies that monitored behavior and brain activity. There are two main non-mutually exclusive theories for why the endowment effect exists. The first one is related to loss aversion—because people feel loss more keenly than gain, they are less likely to want to give up something that they already own.

"In trading situations, most people focus on what they might lose rather than what they might gain because our vigilance system has evolved to always be on the lookout for threats," Platt says.

The second theory posits that the endowment effect is caused by inertia; both sellers and buyers are reluctant to alter the status quo, so they require additional incentive—a discount, or a better premium—in order to overcome this hesitance and make a deal.

Platt's team wanted to tease apart the relative impact of risk aversion versus inertia in determining the endowment effect's impact on trading decisions. To do this, the researchers conducted a series of laboratory experiments to test participants' willingness to buy and sell lottery tickets, and then monitored the participants' gaze and pupil diameter using a video-based tracking system. They also kept track of how long the participants took to make their decisions. Then, they used this data to build a model to describe how buyers and sellers accumulate evidence.

As expected, the endowment effect was evident for both buyers and sellers. Buyers were slower to choose to buy than to choose not to buy, suggesting hesitancy to acquire lottery tickets at most prices, but sellers were slower to choose to sell than to choose not to sell.

Sellers spent more time looking at their goods—the lottery tickets—while buyers spent more time looking at the price they'd have to pay. However, sellers spent more time looking at their lottery tickets than buyers spent eyeing prices, suggesting that loss aversion plays a bigger role in the endowment effect for sellers than buyers.

"When you look at something, it amplifies the importance of that object or information in the brain," Platt says. "And because people tend to look more at information they value more, there's a [feedback loop](#); the more you look at something, the more you value it and vice versa."

The parties were most likely to agree to a deal when both attended to their potential gains, that is, when the seller focused on the price and the buyer focused on the lottery ticket. The researchers also noted that the

sellers' pupils tended to dilate when they agreed to sell, and buyers' pupils dilated when they agreed to buy such that synchronized pupil dilation could be used to forecast successful deals.

While gaze, as a function of attention, may be a factor in guiding trader's decisions, the researchers suspect that [pupil](#) dilation is an indicator of an underlying physiological mechanism rather than a causal factor. People's pupils dilate to adapt to low-light situations, but they also dilate during physiological arousal, when norepinephrine, also known as adrenaline, is released, as can happen during moments of increased mental effort.

"People have to accumulate more evidence before they will make a decision to change the status quo, and this takes more mental effort," Platt says. "All else being equal, your pupils open up when you're about to do something unexpected or surprising."

Though the researchers didn't manipulate the participants' gaze in this study, previous research has shown that trading decisions can be manipulated by making certain elements more visual and thereby attracting the buyer or seller's gaze.

"By making the price bigger, brighter, or more colorful, without actually changing its [monetary value](#), you can actually increase the likelihood that someone will accept a deal, just by making them spend more time looking at the price," Platt says.

These findings could guide interventions to improve the efficiency of free markets by mitigating the [endowment effect](#). They could also have implications for [consumer protection](#) since it's relatively easy for software to monitor where people are looking and for how long.

The study also teaches something interesting about the biological mechanisms behind how we make decisions. "The way our decision-

making process is yoked to attention is not uniquely human," Platt says. "It doesn't have anything to do with what we've learnt or our culture; it emerges from biology and the way our brains are wired."

More information: Feng Sheng et al, The art of the deal: Deciphering the endowment effect from traders' eyes, *Science Advances* (2023). [DOI: 10.1126/sciadv.adf2115](https://doi.org/10.1126/sciadv.adf2115)

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