Biased sampling: no 'Homer Simpson Effect' among high achievers

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The under-representation of women increases when moving up the scientific academic ladder, from 40% to 77% female at the time of receiving a PhD to circa 10% among full professors, depending on research field and country [1, 2]. One of the many potential causes for the relative shortage of women among academic leaders is that men self-promote more than do women, and that self-promotion is necessary to succeed in science [3]. Successful self-promotion requires a realistic and confident self-assessment of personal scientific expertise. However, females provide lower self-evaluations than do males on interview performance [4] and both mathematical and logical reasoning [5]. Laurance and colleagues [6] therefore predict, but do not find, a gender difference in the perception of personal scientific expertise when surveying recognised scientific experts. We argue that, although the inferences that can be drawn from their findings are limited owing to methodology and scope, their study raises awareness of a serious problem. We therefore call for a much more comprehensive study of the main reasons for the under-representation of women among scientific leaders.

Laurance et al demonstrate that there is no gender difference in the self-perception of scientific expertise among a group of recognised scientific experts. However, if we assume that a high self-perception of scientific expertise is either crucial for, or correlated with, success in science, an investigation only among high achievers is problematic [7]. This is because the career selection process might lead to a strong bias in the data set that could completely disguise any initial variation, and in particular, gender differences. When investigating traits that are potentially linked with career advancement, studies need to also consider early career stages in which selection has not yet had a strong influence. Importantly, studies should also test the relative importance of several factors, so as to identify the major causal ones.

Laurance et al asked researchers to score 'their perceived level of knowledge about their study area'. Owing to the constrained format of their publication, specific details are unclear; however, if this was the only question that participants were asked, this would cast serious doubts on their finding. It is well known that questionnaire design is non-trivial and, in particular, that single questions can be misinterpreted [8]. Finally, we highlight the importance of applying appropriate statistical tests (e.g., as dictated by the distribution of the response variable) and of reporting effect sizes so that the magnitude of the effect can be assessed [9].

We believe that Laurance and colleagues [6] are raising a timely and important issue to the wider scientific community. We hope that their letter will stimulate more studies, across all career stages, incorporating all potential causes. Many different factors beyond self-promotion and self-perception of scientific expertise are suspected to cause the gender difference in scientific academia [1, 2, 10, 11]. Studies are therefore required to identify the underlying causes and their relative importance, so that measures can be taken to forestall the 'leaky pipeline' [12]: the loss of highly trained and talented female researchers from scientific academia.

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