Destroy the brilliance bias

Communication among scientists has been described as a social system (1) and thus is likely subject to the same gender cognitive biases. Despite changes in the participation and acceptance of women in non-traditional domains, people perceive strong differences between men and women on stereotype components, today as they did in the past (2).

The writer Caroline Criado Perez defines "the brilliance bias" as the negative stereotype of female intellectual abilities (3). Due to this cognitive bias male are often considered not only more authoritative, objective, and skilled but also more "brilliant" than women. Those differential perceptions emerge early. A meta-analysis of 5 decades of U.S. Draw-A-Scientist Studies (4) showed that children drew roughly equal proportions of male and female scientists when they started kindergarten around ages 5 or 6. However, the tendency to draw male scientists increased strongly with age during elementary school and middle school. To overcome this bias, children should be exposed to different examples of scientists that go beyond the typical dead, white, male scientists usually presented in classrooms. However, female geniuses of the past were written out of history and in the present few women break the so called "glass ceiling". Consistent with these data, several studies reported that the fields whose practitioners believed that natural talent and brilliance are crucial for success (e.g., science, technology, math and engineering) had fewer female representatives (5,6).

Male scientists and "masculine" topics are frequently perceived as demonstrating higher scientific quality. This bias affects female scientists career causing the so-called Matilda effect, systematic under-recognition in contrast with male scientists (7).

Several studies show that female scientists receive grants less often (8) and fewer scientific awards (9) compared to male colleagues with equal requirements. Furthermore, females are drastically underrepresented in higher academic ranks (10).

Publications of papers in specialized journals subject to peer review play a central role in determining individual outcomes and progress in academic settings. Female-authored papers were more often accepted or rated higher with a double-blind peer review process, as it reduces gender biases through author anonymity (11).

Being mentioned in the works of other scientists is a determining measure of the impact of a research. However, women are systematically mentioned less than men (12). There are several reasons for this: in the evaluation and dissemination of research, men are more frequently journal editors and reviewers (13) and invited speakers at conferences (14). Women are significantly under-represented as authors of single-authored papers and in the prestigious positions of first and last author compared with men, on papers with three or more authors (15). Finally, in the last two decades men cited themselves at 1.7 times the rate of women (16). This gender gap in citation rates has remained stable over the last 50 years, despite increased representation of women in Academia.

Surgeon-scientists are uniquely positioned to make important contributions to understand surgical diseases and improve management and surgical results. Although a surgical career is becoming a path more traveled by women, men are still strongly associated with surgery whilst women with family medicine (17). According to data published on *New England of Medicine* (18), nearly two thirds of female surgeons in training experience discrimination. What if women decide to pursue the track of surgeon scientist? They face overlapping discrimination and are often perceived as not "surgeon" enough or (and) not "scientist" enough.

The aim of this focus series is to help to eliminate the tenacious internal conditioning, promoting women surgeon scientists and multiplying existing "scientists" models, confident that science will sooner achieve gender equity.

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