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Out with pink and blue: Don't foster the gender divide

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IN 2010 we need to ask afresh just how deep the rabbit hole goes when it comes to gender politics - and how far we are from digging ourselves out. Our beliefs about differences between the sexes have an impact on society vastly out of proportion to the magnitude of those differences, from female scientists defending their mathematical and technical expertise to boys accused of lacking the communication and emotional skills to succeed at school.

In truth, women are doing well in science: since 1970, the number of doctorates awarded to women in the US has increased five-fold in physics, nine-fold in computer science and 24-fold in engineering, according to the US Department of [Education](#). And yet just last month we heard [John Tierney](#) of [The New York Times](#) appearing to echo former Harvard University president Larry Summers's claim that women may be intrinsically incapable of performing at the highest level in such fields.

At the same time, boys are stepping away from pursuits like creative writing, foreign languages, art and singing in choirs as they hear they are not "hard-wired" for words or feelings. While young women get the message they can do anything, young men are put off careers in journalism, design, teaching, veterinary practice and psychotherapy, where they were once quite successful.

When I set out to write my book *Pink Brain, Blue Brain*, I had little sense of the controversy surrounding gender differences. I was just a neuroscientist with a daughter and two sons, curious about how their brains might differ and how best to raise them. Now I see how little the science of gender differences has penetrated popular culture and am hoping to set the record straight on behalf of both sexes.

Yes, boys and girls, men and women, are different. But most of those differences are far smaller than the *Men are from Mars, Women are from Venus* stereotypes suggest. Nor are the reasoning, speaking, computing, empathising, navigating and other cognitive differences fixed in the genetic architecture of our brains. All such skills are learned, and neuro-plasticity - the modification of neurons and their connections in response to experience - trumps hard-wiring every time. If men and women tend towards different strengths and interests, it is due to a complex developmental dance between nature and nurture that leaves ample room to promote non-traditional skills in both sexes.

The obvious place to start looking for behavioural differences between the sexes is infancy. Yet even here they are often in the eye of the beholder. In a classic experiment, researchers cross-dress babies to fool people that they are interacting with a child of the opposite sex. Volunteers tend to comment more on the physical strength and negative emotions of babies they believe to be boys, and on the beauty and positive emotions of babies they believe to be girls.

In reality, baby boys and girls begin to smile, crawl and walk at the same time. Their vision and hearing are more or less the same, and they make equal eye contact with adults, at least when they are newborns. This changes when they hit 4 months, however: girls lock eyes with adults significantly more than boys. Also, by 4 or 5 months, boys outperform girls at the ability to rotate objects mentally - a spatial ability that differs dramatically between men and women but which only recently was found to differ in infancy.

Between 9 and 12 months, boys and girls start diverging in their preference for toys. While younger boys and girls prefer dolls over other playthings (they have faces, which all babies are drawn to from birth), older boys prefer trucks and balls over dolls and pink beauty sets - one of the largest sex differences that has been identified. Wheeled toys, in particular, are highly attractive to boys, probably because of their higher activity level.

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And yes, boys really are more active than girls, a difference that grows as they get older. By around 8 or 9, the average boy is more active than about two-thirds of girls, meaning that a third of girls are more active than the average boy. Such early differences appear innate, though evidence linking them to the prime suspect - the surge of testosterone in boys before birth - remains shaky. Whatever the initial cause, most behavioural differences between the sexes are amplified with age, as children's initial biases hit our gendered culture and they learn what it means to be a boy or girl. Toy preferences, say, grow more disparate: a male toddler shows only a slight preference for trucks, but by 5 years of age he won't be caught dead near anything pink.

Generally, boys avoid girls' toys, clothes and activities much more than girls avoid boys' things, mostly because of social taboos, but also because parents have seen the benefit of girls playing sports, building things and taking part in traditionally male pastimes. So while prenatal testosterone exposure may fuel boys' initial preference for more active toys, social influences considerably magnify this difference throughout childhood, a period when levels of oestrogen and testosterone do not actually differ between boys and girls.

In spite of their passion for guns or Barbie dolls, boys and girls differ much less in their cognitive and emotional skills than toy preferences suggest. Girls talk earlier, but the difference is small - about a month, on average - and sex has been found to account for a mere 3 per cent of the variation in young children's verbal development.

Girls read and write better than boys, a difference that grows more marked as they go through school. In fact, this gap is larger and more universal than the gap in mathematics, which girls have largely closed in recent years. Yet there is no evidence that boys' brains are any less prepared to learn how to read than girls' brains. Rather, it seems the small advantage girls have from talking earlier encourages more conversation and wordplay with parents and peers, more time with books and earlier development of the skills crucial for reading.

Once they have learned to read and write, girls simply use these skills for pleasure more than boys. Since fMRI studies have found little difference in the way male and female brains process the written word, it is likely that this amount of experience rather than any hard-wiring accounts for the literacy gap. Similarly, boys' spatial abilities grow as they spend more time building, playing fast-paced video games and actively exploring the world around them. Such skills are important in geometry, calculus and physics, where boys tend to pull ahead of girls towards the end of secondary education.

So should we abandon our search for the "real" differences between the sexes? Yes. There is almost nothing we do with our brains that is hard-wired: every skill, attribute, and personality trait is moulded by experience. At no time are children's brains more malleable than in early life - the time when parents are so eager to learn the baby's sex, project it to others and unconsciously express stereotyped impressions of their child.

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Increasingly, biologists appreciate the role of epigenetics in shaping body, brain, mental traits and propensity to disease. Why should sex differences be any different? We know that baby rats that are licked and groomed more by their mothers show a host of neurochemical changes, beginning with DNA modification, that permanently alter their stress response and memory. No one has yet investigated what this means for behavioural sex differences, even though mothers of most species interact differently with male and female offspring.

Gender roles will continue to evolve as our brains adapt to the new opportunities and expectations each generation faces. A fuller understanding of the real magnitude and multiple causes of gender differences can help us avoid stereotyping and better cultivate the unique talents of every child.

Considering our fast-changing world, with its need for nimble, sophisticated thinking skills, surely our children deserve no less.

Profile

Lise Eliot is associate professor of neuroscience at the Chicago Medical School, part of Rosalind Franklin University. This essay draws on her book *Pink Brain, Blue Brain: How small differences grow into troublesome gaps - and what we can do about it* (OneWorld, 2009)

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