

Behavioural implications of elevated levels of testosterone

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Ivey Business School professor Amos Nadler recently co-authored a study showing elevated levels of testosterone led to a heavier reliance on intuition over reflection when it came to decision-making. Credit: Paul Mayne//Western News

Levels of testosterone naturally rise in certain situations. A hard workout could be a culprit. Preparing for, or winning, a competition is well

known to elevate levels of the hormone. Sexual encounters provide a boost, as well.

This is not news. The behavioural implications of elevated levels of [testosterone](#), however, was something Amos Nadler wanted to test.

"For a long time, people have known, intuitively, that men behave differently at [higher levels](#) of testosterone. We wanted to test the activational effects of testosterone on men's ability to cognitively reflect – to see if you can think through a problem when you're at elevated levels of testosterone," said Nadler, an Ivey Business School professor who studies behavioural finance and neuroeconomics.

Nadler partnered with an international team of researchers, including Gideon Nave at The University of Pennsylvania and Colin Camerer at the California Institute of Technology, to determine whether higher levels of testosterone cause men to rely more strongly on intuition versus reflection when it comes to decision making. Recently published in *Psychological Science*, their study indicates men who received a dose of testosterone performed more poorly on a test designed to measure cognitive reflection when compared to a group given a placebo.

"We wanted a good sample size for this study – a lot of what's been done in (this field), and a lot of things we believe, is based on small samples," Nadler noted.

His study is among the largest of its kind ever conducted, he added, with 243 male participants in a double-blind experiment, roughly half receiving a dose of testosterone and half receiving a placebo before engaging in a cognitive reflection test that asked participants three questions, including:

A bat and a ball cost \$1.10 in total. The bat costs \$1 more than the ball.

How much does the ball cost?

The intuitive [answer](#), Nadler explained, is the ball costs 10 cents. But, if you stop to think, and do the math, you will figure out that incorrect answer means the bat costs only 90 cents more than the ball. (The correct answer is the ball costs 5 cents and the bat \$1.05.)

As a control task, to help researchers determine whether testosterone was affecting math skills or cognitive reflection, participants were also given math questions in which they had to add five two-digit numbers. They were not limited on time while taking the test and were offered \$1 for each correct answer and an additional \$2 if they answered all the questions correctly.

"What we found was there was about a 20 per cent drop in the (correct responses) provided in the testosterone group. There was also an increase in the time it took to get the right answer – it's not a huge result, but it took them longer to get the right answer and they gave the wrong answer faster," Nadler noted.

When it came to performance in the math control task, the results from the testosterone group were indistinguishable from the placebo group. This indicates the 20 per cent drop in correct responses on the cognitive reflection task was not because math skills were impaired by testosterone, but because participants who received it were giving answers quickly and choosing the intuitive, incorrect response, rather than reflecting on the question.

"You could say testosterone is generally associated with impulsivity. But we didn't measure impulsivity, per se. But if I increase your [testosterone levels](#), it seems to be indicating you will rely more on instinctive responses and you will reflect less on your behaviour," Nadler said.

This isn't necessarily a bad thing, he added. There are situations where acting intuitively and reacting fast can be beneficial – sports, fighting and even trading on the market could benefit from intuitive responses in place of overthinking.

"If you're an investor, you need to think things through. If you're a trader, you're making quick decisions. I'm not trying to paint testosterone as the bad guy – I'm saying it's about context," Nadler explained.

What he sees as the takeaway is being aware of context and knowing elevated levels of testosterone can inhibit reflection and lead to more instinctive behaviour.

"When we're at elevated states – and elevated testosterone is just one of the possible altered states – it changes how we act. Not getting enough sleep, or being extremely hungry or being extremely angry can affect your decision making," he said.

"What's important is we recognize when we're at altered states and take more caution in making consequential decisions. It's just being aware of this and what happens to your cognition when you're at higher levels of testosterone."

Provided by University of Western Ontario

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