

Gender Equality, Sex Differences¹

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When a friend or relative has a healthy new baby, what is the first question that you ask? If you're like many people, the first question is “Is it a little boy or a little girl?” Why is question so important? One reason may be that even in societies with a strong commitment to gender equality, a baby's sex strongly influences our assumptions about its likely behavior, interests, occupation, and family role. These assumptions are shaped both by our beliefs about the *innate characteristics of men and women* and by our opinions about what a *just society* should be like.

This morning, I will explore these assumptions, starting with the question whether men and women differ in cognitive ability. I will argue that there are real average cognitive differences, but that they're small compared to the variation within each sex and the overlap between sexes. Second, I'll argue that gender equality is a human rights commitment, not a theory of biology, so we don't need to worry that the science of sex differences will undermine gender equality. Finally, I will present some recent evidence that many differences in behavior between the sexes come from differences in the rewards and incentives for the two sexes. Equalizing these rewards and incentives is an important step in promoting gender equality.

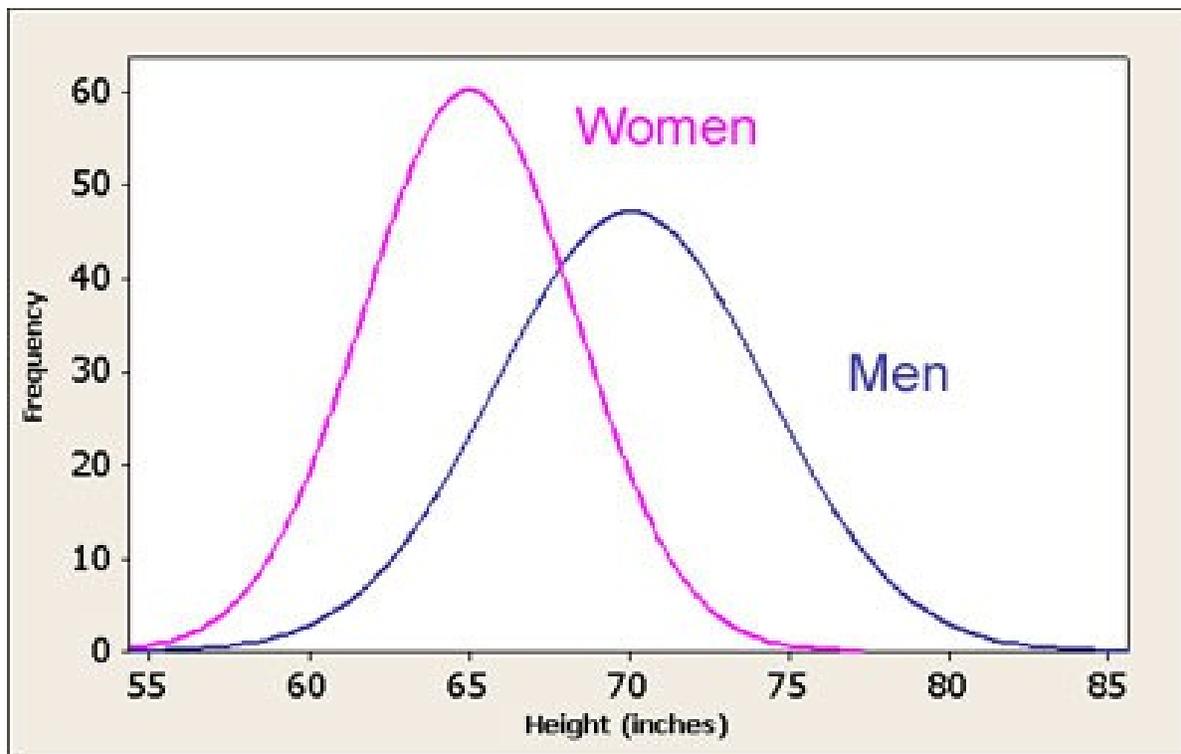
Let's start our discussion of cognitive differences between the sexes with a little quiz: “Which sex has the highest IQ?” We all know the answer to that question, right? It's whichever sex *we* are; that other sex just doesn't get it! Actually, men and women have the same average IQ. Isn't that an awfully big coincidence? Wouldn't you expect to see at least a *little* bit of difference just by chance? It turns out that the reason that there is no difference at all is that designers of IQ tests throw out questions on which one sex does better than the other on the theory that IQ is supposed to represent “general intelligence” common to many tasks and people. A problem easier for one sex than the other wouldn't be measuring general intelligence, but instead would be measuring the difference between the sexes.

Well, suppose that we took all the problems thrown out of IQ tests because one sex or the other does better. What kind of problems would each sex turn out to be best at?

Before we can answer this question, we need to get clear on what it means to say that one *group* is better at something than another *group*. Even if we know what it means for one *person* to be better than another, there are many possible meanings to the statement that one *group* does better than another. One meaning is that every member of group A scores higher than any member of group B. That's not the kind of difference we are talking about this morning. Another meaning is that the mean or average score of members of group A is higher than the mean or average of members of group B and the two groups overlap only a little.

For example, Figure 1 shows that the mean height of men and women is different, and while there is a wide variation in height within each sex and a wide range of overlap, the two distributions are different enough that there is a significant likelihood that a random male is taller than a random female.

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A third possibility is that the means are different but there is big overlap. Figure 2 shows the situation in which the means of the two groups are different, but the variation within each group is so large that the distributions mostly overlap. In this case, knowing what group an individual is in tells you almost nothing about that individual's score. Figure 2 also illustrates a common pitfall in comparing groups. Figure 2 shows that men have higher mean SAT scores than women, but in fact many more women than men take the SAT. As a result, the graph is actually comparing a more selective group of men to a less selective group of women. When exactly the same proportion of men and women are compared, as in states in which all students are required to take the ACT, the difference in overall college aptitude disappears.

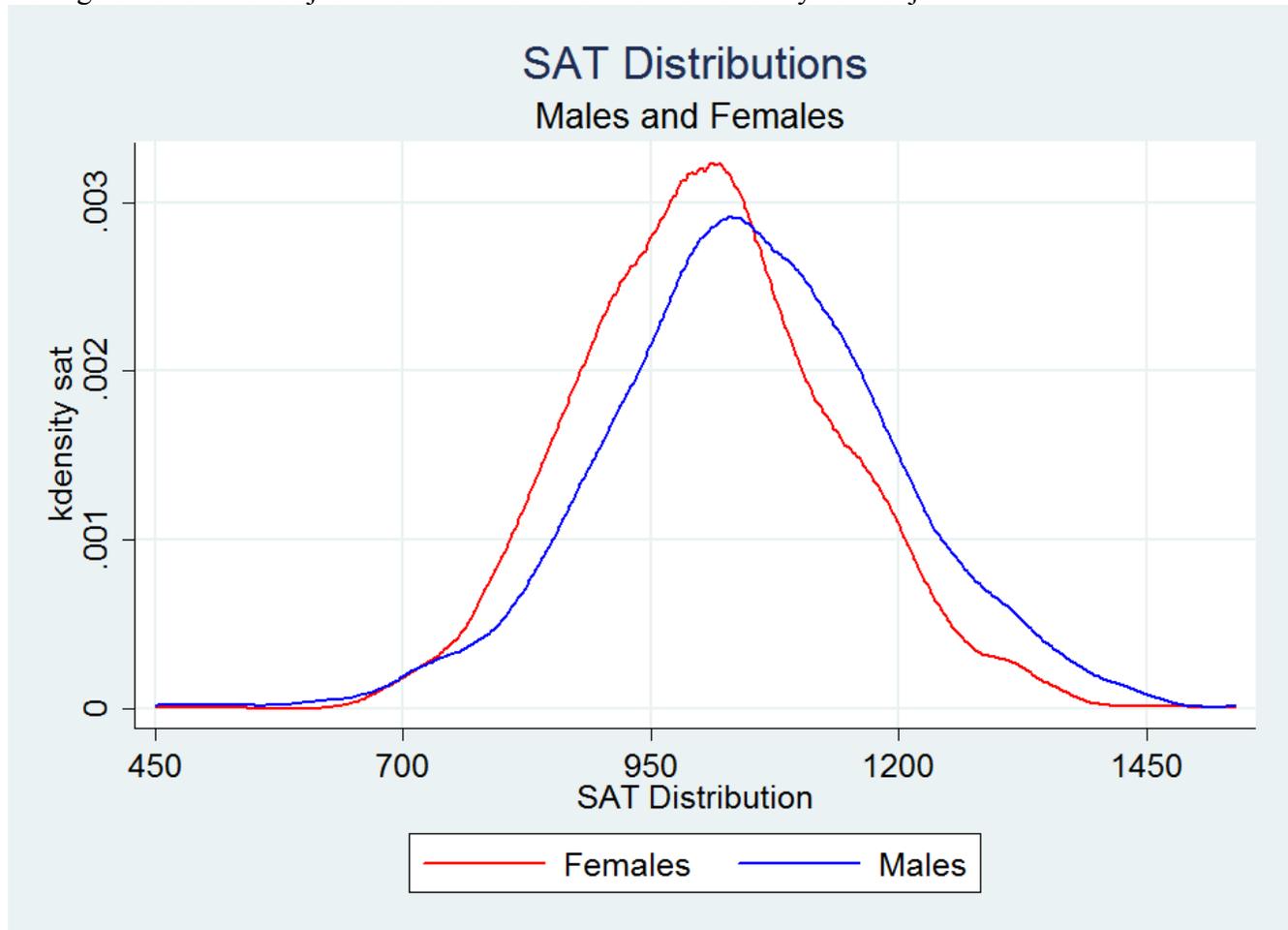
The reason for going into detail about comparing two groups is that the cognitive sex differences that I will describe are generally more like Figure 2, with a small difference in means and a big overlap, rather than like Figure 1, in which there is a large non-overlapping portion. While these differences are meaningful and interesting, it is very important to understand that they tell you almost nothing about any given individual. Instead, each individual must be evaluated on his or her merits.

Turning to the differences themselves, there is an entire textbook on sex differences in cognitive ability, now in its 4th edition, by Diane Halperin. It takes a full semester to cover the basics of this topic, so the most I can do in this short talk is give you an oversimplified elevator-ride summary that glosses over many subtleties. Still, here it is: men are, on average, superior at *spatial and visual reasoning*, and women are, on average, superior at *verbal reasoning and fluency*.

A typical visuospatial task at which men perform, on average, better than women is mentally rotating a 3-dimensional object to see whether it matches another 3-dimensional object or whether it fits into a 3-dimensional indentation. Another is identifying a partially occluded shape, like distinguishing whether a shape barely visible behind a bush is a lion or a gazelle.

Women, on average, are better at writing, reading comprehension, and verbal fluency. Women are also faster at recognizing facial expressions and better at remembering faces and specific events. Researchers have identified dozens of other smaller and odder differences, for example, that men tend to overestimate time intervals but women underestimate time intervals, but visuospatial and verbal abilities are the two biggest cognitive differences.

These differences don't seem to be cultural, but occur across multiple nationalities and appear in small children at the earliest age that these cognitive abilities can be measured. For example, 21-month old female toddlers have, on average, a roughly 20% larger vocabulary than male toddlers the same age² and experiments have shown that at 5 months infant boys seem better able than infant girls to distinguish a familiar object in a new orientation from an entirely new object.³



Of course, there are differences between men's and women's *behavior* beyond these cognitive factors. As Harvard psychologist Steven Pinker puts it:

Men have a much stronger taste for no-strings sex with multiple or anonymous partners, as we see in the almost all-male consumer base for prostitution and visual pornography. Men are far more likely to complete violently ... with one another over stakes great and small ... and [have]

- 2 Andersson, I., Gauding, J., Graca, A., Holm, K., Öhlin, L., Marklund, U. & Ericsson, A. (2011). Productive vocabulary size development in children aged 18-24 months - gender differences. In: Proceedings from Fonetik 2011: Speech, Music and Hearing; Quarterly Progress and Status Report. Paper presented at Fonetik 2011 (pp. 109-112). Stockholm.
- 3 Diane F. Halpern, Sex differences in cognitive abilities, Fourth Edition, Taylor & Francis 2012 at p. 141.

a greater willingness to risk life and limb for status, attention, and other dubious rewards. The Darwin Awards ... almost always go to men.⁴

But in this talk, I want to stick to cognitive differences.

Why do these cognitive differences exist? One way to try to answer this question is to imagine how humans evolved. Perhaps back when our ancestors were evolving men spent their days hunting, and their survival depended on distinguishing a tasty eohippus cowering behind a bush from a saber-toothed cat about to spring and on visualizing the trajectory a spear would have to take to connect to prey. Meanwhile, while back at the cave, the women busied themselves with sorting out relationships, civilizing children, and elaborating tribal myths. Could be, but it's all pure speculation.

Another way to answer the question of why these differences exist is to ask what is it about the development of male and female babies that leads to cognitive differences. Answering this question doesn't require speculation. The over-simplified, elevator-ride explanation is that exposure to male sex hormones—known as androgens—in the womb changes the development of the fetal brain in characteristic ways. Evidence for this theory comes from prenatal conditions, such as adrenal disorders, that cause male or female fetuses to be exposed to hormone levels characteristic of the other sex. The visuospatial and verbal abilities of these individuals is more like the other sex than like their own sex. Researchers have found that the levels of male and female sex hormones in amniotic fluid in the fourth month of prenatal life predicts sex-typical toy preferences (i.e., dolls versus toy trucks) for the infants at 13 months of age.⁵

In addition to affecting the *development* of the fetal brain, androgens have a *short term* effect in mature adults. When individuals undergo hormone therapy as part of a sex change or treatment for various medical conditions, increasing androgen levels improves visuospatial ability and lowers verbal ability while decreasing androgens has the opposite effect. Androgen levels have a similar effect on other species as well, with higher androgen levels improving spatial reasoning and increasing exploratory behavior in rats. In one remarkable experiment that raises a host of ethical issues, a double-blind procedure was used to randomly assign adult women to receive either a single dose of testosterone or a placebo. Those receiving the testosterone had a temporary but measurably improvement at a mental rotation task.⁶ One final observation is that gay men and lesbian women seem to fall between heterosexual men and women in the balance between visuospatial and verbal ability.

To summarize the first part of this talk, current research shows that men and women have characteristic differences in average cognitive ability, these differences seem to be present at birth, and fetal androgen exposure and androgen levels after puberty both contribute to these differences. It can't be stressed too much, however, that statistical differences between groups are meaningful only in relation to the groups themselves, such as in designing education systems that benefit boy and girls equally promoting equitable work environments, or designing non-discriminatory health policies. Statistical differences in cognitive ability between the sexes are just not meaningful when applied to individuals. Using statistical differences between two groups to ascribe traits to an individual isn't science or statistics, it's just *stereotyping*. Each person deserves to be evaluated on the basis of his or her individual traits, not his or her membership in any category or group.

Let's turn to part 2 of this talk with the question whether gender equality in our society is threatened by research showing a biological basis for cognitive differences between the sexes. To answer that question, I think that it's helpful to consider the source of the concept of gender equality. In the year

4 Pinker, S. (2002). *The Blank Slate*. New York: Viking.

5 Halpern, *ibid*, p.182.

6 Apparently, the researchers neglected to test whether these women became less likely to ask for directions.

1700, for example, there was no concept of gender equality; in fact, there was no concept of human rights at all. But by the time of the U.S. Declaration of Independence, 76 years later, Thomas Jefferson could count on educated readers throughout the Western World to accept, or at least understand, the idea that every human being has inherent rights that come, not from aristocratic ancestry or from kings or queens, but from the fact of being human.

The story of how the concept of human rights came into being during the 18th century is told in the fascinating book “Inventing Human Rights” by UCLA historian Lynn Hunt. One key step was the emergence during the American and French revolutions of the idea that the rights of citizens depend only on *citizenship*, and not at all on other attributes like religion. For example, in 1789 the French National Assembly enacted a “Declaration of the Rights of Man and Citizen” which stated that “all men are born and remain free and equal in rights.” In working through the implications of the Declaration, the Assembly recognized that its language left no grounds for restricting the civil rights of non-Catholics, such as Protestants and Jews. The next step down the human-rights slippery slope was granting equal rights to all professions, including those, like executioners and actors, that had formerly been denied political rights. Next, slavery was abolished and equal rights extended to former slaves.

At first, women's rights were ignored, but in 1791 French philosopher Marquis de Condorcet wrote that:

The rights of men follow only from the fact that they are feeling beings, capable of acquiring moral ideas and of reasoning about these ideas. ... Since women have the same qualities, they necessarily have equal rights. Either no individual in mankind has true rights, or all have the same ones; and whoever votes against the right of another, whatever be his religion, his color, or his sex, has from that moment abjured his own rights.⁷

When the Assembly balked at granting full rights to women, playwright Olympe de Gouges published a “Declaration of the Rights of *Woman* and the *Female Citizen*” that extended the earlier “Declaration of the Rights of Man and Citizen” by providing unqualified, equal political rights for women. Tragically, de Gouge efforts to promote women's full rights were cut short when she found herself in the wrong faction during the Reign of Terror and was sent to the guillotine, but Condorcet and de Gouge had made the argument that eventually would prevail.

In American, all 13 colonies denied the right to vote to women, African-Americans, Native Americans, and anyone without property, but after independence some states enacted more liberal provisions. New Jersey briefly extended the right to vote to women who owned property, but Wyoming was the first state to grant the right to vote to all women in 1869.

As we all know very well, the struggle to extend full legal rights to all female citizens of the US and other western countries continued well into the 20th century in the Western World and continues elsewhere even today. But the rationale for women's rights is based in the human-rights principles articulated by Condorcet and de Gouge in the 18th century. Women's rights are simply one facet of our broader commitment to the inherent dignity and worth of every person as expressed in the UN's Universal Declaration of Human Rights and in our own UU principles.

Gender equality is a human-rights commitment and doesn't depend on men and women having exactly the same psychology or on whether any differences are biological or cultural. Sex differences and gender equality are simply separate issues. This may seem obvious, but there was a period a few years

⁷ M. Condorcet, On the Admission of Women to the Rights of Citizenship, 1790, quoted in Lynn Hunt, *Inventing Human Rights*, W.W. Norton 2007.

back when researchers who suggested that men and women might be born with psychological differences were attacked on the grounds that such differences would justify gender-based discrimination. In the 1980's, Harvard biologist E. O. Wilson was physically attacked by protesters objecting to his view that sex differences were the product of natural selection, rather than nurture. Regardless of whether Wilson's view is correct, I hope you will agree with me that gender equality is too important a principle to be shackled to any particular biological theory. Every person deserves to be judged on his or her own merits, not on the basis of their membership in any particular group or category. This principle doesn't depend on the current state of psychological research.

To recap, so far I have argued that men and women differ on average in cognitive ability but that these differences are irrelevant to the justifications for our commitment to gender equality. I'd like to conclude by sharing some research that suggests that the biggest source of sex differences in behavior is often not the relatively subtle cognitive differences that I described earlier, but is instead the many ways that society rewards different behavior in men and women.

Let me start by describing a paper I read a few years ago in my own field, Computational Linguistics, which is the discipline of designing computer systems to understand and generate language and text. The researchers analyzed transcripts of conversations between pairs of individuals. The object was to see if an algorithm could learn to distinguish male from female speakers based just on word selection. The answer was ... yes and no. The algorithm easily learned to distinguish men talking to men from women talking to women. But when men and women talk to each other, their word choice was indistinguishable. Evidently, women and men can be from Venus and Mars when talking to other members of the same sex, but from Planet Earth when talking to the other sex. Other experiments have shown that men and women can easily speak in a manner stereotypical of the other sex when they need to: men can be supportive and facilitative and women instrumental and pragmatic.

Perhaps you are thinking, sure, members of each sex can *talk* like the other when there is a reason to, but more basic types of behavior are just built in and don't depend on situations or incentives. For example, what about a woman's preference for manly men versus the sensitive guys? Surely that doesn't depend on circumstances. And yet, a 2011 study involving more than 90 large and mid-sized US cities showed that women who perceive themselves to be living in high-crime neighborhoods were significantly more likely to prefer aggressive, formidable men than those who perceive themselves to be in low-crime areas.⁸ Evidently, the kind of man a woman prefers to marry depends at least in part on the situation she is in, not just hardwired preferences.

A third area where gender-stereotypical behavior seems to depend on incentives appears when we look at gender pay disparity. In 2010, the median income of full-time year-round workers was \$42,800 for men, compared to \$34,700 for women.⁹ This disparity seems to have several causes. One is gender bias. Explicit bias is less prevalent than it once was, but it isn't entirely gone, and numerous experiments have shown that both male and female reviewers treat job applications, grant proposals, and paper submissions slightly differently depending on whether the author has a female or a male name—Joan Smith versus John Smith—even if everything else is identical.¹⁰ Even people who staunchly believe in gender equality can still have an unconscious bias.

8 Jeffrey K. Snyder, Daniel M.T. Fessler, Leonid Tiokhin, David A. Frederick, Sok Woo Lee, Carlos David Navarrete, Trade-offs in a dangerous world: women's fear of crime predicts preferences for aggressive and formidable mates, *Evolution and Human Behavior* 1 March 2011 (volume 32 issue 2 Pages 127-137).

9 http://en.wikipedia.org/wiki/Male%E2%80%93female_income_disparity_in_the_United_States

10 For example, see Corinne A. Moss-Racusin, John F. Dovidio, Victoria L. Brescoll, Mark J. Graham, and Jo Handelsman, Science faculty's subtle gender biases favor male students *PNAS*, October 9, 2012 vol. 109 no. 41 16474-16479

A second factor is the fact that some jobs disproportionately reward willingness to work exceptionally long hours. On average, women are less willing than men to sacrifice time with their families for the sake of their jobs. As a result, occupations that reward extra-long hours most—like surgeons, attorneys in private practice, financial specialists, and other fields where workers are viewed as unique and non-substitutable—have the widest gender-pay gap. In contrast, in fields in which employees can more easily substitute for one another, like pharmacy and human resources, there is little or no penalty for structuring work time to fit family needs, and the pay gap is least.¹¹ Claudia Golden, the Harvard economist who published this research earlier this year, suggested that the labor market needs to be restructured to reduce this bias, although she doesn't suggest how to accomplish this. In any case, this just raises the question: *why* are more men than women willing to sacrifice family time for work time? Is it biologically hardwired or situational?

To try to answer this question, let me tell you about an ingenious experiment published in 2006 involving data obtained on 23,000 users of an online dating service in Boston and San Diego. By tracking the success of online daters, the researchers were able to determine the relative importance of various measures of attractiveness to other daters, such as height, weight, hair color, body-mass index, income, and general *hotness*. They found that an ordinary-looking man would have to make \$143,000/year more than a man whose picture was ranked in the top 10th to be equally successful. A man whose attractiveness was in the bottom tenth would have to make \$186,000/year than the handsome man to be equally successful.¹² And how much more would a not-so-attractive woman have to make than an attractive woman to be equally successful in the dating market? The answer is that in this dating site no amount of money was sufficient. Men's judgments of women seemed not to be influenced by women's income.¹³ So we now have an explanation of why men are often more will to place work and income before family and relationships. In the words of Steven Pinker:

On average, men's self-esteem is more highly tied to their status, salary, and wealth, and so is their attractiveness as a sexual partner and marriage partner, as revealed in studies of what people look for in the opposite sex.¹⁴

[As an aside, this study seems to be limited to heterosexual daters. It would be fascinating to see how gender differences are reflected in gay or lesbian online dating services, but I haven't heard of this being done yet.]

Of course, this leads to the still another question, *why* is income more significant to male than to female status and attractiveness? I don't think that there is a clear answer to this question, but it has been suggested that it comes from social assumptions based on the family structure in 19th and 20th century western economies, in which higher male earners were typical. What seems clearer is that the assumption that husbands *should* earn more is in that it results in a labor market that in fact rewards men with higher incomes.

Given that female college graduation rates have exceeded male graduation rates for several decades, and given that income growth is increasingly in fields that require higher education, the assumption that male partners will out-earn female partners is becoming increasingly anachronistic. The young men and

11 Claudia Goldin, A Grand Gender Convergence: Its Last Chapter, *American Economic Review* 2014, 104(4): 1091–1119; <http://www.nytimes.com/2014/04/24/upshot/the-pay-gap-is-because-of-gender-not-jobs.html>

12 Hitsch, Guenter J. and Hortacsu, Ali and Ariely, Dan, What Makes You Click? Mate Preferences and Matching Outcomes in Online Dating (February 2006). MIT Sloan Research Paper No. 4603-06. Paraphrased in <http://tierneylab.blogs.nytimes.com/2007/04/09/how-dont-i-love-thee/>

13 When I read about this study, I was reminded of the old saying that a woman is better off being pretty than smart because men can see better than they can think.

14 Pinker, *ibid* pg. 356.

women of the future will have no choice but to become more flexible about their relative incomes. And when the assumption that men should make more money evaporates, a major factor in gender-pay disparity may evaporate as well.

In this talk we have just dipped our toe into the ocean of research on gender differences and similarities. However, I have tried to convince you of three things:

1. First, there are differences on average in the cognitive ability of men and women—or more broadly between people with high and low levels of prenatal androgen exposure—but that these differences are not large compared either to the very wide variation within each sex or to the overlap between the variations of each sex. Knowing these average differences can help us build institutions that better serve both sexes, but mistaking group differences for individual differences is nothing more than stereotyping.
2. Second, our commitment to gender-equality is just one facet of the larger human-rights revolution that produced our form of government and our broader commitment to the inherent dignity and worth of every person. This commitment is not endangered by research on gender differences. “Equal” doesn't mean “identical,” and the individual differences that make each of us unique are no threat to our inherent human rights.
3. Finally, many of the differences in behavior and condition of men and women comes not from inherent biological differences, but from the fact that in our culture and society men and women often have different incentives. Men and women talk alike or talk differently depending on the situations that they find themselves in. Our preferences for marriage partners is shaped by the particular life situation we find ourselves in. The difference in the willingness of men and women to work grueling hours to achieve professional and financial success at the expense of family comes at least in part from self-fulfilling cultural norms that judge men, far more than women, by income.

Men and women are different, but our differences are dwarfed by our similarities and by the tremendous adaptability that enables each of us act in stereotypically feminine, masculine, or gender-neutral fashion as needed.

May we see clearly through the shallow differences that divide us to the deep, essential humanity that unites us, may we never let the din of the crowd obscure the beauty of each individual voice, and may we never confuse group statistics for the unique and precious gifts that makes each individual priceless.