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Does extra testosterone reduce your empathy?

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Cognitive empathy is the ability to recognise what another person is thinking or feeling, and one way it can be assessed in the lab is by using the "reading the mind in the eyes test" – or "eyes test", for short. This involves looking at photos of a person's eyes and picking which word best describes what the person in the photo is thinking or feeling.

Many studies, including our own, have shown a link between elevated testosterone and reduced cognitive empathy. But a new study led by Amos Nadler, a visiting professor of economics at the University of Toronto, found that administering testosterone to men does not reduce their empathy, as measured by this test.

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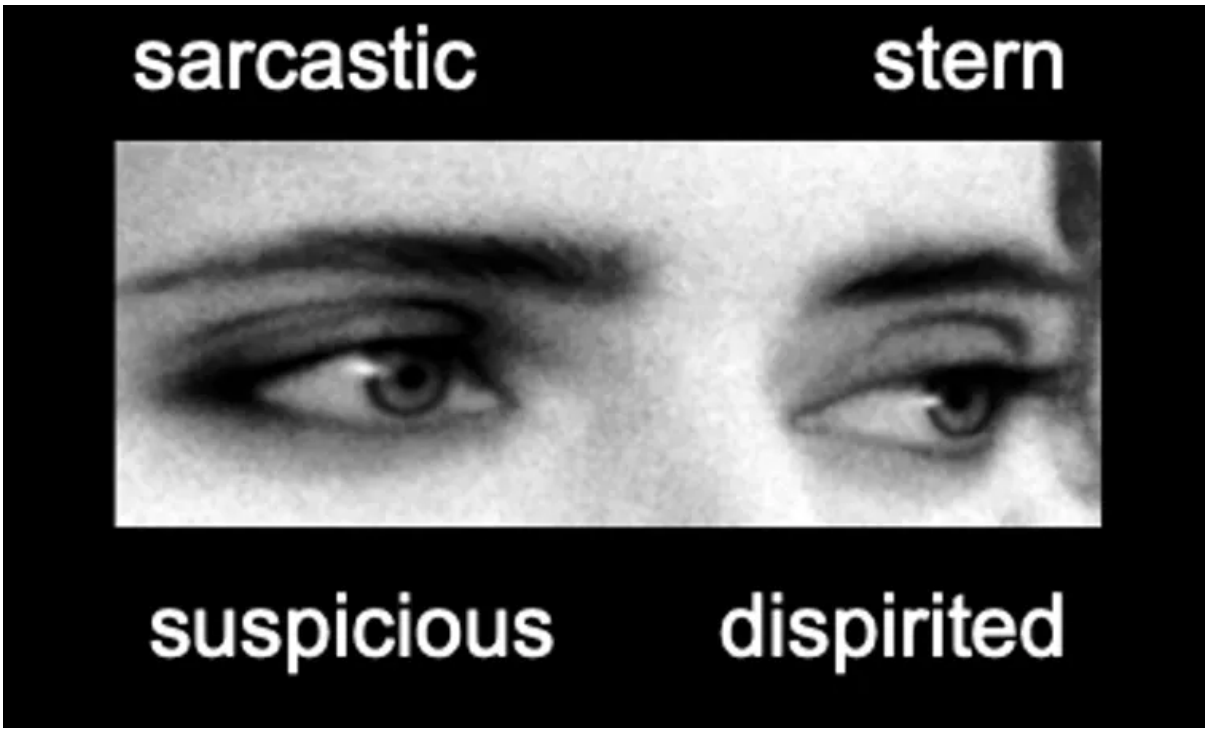

Reading the mind in the eyes test. Author provided

Nadler and colleagues also measured digit ratio. The ratio between the length of a person's index and ring finger is thought to be an indicator of how much testosterone they were exposed to in the womb (prenatal testosterone levels), and has also been tied to a lack of empathy. Nadler and colleagues' study found that digit ratios were not related to empathy scores.

From these findings, they draw two conclusions: first, that this disproves a previous study by Jack van Honk and colleagues in which administering testosterone to women reduced their empathy. And second, that prenatal testosterone levels do not affect later empathy.

Challenging the conclusions

We would challenge both these conclusions, on two grounds. First, Nadler's study only included men whereas van Honk's study only included women. So while we agree that administering extra testosterone to men does not appear to reduce their empathy, Nadler's study cannot be regarded as an attempt at replicating the van Honk study. A large-scale study of women would be needed for that.

And perhaps giving women extra testosterone does reduce their empathy (as van Honk found) while giving men extra testosterone does not. This could be because women on average score higher on the eyes test than men do, so there is more room for their scores to decrease. Also, on average, women

have lower circulating testosterone levels than men, so large changes in their testosterone levels may have bigger effects on empathy.

In Nadler's study, the testosterone levels of male participants were elevated two or threefold. In contrast, in the van Honk study, the testosterone levels of female participants were elevated at least tenfold. It is possible, then, that a higher dose of testosterone *would* have affected empathy in men.

Second, digit ratio may not be a good proxy of how much testosterone someone was exposed to in the womb, as other factors may affect this ratio. To properly study prenatal testosterone, it should be measured directly, using prenatal samples.

Of course, measuring prenatal hormone levels in the womb is very difficult, but it is essential because testosterone exerts many of its programming effects during a critical time window when the brain is developing.

That is why we measured prenatal testosterone levels in the amniotic fluid surrounding the developing foetus in women who opted to have an amniocentesis during pregnancy and then following up the child years later to see how they developed. We confirmed that the higher the level of prenatal testosterone, the lower their scores on the eyes test of empathy when tested at age six to eight years.

Extreme male brain

In their press release, Nadler and colleagues argue that their new data challenges the "extreme male brain" (EMB) theory of autism. But Nadler's study has little to do with the EMB theory.

The EMB theory makes no predictions about what will happen to a person's empathy if you give them more testosterone. The EMB theory simply states that, on tests of empathy, typical females will on average score higher than typical males, and autistic people will on average score lower than typical males.

The EMB theory also states that on tests of systemising – the drive to analyse or construct systems in terms of rules – typical males will on average score higher than typical females, and that autistic people will on average score higher than typical males.

The EMB theory was recently confirmed in the largest test of sex differences in empathy and systemising among 600,000 people, and in the largest study of autism, among 36,000 autistic people.

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And in other recent studies, we showed that several prenatal sex steroid hormones, such as testosterone and oestrogen, are elevated in the amniotic fluid of autistic boys, demonstrating the importance of prenatal sex steroid hormones in changing brain development.

So, while the Nadler study is impressive for its scale, we now need a direct replication study of testosterone effects on women's cognitive empathy. Finally, it is important to separately study the effects of testosterone on the prenatal brain, compared to the effects of the same hormone on the adult brain.

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