

Cumulative disadvantage

Reply to "Consider choices in the Gender in Science debate"

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Reply to ‘Consider choices in the Gender in Science debate’

Cumulative disadvantage

Pontus Persson, the Executive Editor of *Acta Physiologica*, invites for continued debate on the topic *Gender in Science*.

In his recent Editorial Dr. Persson surmises that it is not surprising that the number of truck accidents involving male truck drivers is much larger than the number of accidents involving female drivers, because there are more male drivers (1). However, this information is only relevant from any perspective in the gender debate, if the numbers of accidents are compared with the amount of drivers of each gender to create a *gender-specific accident risk*.

“With regard to science”, Dr. Persson writes, “We must first ask whether there is reason to believe that gender differences in research simply reflect sex differences in choices. Such data exist.” Dr. Persson then ends his editorial with “It is our challenge in academia to detect, whether, and if so, how much of gender differences is related to factors other than personal choice”. This assertion follows the presentation of a table derived from Lubinski, Benbow and Kell (2014)(2) showing that (also) among mathematically gifted students, later in life gender stereotypic choices were observed, in the sense that more males were working outside the home, while more women were working inside the home. Some of the reasons for these gender specific differences in choice are discussed below.

Data show that with regard to mathematics performance of girls, this is highly correlated with the Gender Gap Index (3), depends on socio-economic circumstances and that this gap has been closing steadily (4). Thus, girls are not *per se* less able at mathematics than boys. Moreover, it is well documented that different explicit stereotypes as well as implicit expectations exist for boys vs. girls with respect to mathematical abilities. These negatively affect female performances during math tests as well as female confidence about pursuing mathematics heavy life paths (5, 6). Thus, societal values and expectations have a large influence on the choices made by females (7, 8).

I would further question whether the *important* issue is *gender specific choices* and will instead suggest that, based on the above, *societal norms do not sufficiently encourage* female representation in STEM (science, technology, engineering and mathematics). Neil DeGrasse Tyson gave an illustrative insight into societal norm breaking from the perspective of a minority boy aiming for a career in astrophysics. Tyson pointed out that a black kid

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choosing a career in science was "hands down the path of most resistance" and that it was only through a constant struggle that he got to where he wanted to go (LINK (9)).

Another important question is the performance of the comparatively fewer women that *do choose to* make science/STEM their career. There is a marked female underrepresentation among academic positions in EU, especially within STEM. In Denmark, the proportion of female professors (in STEM) was below 15% in 2013, with numbers only slightly higher in the rest of the Nordic countries. Moreover, when females actually *were* appointed professors, it was much more likely to be temporary professorships (Professor 'MSO') (10) rather than permanent full professorships, compared with positions in which men were appointed (11). Given that for many university degrees, females graduates currently outnumber males, this points to the important fact that for each level of academic positions, women are less likely to progress to the next (12), also known as the 'The leaky pipeline'.

Do women choose to leave science or are they pushed? Data indicate that women leave science (or do not enter at all), because they face a diverse range of difficulties compared with men. These include outright discrimination, explicit and implicit biases gender conditioning, negative stereotyping and structural problems that come together to negatively influence the career paths of women in science (13).

Recently, Lydia Zepeda coined the phrase 'Harassment tax' to describe work harassment and its toll on women in science (14).

Negative stereotyping, biases and gender conditioning harm women in many ways:

- Limit the possibilities for funding of start-ups (15-17).
- Women require more publications to achieve same rating for funding (the now classical Wennerås & Wold study (1997) (18), while CVs are rated less impressive if the applicant is female (19, 20).
- Differences in funding exist in the sense that compared with men, women receive grants less often and receive smaller grant allocations and are less cited for their work (21-23). This further adds to the observation that women in science are up against a pervasive culture of negative bias, an observation which has been termed the 'Matilda effect' as an opposite to the well known Matthew effect (for to all those who have, more will be given" (Matthew 25:29)) (24, 25).
- Women are recognized less often for their scientific excellence; are less frequently invited speakers at conferences, which limits their possibilities for sharing their science and create networks. Women are also less likely to win awards or prizes for their research (13, 26).
- Female college professors are given lower ratings for teaching despite equal performance of students in tests. More support is expected from female teachers at the university level and students evaluate these more critically than male teachers (27-29).
- Letters of reference written about women contain less powerful and less ambitious words (30, 31).
- Having parental leave is a bonus for men, while it is a distinct disadvantage for women (32).
- Stereotypes for female leaderships include images such as being too aggressive, arrogant or self-promoting (33-36).

All of these barriers and differences for women accumulate to create severe disadvantages for them (37). The question above was whether female under representation among academic scientists is due to women having a tougher time. As explained above, data support that this is the case.

It is my personal impression that women stay in science as the result of a willful choice and passion, similarly to men, who stay in science. Minorities of any kind generally face the same difficulties. I also think that given this, it is extremely important to ensure that credit and *real* equal opportunities are given to all independent of whether they belong to a minority, be it gender or ethnic origin.

I have a long, though very incomplete, list of suggestions for ways in which to remove negative stereotypes, explicit and implicit biases: First of all, education and norm setting are important paths to enlightenment – the more we are aware of our own biases, and the norms that lie underneath them, the better evaluators, colleagues and scientists we become. Moreover, we could include knowledge about societal norms and biases in our curricula for school and kindergarten teachers as well as in the higher education system – without preaching that men and women are created equal. Governmental funders should make it a priority to increase institutional awareness of the benefits of increased diversity among staff and students. Support all students, but be especially supportive of female students, who are less confident about their career possibilities in STEM. Invite women more often into scientific networks, to meeting organization committees, executive boards, and as grant evaluators, to mention a few possibilities. Instead of imposing old-fashioned norms, we should - as individuals and as society - have increased focus on giving support to the girls and women that show interest in STEM. We should do this to ensure diversity, which fosters creativity and excellence and leads to societal progress.

Conflict of Interest:

I have no conflicts of interests.

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