

Sex Roles

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Exploring the science behind sex and gender differences in cognitive abilities

Sex Differences in Cognitive Abilities, Fourth Edition

By Diane F. Halpern, New York, Psychology Press, 2012. 456 pp. \$62.50 (paperback)

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It has been over four decades since Maccoby and Jacklin (1974) published their landmark text, *The Psychology of Sex Differences*, which was the first to review in a systematic way differences between males and females in thought and behavior. Considerable progress has been made since their narrative review both in the body of knowledge of psychology and the statistical techniques we use to assess experimental findings, such as meta-analysis. The very notion of gender differences is still controversial though. Some theorists argue passionately either that they do not exist, or are too small to be of practical impact (Fine, 2010; Hyde, 2005), while others argue for innate biological differences between males and females (Kimura, 2000). There is a vast body of literature to evaluate and huge educational, occupational and social implications to the answers to such questions. To whom should we look for a critical and objective analysis of the body of research studying the issue of cognitive

differences? Are men and women really that different in cognitive ability? If so, do these differences come from nature, nurture, or an interaction of both?

Halpern's *Sex Differences in Cognitive Abilities* (4th Ed.) will be an invaluable guide to the interested reader in answering that question for themselves. Rather than attempting to sway the reader towards an uncritical acceptance or rejection of cognitive differences, Halpern challenges the reader to be critical of *all* such claims and to hold the scientific evidence presented to greater scrutiny. This theme is introduced from the very beginning, as the author guides the reader through the history of scientific research into gender differences and its social implications. This provides a way to introduce and discuss issues of scientific bias, values and objectivity within research, as well as basic terminology such as the difference between the terms *sex* and *gender*. Many scholars prefer the use of *gender* to denote a sociocultural mechanism for cognitive differences (Muehlenhard & Peterson, 2011), yet Halpern notes much of the scientific literature on the topic still uses *sex* differences as the preferred term. One should not mistake the author's preference for the term *sex* difference as supporting the biological perspective over the psychosocial perspective, however. Halpern is a strong advocate of combining the two, from a biopsychosocial perspective, and argues that it is often impossible to separate *sex* as a biological property from the social consequences of being either male or female - reflecting Unger's (1979) argument that *sex* is both a subject and a stimulus variable.

The second chapter goes more deeply into the methodology used to study general intelligence (IQ) and specific cognitive abilities. It serves as an excellent primer on statistics for those who have had only limited exposure, such as the difference between statistical and *practical* significance, and effect sizes. For those whose statistics are a little rusty this chapter serves as a good refresher and empowers

the reader to evaluate claims about gender differences in research. It is a highly accessible overview for non-statisticians, though the interested reader might choose to follow up with a more detailed book on statistics as interest permits.

The third chapter is perhaps the most important, and brings together a coherent and structured review of the ever growing scientific literature and empirical evidence for cognitive gender differences. While there is almost unanimous consensus that men and women do not differ in general intelligence (Halpern, et al., 2007), a large body of research has investigated the question of whether males and females have particular aptitude on more *specific* cognitive abilities, such as visuospatial or verbal ability. Some authors on this topic err in presenting only selective reviews that support their arguments about similarities or differences, but Halpern presents an authoritative and measured critique of the literature which is broader and comprehensive. She reviews areas such as perception and memory that often go unremarked by other authors (Hyde & Lindberg, 2007). While there are many areas where further research is required, she also presents those findings which demonstrate consistent and robust gender differences such as verbal and visuospatial abilities, favoring females and males respectively.

Readers familiar with previous editions will notice considerable changes in this section to reflect more recent evidence and studies. They may also notice that Halpern's interpretation and judgement have shifted on certain issues, and is a departure from previous beliefs about quantitative abilities such as mathematics (Halpern, 2000). Whereas once the evidence may have been strong, recent studies have challenged the assumption that "males are always better at math". Gender differences are found on some, but not all types of mathematical problems, and at different stages during development. Such flexibility in the face of new evidence

should be the hallmark of scientific scholarship – dearly held beliefs and convictions should be malleable to refinement in the face of new evidence and disconfirming data. This is followed by a discussion about the magnitude of such gender differences and similarities, as well as addressing claims that they are decreasing in response to societal changes in gender equality. Some areas are changing (such as mathematics), while others are stable.

The remainder of the book reviews the many biological and psychosocial perspectives on the origins of gender differences. Two chapters explore biological perspectives on gender differences. The first reviews evidence for the influence of genes and hormones on the human brain. Although it is common to think of a direct association between sex hormones and cognition (and often to explain away behaviour as being the product of ‘hormones’), the relationship between them is far more complex and begins before our birth. Prenatal exposure to hormones at critical developmental stages shapes both body and brain. There are also differences between men and women after puberty in the level of hormones such as testosterone and estrogen, but these differences correlate only weakly to actual measures of cognitive performance (Halpern & Tan, 2001). It is not a simple linear relationship of ‘more is better’. There are also cyclical fluctuations in hormone levels across the course of a day for males, and across the menstrual cycle for women. That males also experience fluctuations may be surprising for many readers, Halpern remarks, as female cyclical variation is the more commonly reported by media.

The second biological chapter reviews structural differences between male and female brains. One may actually be quite surprised at just how few differences there actually are – removed from the skull, there are no gross anatomical differences to distinguish male from female brains. Women’s brains are often slightly smaller than

males, but this is in proportion to body size not intellect because general intelligence does not differ between males and females (Halpern, et al., 2007). Halpern is also careful to present the biology in its historical context, noting that in the past such arguments were used to deny both women and African Americans the right to vote.

Chapters 6 and 7 then present psychosocial perspectives on gender differences. These chapters explore how differences in the socialization experiences of boys and girls might lead to differential developmental outcomes, as well as how the gender roles and norms of a culture might shape our interests, preferences, and beliefs about the cognitive abilities of men and women. In doing so, the author is as cautiously reserved about making causal statements about socialisation as she is about biological ones, asking the reader to hold them to the same scrutiny as biological hypotheses.

The first of the psychosocial chapters is devoted entirely to gender roles, and associated stereotypes. Gender stereotypes about the relative abilities of males and females, the way in which they ought to behave, and the types of interests and activities that are typical for a boy or girl shape the way we see ourselves as well as the way we judge others who do not conform to them. For example, gender differences in interests and values emerge very early in childhood - what Lippa (2001, p. 168) has coined the “People-Things” orientation. Early differences in socialisation and gender stereotypes stress caring and empathy for females while encouraging an interest in things, objects and tools for males. This may lead to different motivation to choose occupations that reflect those interests, as well as motivation to develop skills in masculine or feminine cognitive domains (Eccles, 1987). Despite advances in gender equity, implicit stereotypes prevail of maths as being masculine, and reading as feminine.

These gender stereotypes can also have powerful effects on our self-efficacy beliefs and cognitive performance. Halpern gives particular emphasis to the issue of *stereotype threat* (Steele, 1997), and how performance in stereotypically masculine or feminine domains might be boosted or impaired by beliefs about men and women's abilities. She reviews a number of recent empirical studies into the nature of stereotype threat, which taken together cast doubt about what is actually being measured in cognitive testing – do such tests tap actual *ability*, or merely temporary performance that is impaired simply by the act of making gender salient? Gender stereotypes are powerful and pervasive, and may be implicitly primed simply by performing in gender-typed domains such as mathematics or science even without overt cues. Stereotype threat also undermines performance on working memory, particularly in high-stakes testing such as for college entry exams. One must be cautious about any conclusions drawn without also considering academic achievement – an area where females as a group score higher than males.

Finally, the psychosocial section concludes by reviewing all the major theoretical perspectives for gender differences, such as differential practice and training on spatial tasks through gender-typed activities and videogames, gender differences in self-efficacy, and socialisation differences between the way girls and boys are raised and taught in school. Though the topic area reviewed is quite broad and overlaps with other texts, her coverage is well supported by recent studies offering empirical evidence for such claims.

This section has also been expanded from previous editions to include expanded sections on cross-cultural differences in the size of gender differences. Comparisons of gender differences between nations provide an excellent test of the influence of sociocultural factors – if gender differences are substantially the product

of biology, then we should see relatively little cultural variation in cognitive ability. Halpern takes the reader through several quite fascinating studies, examining the size of gender gaps in mathematics and reading and how they are correlated to independent measures of gender equity such as attitudes towards women in the workplace. Smaller gender gaps in mathematics were found in gender-equal nations (Else-Quest, Hyde, & Linn, 2010), but the same pattern was not found for reading and comprehension. Although gender gaps in reading favoring females was found in all nations, quite surprisingly the gender gap actually *increased* in nations that were more gender-equal (Guiso, Monte, Sapienza, & Zingales, 2008).

Such evidence sets the stage for Halpern's essential thesis that gender differences are the product of both social and biological factors, and that a comprehensive model incorporating aspects of both perspectives is required. In the concluding chapter, Halpern elaborates on the need for a biopsychosocial model of gender. While still working from a strong framework of scientific evidence, the tone of the book changes to a political one in considering the social implications of such gender differences, and how this body of evidence may relate to public policy about education and further gender difference research. Consider for example the issue of single-sex schooling, and how studies claiming essentialist differences between boys and girls may shape the debate. While many see it as an easy solution to gender-gaps, the practice of segregation (by any category) has been shown to have extremely negative social and educational outcomes, such as increasing the saliency of gender and increasing stereotype threat. Halpern firmly opposes sex segregation in education (Halpern, et al., 2011), and argues persuasively in this text that the claim of improved performance or different styles of learning between boys and girls is not supported by the scientific evidence.

Readers will find *Sex Differences in Cognitive Abilities* presents a measured and thorough review of the current state of gender difference research, while also encouraging critical thinking about such claims. There are similar books on the same subject, such as Kimura (2000) and Fine (2010), but these suffer from selective reviews of evidence to advance or refute innate biological differences. Halpern encourages the reader to form their own opinions, and to question both sides of the argument. Although the arguments may sometimes echo those made by feminist scholars, Halpern writes from a scientific perspective first and foremost. While clearly geared towards a college level audience with an interest in psychology, the book does not assume a deep knowledge of statistics. The author gently walks the reader through the methodology behind gender difference research, followed by empirical evidence. As such, it would be equally appropriate to use as a text or as readings for gender studies as well as psychology courses. Sections of the book would also be appropriate as readings for education courses in highlighting the ways that gender-typing influences learning, and the role that parents and teachers play in shaping a gendered view of the world.

This is a particularly ‘hot’ and contentious area in science and psychology with serious social and educational implications. Regardless of which side of the scientific debate you endorse, you may find that Halpern’s text gives you pause to reflect and reconsider your certainty. At a minimum, it will leave you well-informed of the scientific evidence behind claims about cognitive differences. All stakeholders in this debate would be well served in reading it.

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The fourth edition of *Sex Differences in Cognitive Abilities* critically examines the breadth of research on this complex and controversial topic, with the principal aim of helping the reader to understand where sex differences are found - and where they are not. Since the publication of the third edition, there have been many exciting and illuminating developments in our understanding of cognitive sex differences. Modern neuroscience has transformed our understanding of the mind and behavior in general, but particularly the way we think about cognitive sex differences. Psychology students will appreciate this excellent text as would anyone interested in what science has to say about the cognitive abilities of women and men." - Alice H. Eagly, Ph.D., Northwestern University, USA.