For the birds

What regulates the lengths of human fingers?

I'll show you mine if you show me yours

FROM financial traders' propensity to make risky decisions to badly behaved schoolboys' claims to be suffering from attention deficit hyperactivity disorder, testosterone makes a perfect scapegoat. In both of these cases, and others, many researchers reckon that the underlying cause is exposure to too much of that male hormone in the womb. Positive effects are claimed, too. Top-flight female football players and successful male musicians may also have fetal testosterone exposure to thank for their lot in life.

Yet the evidence that it is exposure in utero to testosterone that causes all these things relies on a shaky chain of causation. What these people actually share is a tendency for their ring fingers to be longer than their index fingers. This peculiarity of anatomy is often ascribed to fetal testosterone exposure because it is common in men and much rarer in women, and because there seems to be a correlation between the point in gestation when it appears and surges of testosterone in the womb. But the link has never been proved decisively. It has, rather, just become accepted wisdom.

Research carried out on birds now suggests that the accepted wisdom could be wrong. In their study of the feet of zebra finches published this week in the Proceedings of the Royal Society, Wolfgang Forstmeier and his colleagues at the Max Planck Institute for Ornithology in Seewiesen, Germany, conclude that oestrogen—the hormone of femininity—rather than testosterone, may be to blame.

Although it is well over 300m years since people and finches had a common ancestor, the basic vertebrate body plan is the same in both. So, a few years ago Dr Forstmeier, an expert on finch behaviour, wondered if the link between digit ratio and behaviour might show up in his animals, too.

It did. The ratio between a zebra finch's second and fourth digits (which are not fingers but toes in birds) is associated with more courtship songs by males and fewer flirtatious hops by females—in other words with more masculine behaviour, regardless of the sex of the individual.

Dr Forstmeier probed the matter further. He has been investigating the birds' oestrogen and androgen receptors—molecules that respond to female and male hormones, respectively.

Zebra crossing

The receptors in question orchestrate both behavioural and physical development, including some types of bone growth, in many vertebrate species. Different versions of a receptor (encoded by genes that have slightly different DNA sequences) can be more or less sensitive to the appropriate hormone. That led Dr Forstmeier to ask whether the type of hormone receptor a bird has influences its digit ratio, its sexual behaviour or both.

To find out, he looked for correlations between genes, ratios and behaviour in more than 1,100 zebra finches. Surprisingly, in view of the working assumption about humans, the type of testosterone receptor that a bird had proved to be irrelevant. Its oestrogen-receptor variant, however, had a significant impact on both digit ratio and courtship behaviour. This suggests that the sorts of predispositions that in people are blamed on fetal testosterone are caused in birds by fetal oestrogen (or, rather, the response to it).

That does not, of course, mean the same thing is true in people: 300m years is quite a long time for differences to emerge. It is also true that the digit-ratio that predicts male-like behaviour in birds is the opposite of the one found in humans (ie, the second digit, rather than the fourth, is the longer of the two). But it does suggest that it would be worth double-checking. Though science likes to think of itself as rational, it is just as prone to fads and assumptions as any other human activity. That, plus the fact that most scientists are men, may have led to some lazy thinking about which hormone is more likely to control gender-related behaviour. Just possibly, the trader's finger should be pointing at oestrogen, not testosterone.

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