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What Testosterone Has in Common with Schrodinger's Cat

By: John Medina | Posted: January 25, 2012



People are often startled by the extent to which environment plays a part in mediating the biological processes behind their behaviors.

There is a terrific illustration of the environment's power in a recent experiment involving the injection of testosterone into human volunteers.

Some of the volunteers were warned in advance that they were being injected with the hormone. Others weren't told what they were getting at all. Their perceptions of what they were getting changed their biological reactions to the hormone.

This obviously involves some explanation.

Testosterone has a reputation for meddling with two behaviors — one not so famous, one very well known.

The not-so-famous behavior involves sexual arousal. Testosterone helps to mediate the lusty muse in both men *and* women. So powerful are its effects on males you can supposedly judge how many sexual thoughts a man has per day by measuring how quickly his beard grows. This is because sexual thoughts produce a storm surge of testosterone, which in turn accelerates facial hair growth.

Testosterone has a more famous social reputation not for sex, but for some of the more unpleasant angels of our nature: aggression, irritability, belligerence, and violence. The media will sometimes say "This fiery race car driver is fueled by testosterone," or "NFL players bash into each other on the testosterone-soaked gridiron."

Given testosterone's minor reputation for sex and major reputation for anger, you might predict that injecting bucketloads of the stuff into people would make them hyper-sexual or hyper-aggressive or both. Since hyper-aggression is a bit easier to measure, researchers asked "Is that what you find?"

The answer is "No, you don't find that at all."

Surprised? The answer isn't just surprising. It's *weird*.

Whether or not testosterone makes subjects angry *depends upon whether or not the subjects knew in advance they were getting testosterone*. If they were told "Here is your testosterone injection," the subjects experienced the stereotypical big spike in aggressive behavior — which was easily measured by the researchers. But if they were not told they were getting testosterone in the shot, a completely different result was observed. The steroid actually calmed them down! There was no spike in aggressive behavior as experienced by the subjects or as measured by the researchers.

This result makes no sense. How can testosterone have variable effects — seemingly dependent upon whether or not you knew what you were getting? Can you toggle its aggressive properties on and off with some weird mental light switch? These data color outside the lines of common thought — because the answer, disturbingly, is the latter. Like the famed Schrodinger's cat in a light box (you non-physics majors can look it up [here](#)), what result you obtain depends upon the prior knowledge of the observer.

Uncomfortable as that sounds, this seemingly strange and arbitrary result is not all that strange or arbitrary to behavioral researchers, which is why I bring it up.

This experiment is a classic example of the power of environment over even seemingly environmental-proof behaviors. It is part of this general mantra, liberally co-opted from vision researchers: "You don't perceive what is out there. You perceive what you expect is out there." You expect testosterone to make you feel aggressive, and in a self-fulfilling prophecy, that's what you find. You don't expect some clear liquid to do anything, so you react in a different (perhaps more authentic?) fashion.

Hard to believe, perhaps, but our perceptions regularly have to deal with a brain weighed down with the ballast of its own expectations. That is the whopping power of the environment, with a capital "E" — another interesting side excursion for the ship that navigates the seas between nature and nurture.

Comments

ONE COMMENT TO "WHAT TESTOSTERONE HAS IN COMMON WITH SCHRODINGER'S CAT"



Joe says:

February 7, 2012 at 9:25 pm

I'm really enjoying your new blog, Prof Medina. Keep the posts coming!