ARTICLE

Women scientists in psychology – time for action

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Why is there a gender imbalance in the academic field of psychology, and what can be done to address it? Following a meeting organised to inspire women in psychology, we ask colleagues who have reached the top of their profession what they think helped them get there. We also examine the issue of unconscious biases that affect decisions in hiring, mentoring and evaluating people, and the value of exposing these gender schemas within ourselves and the organisations we work in. Finally, we discuss ideas about action, ranging from small, but significant, invitations and nominations, to implementation of meaningful institutional measures. Such measures should include, amongst others, linking eligibility for funding with consideration and management of equality and diversity issues.

questions

Why are women underrepresented in senior academic positions?

Does it matter? And can anything be done about it?

resources

'Why so slow? The advancement of women' talk by Virginia Valian: tinyurl.com/n7l6kenwww.wisecampaign.org.uk
www.athenaswan.org.uk
www.hunter.cuny.edu/genderequity/resources/equitymaterials

Women remain heavily underrepresented at the higher levels of academia, particularly in science, engineering and technology, according to a House of Commons committee report (Science & Technology Committee, 2014). Psychological science should have a considerable advantage over other sciences with its majority female undergraduate intake, yet the picture in psychology is roughly consistent with this trend.

In order to be scientifically competitive, a country must 'maximize its human intellectual capital' (Larivière et al., 2013). Thus, the underrepresentation of women at senior levels has adverse consequences not just for women, but for the research community and society as a whole. Promoting diversity can also influence the impact of scientific output. For example, Campbell and colleagues recently reported that authorship teams that included men and women produced publications that were more highly cited than those produced by gender-uniform teams. The higher number of citations indicated that the science reported by mixed teams was perceived to be of higher quality by the authors' peers, compared with publications from teams that consisted entirely of men (there were not enough papers by solely female authors to include in the analysis). This result complements findings and reports from the corporate world (e.g. Devillard et al., 2012), where gender diversity is promoted as a priority issue, since companies with gender-balanced management tend to perform better, as well as from the Science and Technology Committee (Science & Technology Committee, 2014), who make the economic and business case for gender diversity.

Motivated by the desire to raise awareness of such issues the MRC Cognition and Brain Sciences Unit (CBU) in Cambridge hosted a symposium some time ago to celebrate established women psychologists who had been associated with the CBU (or former Applied Psychology Unit) at some point in their career. The speakers, drawn from the developmental, cognitive and clinical fields of psychology, shared their experiences of challenges they had faced as women scientists, and their views of strategies that could be implemented to overcome them. Here, we first detail core themes that emerged during much energetic discussion and debate.

While these themes, though considered from the perspective of eminent UK psychologists, tended not to be specific to the field of psychology, a recurrent thread was that psychologists should be uniquely placed to understand some of the reasons for the underrepresentation of women in science. Consequently, the second part of this article touches briefly upon psychological factors, gender schemas and unconscious bias – our tendency to make associations between categories (e.g. women) and attributes (e.g. competence) to evaluate the category members – which may operate to perpetuate the status quo and maintain barriers to the progression of women in science.

No single career path

One of the clearest patterns to emerge was the range of ways in which these women had achieved success (see also Leyser, 2009). Some began their careers as mature students, had undertaken a range of demanding caring responsibilities (for parents, children or spouses), or had substantial career breaks for other reasons (illness or bereavement). Professor Barbara

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Wilson, for example, completed her undergraduate degree in psychology after having children. Her love for the subject matter led her to pursue clinical psychology training and to build a tremendously successful career in the field of rehabilitation thereafter.

But if the practicalities of career paths differed widely, a thread common to all speakers at the CBU event was the combination of a strong enthusiasm for psychology with an optimistic approach to life. Goals had often been set for the next career step, rather than for a larger career blueprint, with these scientists responding flexibly to unpredictable contingencies and taking advantage of (sometimes unexpected) opportunities as they arose. Nevertheless, Professors Dorothy Bishop and Susan Gathercole strongly recommended an approach that places the highest premium on doing science well and in which activities are guided by core scientific values; e.g. writing papers to communicate important findings and ideas, and applying for funds to facilitate high quality research.

The impact of family life on a research career

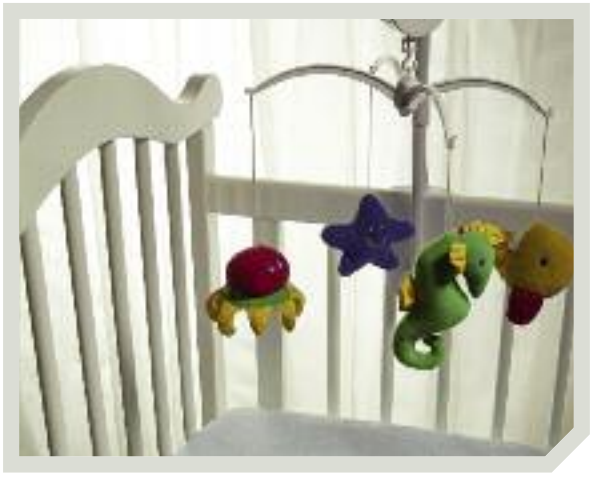
Not surprisingly, scientists who had had children or had cared for parents (a duty that tends to fall predominantly to women: Brody, 2004) felt that this had affected their careers more than those of their male counterparts. This is consistent with evidence showing that having more children reduces the number of hours worked by women, but increases the number of hours worked by men (Leslie, 2007). There was also general agreement that a senior academic post does not come without repercussions upon the smooth running of one's family life. Still, family life and a successful career were by no means considered incompatible. On the contrary, it was felt that one could sometimes be more effective by following a schedule that allowed time for non-academic activities that include caring responsibilities, as each could provide a welcome change from the other.

The nature of support needed to foster an academic career was discussed widely. In general, the speakers considered that the attitudes of academic managers had improved greatly, and the provision of formal and informal flexibility in working hours was often more accommodating than that in other professions. Difficulties remain, however, for women who wish to work part-time. In university settings, this is due primarily to the pressure to maintain teaching and administration duties at the expense of research activities, which weigh disproportionately in hiring and promotion, as well as in institutional evaluations, such as the Research Excellence Framework.

The best timing of career breaks varied across individuals, and there was no preferred model amongst the speakers. Some had waited until their careers were established before having children; a benefit of this was that research staff and PhD students could sustain some momentum during periods of leave. Others had had children at an earlier stage in their research careers; adequate support upon return to work following leave was considered to be particularly essential in such cases. Given that periods of maternity leave, caring responsibilities and part-time work can leave many women with extended productivity gaps in their CV, formalised mechanisms to re-establish and support scientific activity upon return to work are necessary if individuals are to realise their full potential.

Support and inspirational role models

Support can come in many different shapes and forms: practical, emotional, financial and infrastructural. It can also come from different sources; for example, partners or parents, peers or colleagues, departmental heads and funding bodies. Access to mentoring, the right to flexible working arrangements, appropriate share of computing or other laboratory resources, breastfeeding facilities and child-friendly spaces at work, provision of childcare at conferences and cover for teaching responsibilities after a period of maternity leave represent just a few of the many concrete examples provided by the CBU speakers. It was considered essential not only for women to support and encourage one another into leadership roles and even 'push' students and junior researchers to take on responsibilities they might not undertake otherwise, but also for men to be supportive and encouraging. Organisations such as Cambridge AWiSE and Athena SWAN (see resources box) were felt to play an important role in encouraging women to progress in their scientific careers by providing opportunities for networking, advice on how to progress in one's career, information about funding, employment and legislation, and a framework for formal and informal mentoring.



Periods of maternity leave, caring responsibilities and part-time work can leave many women with extended productivity gaps in their CV

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Inspirational role models were felt to be especially important for women, and there is evidence to suggest that women may derive greater inspiration from female than from male role models, whereas the corresponding asymmetry is not apparent for men (Lockwood, 2006). Professor Elisabeth Hill spoke about the tremendously positive impact several female role models had had upon her career, while acknowledging the positive influence from male role models too. There was strong agreement that women could take responsibility for being a role model at all levels of their career. This could include modelling positive behaviour not only through simple actions such as asking questions at seminars and meetings, but also by taking on delegation responsibilities, chairing lab meetings or seminars, and agreeing to give talks at the group or departmental level. Having access to a mentor at key stages in one's career could achieve similar effects, with the added benefit of the wisdom and guidance gained from an established and senior scientist, particularly where a formalised and thoughtfully implemented mentor and mentee framework was in place.

Publish or perish

A recent large-scale analysis based on over 8,000,000 papers across the social sciences, natural sciences and humanities revealed a number of subtle but persistent ways in which gender inequities remain. Even where raw publication counts were similar between genders, closer scrutiny revealed that men were often more likely to be found in the prestigious first and last author positions (West et al., 2013). A related assessment of scientific research output across varied disciplines, published in *Nature*, reported that globally there is no significant discrepancy between the representation of women in authorships overall and first authorships (approximately 30 per cent), but that where a woman occupied any of the prominent author positions – sole authorship, first authorship, and last authorship – papers were cited significantly less often than when a man occupied these positions (Larivière et al., 2013).

Findings such as these suggest that considering authorship at the outset of a study, alongside explicit departmental guidance, could help to offset and resolve the emergence of ambiguities. Because first and last authorship positions outweigh other authorship positions, these data furthermore suggest, as did our speakers, a strong case for the inclusion of an 'author contribution statement' on publications where women have made a significant contribution without achieving first- or last-author status. The Larivière study argued that collaboration is key in driving research output and scientific impact, further suggesting that programmes dedicated to the promotion of international collaborations for women might help to offset such imbalances.

Explanations for the under-representation of women in science have sometimes focused on gender bias in peer review. The peer review process guides decisions about which scientific articles to publish and which research projects to fund. These are the two main indices of academic success, influencing hiring, tenure and salary decisions, and underpinning academic reputation. Studies show that the same article can be rated more highly with a male versus a female author (Paludi & Bauer, 1983; Paludi & Strayer, 1985). A recent audit in infectious disease research also found that women principal investigators had fewer funded studies and received less funding over a 14-year period (Head et al., 2013). An audit of the Wellcome Trust research grants (Wellcome Trust, 1997, 2000), found no evidence of discrimination in the outcomes of peer review, but found an influence of gender on grant application behaviour: proportionally fewer women than men submitted grant applications. Factors identified as having a strong influence on grant application behaviour included seniority, employment status, tenure, type of institution, professional profile, institutional support, career breaks and family circumstances (Wellcome Trust, 2000). These findings further highlight the need for carefully considered policies in relation to part-time or flexible work and career breaks. They also hint at the possible involvement of psychological factors such as gender schemas, the topic we turn to next.

Gender schemas and unconscious bias

In Virginia Valian's book, *Why So Slow?*, we find a balanced appraisal of research on gender inequalities (Valian, 1998). Valian explains the absence of women from leadership positions in terms of implicit hypotheses about the genders. These schemas, which are held by women and men (Steinpreis et al., 1999), lead to small differences in behaviours, perceptions, attitudes and evaluations of performance that accumulate to advantage men and disadvantage women over time, a mechanism she calls 'accumulation of advantage'. Valian insists that implicit gender schemas, which lead individuals to overrate men and underrate women, must be made explicit before women and men have truly equal opportunity (see also Bauer & Baltes, 2002). This is a realisation and conclusion now openly embraced by scientists (e.g. Raymond, 2013) and policy makers (Science and Technology Committee, 2014) alike.

In an illustrative example, an analysis of over 300 letters of recommendation for faculty applying for jobs at a medical school revealed shorter letters written for female relative to male candidates (Trix & Psenka, 2003). There were also systematic differences in the content of these letters, which tended to portray women as students and teachers and men as researchers and professionals. Recent highly publicised evidence comes from a study led by Yale University, where faculty (127 science professors) from six research-intensive universities rated student applications for a lab manager position

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A study of academic publishing revealed a number of subtle but persistent ways in which gender inequities remain

(Moss-Racusin et al., 2012). The application materials were randomly assigned to a male ('John') or female ('Jennifer') candidate, but were otherwise identical. The faculty, both men and women, found John significantly more competent than Jennifer, and offered him a higher salary and more career mentoring opportunities. As Valian points out there only has to be a slight day-to-day bias of paying more attention to John than to Jennifer in mundane professional life before all the decision makers in the profession or organisation are male.

A unique insight into the ways that women are judged differently to men, based on the same abilities and qualifications, is offered by Ben Barres, a Professor of Neurobiology at the University of Stanford, who is transgendered and has experienced academic life both as a woman and as a man. As Barbara, Professor Barres was not taken seriously when she did well at maths at MIT, wanted to do her thesis research or applied for a fellowship. As Ben, however, his work was scoring extra points just because, it would seem, of his gender: after a seminar at a prestigious research institute, one scientist remarked how much better Ben's work was, compared with his sister's. Ben did not have a sister – the Barbara Barres the man remembered was Ben before his gender change (Begley, 2006).

Complementing these powerful anecdotal pieces of evidence there is a significant body of theoretical and empirical research from the social sciences that explain and demonstrate consistent patterns of discrimination. Examples of such theories, as presented in Benard et al. (2008), include: status characteristics theory, which predicts that low-status individuals are evaluated to stricter performance standards compared with high-status individuals (Foschi, 1996); the stereotype content model (Cuddy et al., 2004); the shifting standards model (Fuegen et al., 2004); and the lack of fit model (Heilman & Okimoto, 2008).

There is empirical evidence indicating that even when individuals' consciously reported beliefs about the abilities of women and men do not differ, the implicit belief systems of those same individuals tell a different narrative. Implicit measures demonstrate that 70 per cent of people around the world, including practising women scientists, implicitly associate men (more than women) with science, maths and high authority, and women (more than men) with the liberal arts, family and low authority (Nosek et al., 2009; Rudman & Kilianski, 2000).

These implicit associations have a real and detrimental influence upon behaviour and career expectations for both women and men. And they matter significantly in the strongly hierarchical environments of research units and universities. 'Pushy, loud, articulate individuals are more likely to be noticed by established academics, and these types may be less common among women (Science and Technology Committee, 2014). In last year's special issue of *Nature* on gender inequality in science Liisa Husu describes the power of 'non-events' – the non-invitations to meetings, conferences and seminars, the non-reactions from senior local colleagues when a high-profile article is published, the subtle discouragement, side-lining or exclusion – to subtly, but systematically, affect not only women's progression, but also aspirations, in their chosen field.

It is also important to acknowledge men's attitudes to this issue, as they often occupy senior positions and make relevant hiring and promotion decisions. Recent data indicate that 54 per cent of men, especially those who are not aware of obstacles for women's career progression, may view measures to promote women leaders as unfair to men (Devillard et al., 2012). A further complication in academia is that scientists may be in denial of the existence of any bias, since 'we are trained to be objective' (Science and Technology Committee, 2014, p.24). As Professor Barres says, the issue with bias is that people deny the data that show there is persisting bias (Bates, 2013). As a consequence, despite the abundance of equality and diversity training programmes that can expose the consequences of bias, it is ironic that these programmes can sometimes be ignored or resisted by those who need them the most (Science and Technology Committee, 2014).

Changing the distribution

Implicit associations or schemas may help explain the conditions that contribute to the absence of women in top academic positions at all stages – hiring, retention and promotion. Because schemas are derived from statistical abstractions, if the status quo of a male predominance in a field is maintained, then the schema that regards men as more natural and women as less natural in this role will persist (Valian, 1998). What this means, Professor Anne Cutler argued at our CBU event, is that in order to effect real change in the way individuals react to the world, we must change the distribution and the statistics of the world around us. There is also some empirical evidence that the influence of schemas can be offset by environmental factors. For example, women exposed to female leaders in social contexts are less likely to express automatic stereotypic beliefs about women, and the frequency of exposure to women faculty members mediates the long-term effect of social environment (women only vs. mixed college) on automatic gender stereotyping (Dasgupta & Asgari, 2004).

It is clear that it is necessary to increase the numbers of women in senior positions to help establish unbiased expectations of career development across the sexes. What is less clear is the best way to do this. Professor Vicki Bruce advocates critical examination of the criteria applied to hiring and promotion with an eye to future revision. For example, existing criteria do not reward administrative and pastoral care duties that currently fall, without recognition, to many women academics. Similarly, academic employers could develop transparent and equitable means of accounting for the potentially adverse effects of part-time work and career breaks on some women's productivity and timely career progression. Both women and men could make small and comparatively effortless changes at all levels that would help to normalise the skewed distributions. These changes could include inviting women as keynote speakers and session chairs at conferences, nominating deserving women for prestigious prizes, selecting women for prestigious editorial roles, and placing women on influential committees and boards.

A number of reasons and solutions have now been argued and replicated as to why there is gender inequality in science,

and what measures can be taken to change that (Science and Technology Committee, 2014). The latest reports both from the government and the private sector (Devillard et al., 2012) agree about the measures that could help, but urge that their implementation must be prioritised and monitored. Andrew Miller, chair of the House of Commons Science and Technology Committee, recently urged the universities to 'pull their socks up' and implement the measures we know will reduce the gap between the representation of men and women in science (Else, 2014). We would argue that there are two important changes that we scientists should implement ourselves. First, we all – women and men – must be aware of our biases. Second, women in particular must take and be encouraged to take risks that take us out of our comfort zone, or in other words, 'lean in' rather than refrain from seizing opportunities that arise in the workplace (Sandberg, 2013). There are potentially far-reaching benefits of developing self-confidence in women alongside the courage to take measured risks. These risks include agreeing to give a talk before feeling completely 'ready', applying for a position when we fulfil only the essential, rather than desirable, criteria, or embarking upon collaborative research where we might not otherwise have chosen to do so.

It is the responsibility of our generation to push the boundary further

The above goals are supported through the existence of schemes such as the Athena SWAN Charter, which evolved to advance the representation of women in science and related disciplines. Athena SWAN was given a significant boost in 2011, when the Chief Medical Officer (Professor Dame Sally Davies) announced that the National Institute for Health Research (NIHR) would shortlist for funding only those medical schools that held a Silver Athena SWAN award. Although the Research Councils UK (RCUK) does not yet link funding to Athena SWAN, 2013 witnessed the launch of its 'Statement of Expectations for Equality and Diversity'. Those receiving research council funding were expected to provide evidence of ways in which 'equality and diversity issues are managed at both an institutional and department level'. This evidence includes participation in schemes such as Athena SWAN and Project Juno. By making the issue of gender inequality a funding issue (evidence of addressing gender inequalities linked to eligibility for research funding), every single medical school in the country has had to take notice of Athena SWAN and prepare credible applications for the three award levels (bronze, silver, gold). These submissions need to demonstrate a critical self-assessment of how the schools support career development, flexible working, parental leave and gender balance on decision-making positions. The Athena SWAN awards also introduce accountability in the form of an action plan that outlines how and when outcomes of specific initiatives will be measured. Professor Davies's leadership has instigated a great deal of action, and RCUK may follow NIHR's lead in the future.

Push the boundary further

There are a number of risks associated with the disproportionately low numbers of women at the higher levels of academic psychology. An obvious one is the loss of valuable perspectives and views from women. Another is that women may feel out of place in a predominantly male environment. Women fail to reach their full potential in science for many reasons, and there is no simple solution to their underrepresentation in the more senior ranks of even academic psychology. Yet one thing is clear: as long as women are underrepresented in senior positions, fewer females will believe that an academic career is appropriate or possible for them.

Some restructuring of the academic research system could go a long way towards retaining women in psychological science, a development that would have important benefits not only for women in psychology, but also for the academy and society at large. There are many ways in which employers and funding bodies could and do help. They include encouraging job-sharing or part-time work, providing adequate support for people returning from parental or child-rearing leave, encouraging and regulating collaborations with other researchers, and revising the criteria for professional assessment.

Some positive steps have already been taken. For example, the Equality Challenge Unit (2009) undertook a review of the 2008 Research Assessment Exercise and recommended that staff whose particular circumstances (e.g. part-time work or career break) had adversely affected their capacity to undertake research should be permitted to submit fewer than the minimum number of outputs in the next Research Exercise Framework. Certain funding bodies have increased the number of years post-PhD during which they will consider applications for prestigious grants, and allowances are increasingly made for years spent working part-time and for career breaks. This is all progress in the right direction, though by no means sufficient to address the still dramatic imbalance of genders at senior levels.

Despite the inequalities and obstacles outlined above, women have come a very long way since the early 20th century, when they had to fight for the right to higher education and enter a profession. This shift in the social and professional norms in contemporary Western society means that a high proportion of girls and women believe that it is possible to study at university level and make educational choices accordingly. It is the responsibility of our generation to push the boundary further, so that women of the 21st century can achieve their full potential in psychological science and other research careers.

As a case study of the pressures and opportunities facing women scientists associated with a leading centre for psychological and cognitive neuroscience research, together with discussion of the psychological factors that maintain any disparity between women and men, this article will, we hope, offer insights for men and women working in varied conditions across diverse fields of psychological science. It is our hope that increasing awareness will allow us all to implement strategies that will effect positive change.

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