

The Nature–Nurture Debates: 25 Years of Challenges in Understanding the Psychology of Gender

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Abstract

Nature–nurture debates continue to be highly contentious in the psychology of gender despite the common recognition that both types of causal explanations are important. In this article, we provide a historical analysis of the vicissitudes of nature and nurture explanations of sex differences and similarities during the quarter century since the founding of the Association for Psychological Science. We consider how the increasing use of meta-analysis helped to clarify sex difference findings if not the causal explanations for these effects. To illustrate these developments, this article describes *socialization* and *preferences for mates* as two important areas of gender research. We also highlight developing research trends that address the interactive processes by which nature and nurture work together in producing sex differences and similarities. Such theorizing holds the promise of better science as well as a more coherent account of the psychology of women and men that should prove to be more influential with the broader public.

Keywords

psychology of gender, sex differences and similarities, nature and nurture, meta-analysis

Is nature or nurture the stronger influence on sex differences and similarities? If asked, most psychologists would probably reply that the question is misguided. Obviously, both are influential. Yet, as we show in this article, nature–nurture debates have remained highly contentious in the psychology of gender, and contemporary researchers only sometimes integrate the two causal influences. More commonly, researchers focus on one type of cause to the exclusion of the other or treat them as competing explanations. In analyzing the state of these nature–nurture debates in psychological science, we invoke the terms in their broadest meaning, whereby *nature* refers to biological structures and processes and *nurture* refers to sociocultural influences.

There is no doubt that these issues are important and absorbing to the general public as well as scientists. However, despite the immense amount of psychological research on gender, often it does not inform public discourse on gender issues. For example, 2012's most widely discussed journalistic treatment of gender issues is Anne-Marie Slaughter's article "Why Women Still Can't Have It All," which appeared in the July–August issue of *The Atlantic*. Evidence of the article's success lies in the approximately 370,000 hits produced by a Google search

pairing its title and author (conducted March 29, 2013). Written in part from the perspective of the author's own career decisions, the article cites mainly the opinions expressed by other women with highly successful careers (e.g., Sheryl Sandberg, Elizabeth Warren).

Although Slaughter's presentation is highly engaging, many of the topics that she covered could have been linked to extensive psychological research (e.g., maternal employment, stereotype threat, work–life balance). When touching on the key issue of causes of the parental division of childcare responsibilities, Slaughter opted for her personal insight that, despite the influence of social expectations, maternal instinct ("a maternal imperative," p. 92) is critical. Even though Slaughter's expertise is in international relations, it is fair to ask why scientific psychology did not enter into her analysis. Moreover, Slaughter's approach is not unusual: Authors who write about the engaging gender questions of the day often fail to ground their answers in psychological research. Why?

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In this article, we argue that these failures are due in part to the conflicting messages that scientists convey to the public about the psychology of women and men.

In this article, we analyze changes in psychologists' thinking about nature and nurture by tracing the psychology of gender from the founding of the Association for Psychological Science in 1988 to the present day. We thus consider the last quarter century of research. Though we recognize the highly varied content of research in basic and applied domains, we focus this article on the central issue of nature and nurture causation of sex differences and similarities in traits, abilities, behavioral tendencies, and attitudes and beliefs. For researchers who address these issues, one dramatic shift in the last quarter century is the general acceptance by psychologists of meta-analysis as the most appropriate method for aggregating the findings of groups of related studies that have compared the sexes. Although this methodological advance guides gender researchers toward acknowledging the systematic patterning of sex differences and similarities, resolving nature–nurture causal issues remains fraught with conflict.

Historical Trends in Research on Sex Differences and Similarities

The beginning of the past quarter century marked the end of an era in psychology with a strong tilt toward nurture-related explanations of sex-related differences. In that period, most developmental psychologists had emphasized socialization and learning as important causes (Bandura, 1977; Kagan, 1964; Mischel, 1966), and social and personality psychologists had emphasized stereotypes, norms, identities, and roles that support gender differentiation in cognition and social behavior (e.g., Bem, 1974; Deaux, 1984; Eagly, 1983; Spence & Helmreich, 1978; Williams & Best, 1982). Despite this emphasis on nurture, Maccoby and Jacklin's (1974) influential review considered both biological factors and socialization as potentially causal and raised questions about the consistency and quality of the evidence on sex differences and similarities.

The feminist movement was an important influence on theories of gender because most psychologists who were allied with the wave of feminism that began in the 1960s were firmly in the nurture camp (Eagly, Eaton, Rose, Riger, & McHugh, 2012). Feminist psychologists argued that many scientists had wrongly ascribed the behaviors of women to their intrinsic nature and failed to recognize the causes embedded in the social context of women's lives (e.g., Weisstein, 1968). In vividly making this point, Shields (1975) challenged the gender-as-nature views of Darwin (1871) and other earlier writers who portrayed women as inherently childlike, passive, intellectually deficient, and motivated mainly by maternal

instinct (e.g., Galton, 1907; McDougall, 1923; Thorndike, 1906). In keeping with their gender-as-nurture message, feminist psychologists also advocated separating sex as a biological influence from gender as a sociocultural influence (e.g., Unger, 1979). In feminist research, gender then received far more emphasis than sex, as illustrated by Bem's (1974, 1981) studies demonstrating that gender identity, as an individual difference, predicted sex-related behavior better than the dichotomous variable of sex.

The 1980s marked the end of this relative supremacy of nurture explanations of the psychology of women and men and the beginning of a powerful reassertion of nature. Evolutionary psychologists advocated for nature by emphasizing evolved, inherited dispositions in women and men, as illustrated by Buss's research (1989) on the mate preferences of women and men. The theoretical writings of Tooby and Cosmides (1989, 1992) attracted attention, and Daly and Wilson's (1983) engaging book proposing evolutionary explanations of various human behaviors reached a wide audience. Although evolutionary theory had been applied to human behavior in the preceding decade, labeled as *sociobiology* (e.g., Trivers, 1972; Wilson, 1975), it gained prominence mainly through evolutionary psychology.

Another source of the rise of nature in the 1980s and beyond was psychologists' increasing efforts to apply the science of brain structure and hormones to the psychology of women and men (Hines, 1982; Hines & Green, 1991; Notman & Nadelson, 1991). Although skeptics abounded, especially among feminists (Bleier, 1991), research in this area proceeded at a rapid pace. The hypothesis that prenatal and early postnatal androgens affect brain structure and subsequent behavior had roots in earlier research (e.g., Money & Ehrhardt, 1972) and became well-accepted in the 1990s (Collaer & Hines, 1995). Popular themes included sex differences in the relative dominance of the cerebral hemispheres and in the size of the corpus callosum, which connects the cerebral hemispheres (e.g., Davatzikos & Resnick, 1998). Researchers also focused attention on the ways that hormones activate behaviors, especially testosterone's relations to dominance and aggression (e.g., Mazur & Booth, 1998; Sherwin, 1988). Somewhat later, oxytocin became a focus of research concentrating on its relation to sex differences in stress-induced responses and bonding (Taylor et al., 2000).

This rise of nature explanations of sex-related differences in the 1980s and beyond did not staunch the flow of research favoring nurture explanations. Instead, psychologists exploring the effects of social experience on men and women developed many new research questions and methods. Large amounts of research addressed stereotype threat (Steele & Aronson, 1995), ambivalent and hostile sexism (Glick & Fiske, 2001), implicit gender

stereotypes and attitudes (Rudman, Greenwald, & McGhee, 2001), backlash from gender-incongruent behavior (Rudman & Glick, 1999), workplace discrimination (Heilman & Parks-Stamm, 2007), and children's development of gender role knowledge (Martin, Ruble, & Szkrybalo, 2002). The rise of nature theories in the last 25 years thus occurred in the context of continuing growth of nurture perspectives. The result is that impressive, but largely separate, streams of research currently support nature and nurture.

To illustrate contemporary thinking about these two sets of causes, consider the popular topic of spatial ability. The sex difference favoring boys and men is relatively robust, especially on tasks requiring the mental rotation of three-dimensional objects (see meta-analysis by Voyer, Voyer, & Bryden, 1995). Some researchers emphasize biological causes by, for example, relating female and male spatial performance to their hormonal cycles (e.g., Courvoisier et al., 2013) or by claiming that observed structural sex differences in the brain cause these and other cognitive sex differences (e.g., Chou, Cheng, Chen, Lin, & Chu, 2011). Other researchers emphasize sociocultural influences by demonstrating that, for example, the usual sex difference can be reduced or eliminated by equating male and female participants' confidence in their ability (Estes & Felker, 2012) or by inducing the belief that male superiority in performance is due not to ability but to external causes (e.g., gender stereotyping; Moè, 2012). Thus, spatial ability illustrates a common pattern whereby research articles often favor nature or nurture explanations and acknowledge the alternative minimally or not at all. Although a few research projects have taken both nature and nurture into account (e.g., M. Hausmann, Schoofs, Rosenthal, & Jordan, 2009), researchers often treat these factors as sole contending causal influences on sex differences and similarities, despite the popularity of the abstract principle that nature and nurture interact.

Given the development of separate nature and nurture currents of thought about sex-related differences in the past few decades, any recent survey would reveal competing factions of psychologists who promote mainly one or the other explanation. In this respect, psychologists mirror public opinion in the United States. In response to a question asking people to choose “the main reason that men and women are different,” a 1997 nationally representative poll found that 53% endorsed nurture, 31% nature, 13% both, and 3% were not sure (National Broadcasting Company, 1998). The continued visibility of evolutionary psychology and neuroscience in recent years may have increased public acceptance of nature causes but likely not beyond the acceptance of nurture causes, given the 22% endorsement gap that existed in

1997. The public thus appears to be as divided in their favored explanations as the expert scientists.

Before delving into specific illustrations of the yin and yang of nature and nurture explanations, we describe how the science has gained from the increasing use of meta-analysis to estimate the size and variability of sex differences. As we explain in the next section, these estimates tend to restrain researchers from exaggerating findings or selecting only the findings that are compatible with their favored theory.

Methodological Innovations in the Study of Sex Differences and Similarities: Effect Sizes and Meta-Analysis

The past quarter century has seen the increasing use of meta-analysis and greater sophistication in interpreting comparisons between women and men. Traditionally, a significant effect was taken as potentially important, whereas a nonsignificant effect was taken as unimportant. Although significance testing is often sensible to rule out the possibility that findings reflect mere chance, such tests depend on statistical power. Very small effects can become significant with large sample sizes. Because judging findings by their statistical significance could draw attention to small sex differences with little practical importance, feminist psychologists were among those calling for the reporting of effect sizes, which are independent of statistical significance (e.g., Lott, 1985).

Effect sizes, as a statistically appropriate metric for comparing findings across studies, are the key to judging the stability versus variability of psychological sex differences across studies as well as their average size. In the 1980s, the development of statistical methods for analyzing effect sizes across studies advanced the sophistication of reviews of the female–male comparisons provided by thousands of research reports (Glass, McGaw, & Smith, 1981; Hedges & Olkin, 1985).

Application of meta-analysis to the psychology of gender

Meta-analyses comparing the sexes proliferated due to the considerable interest in the psychology of gender in the wake of the feminist movement and due to the simplicity of computing effect sizes that compare two groups. Early meta-analyses estimated sex differences in influenceability (Cooper, 1979; Eagly & Carli, 1981), accuracy in nonverbal communication (Hall, 1978), cognitive abilities (Hyde, 1981), empathy (Eisenberg & Lennon, 1983), helping behavior (Eagly & Crowley, 1986), aggression

(Eagly & Steffen, 1986; Hyde, 1984), and group performance (Wood, 1987). These reviews typically provided evidence for overall small-to-moderate sized effects but also considerable variability within each meta-analysis because some of the reviewed studies yielded large sex differences, others small differences, and still others reversals of the overall effect.

Meta-analyses comparing male and female social behavior and cognitive performance quickly became common in *Psychological Bulletin* and other journals. In the last 25 years, approximately 370 meta-analyses comparing the sexes have appeared in journal articles catalogued by PsycINFO (identified by combining the index term “human sex differences” with “meta-analysis” and “journal article” codes for the years 1987 to 2013). Highly cited reviews pertained to, for example, math performance and spatial ability (Hyde, Fennema, & Lamon, 1990; Voyer et al., 1995), personality (Feingold, 1994), and leadership style (Eagly & Johnson, 1990). Despite the precision of such meta-analyses in estimating the overall magnitude and variability of male–female comparisons, this new method did not generate a quick consensus about the importance or explanation of these effects. Some feminist psychologists were concerned that these meta-analytic findings could be used to justify social inequities and preferred to emphasize the small overall effect sizes that these reviews often obtained (Hyde, 2005).

Once a large number of meta-analyses comparing the sexes had been published, some researchers aggregated their findings to estimate the size of effects across multiple meta-analyzed domains of traits and behaviors. Using this technique to describe a wide range of social psychological effects, Richard, Bond, and Stokes-Zoota (2003) reported that sex differences are somewhat smaller ($d = 0.26$) than effects averaged across social psychology as a whole ($d = 0.45$). Yet, sex effects in this research were comparable in magnitude to those in several foundational research areas in social psychology such as attribution ($d = 0.28$) and social influence ($d = 0.26$). And research has demonstrated that even small differences can be important. The cumulative impact of small effects that occur repeatedly over occasions and situations can be considerable and is often masked by single-shot studies that capture only a small slice of behavior (e.g., Abelson, 1985). Furthermore, sex differences may appear small when aggregated across many meta-analyses because the aggregated estimates are not theory driven and do not distinguish between the domains that theoretically should or should not yield sex differences. Even individual meta-analyses typically aggregate findings across a broad behavioral category—sometimes collapsing across contexts and behaviors for which sex differences are more or less likely.

Interpreting meta-analyzed sex comparisons

To understand how a sex difference that is small when aggregated across many studies can mask larger differences that appear in some circumstances, consider the domain of risk taking. Consistent with the cultural stereotype that men exceed women in *agency*, which includes attributes of assertiveness, dominance, and confidence, men take greater risks than women in a wide range of laboratory and other settings. However, when meta-analyzed by Byrnes, Miller, and Schafer (1999), this overall effect yielded a standardized mean difference (d) of only 0.13 (corresponding to a correlation between sex and risk taking of approximately $r_{pb} = .065$). Such small differences are consistent with an underlying dimensional structure of psychological sex differences rather than one composed of two distinct types of humans (see Carothers & Reis, 2013).

Despite a small average sex difference, women and men differed more in some types of risk taking—for example, men were more likely than women to perform games of risk involving physical skills ($d = 0.43$). Also, evidence beyond the Byrnes et al. meta-analysis has shown that men were much more likely than women to perform extremely dangerous interventions, such as those meriting the Carnegie Hero medal (Becker & Eagly, 2004). However, in contrast to the overall male direction of risk taking, women did not differ from men in their propensity to take social risks (e.g., C. R. Harris, Jenkins, & Glaser, 2006) and were slightly more likely than men to undertake risky actions such as Holocaust rescues of Jews or living kidney donation (Becker & Eagly, 2004). Such inconsistencies in findings across subdomains of a behavioral category are common in research comparing the sexes and are often theoretically meaningful, as also illustrated by analysis of the broad domain of prosocial behavior (see Eagly, 2009).

A meta-analysis always presents an overall average sex comparison based on all of the available studies. This mean effect size often is not very informative, not only because it may mask highly inconsistent effects, but also because it could be explained through theoretical perspectives highlighting either nature or nurture. For example, within a meta-analysis of a wide range of mathematics performances, the overall finding of boys performing somewhat better than girls on visual spatial skills in standardized tests across 49 nations (Else-Quest, Hyde, & Linn, 2010) invites explanation. This effect could be due to selection pressures that favored such skills in men throughout human evolutionary history and/or to differential contemporary social expectations and experiences (e.g., video games). Because many sex differences are

compatible with both nature and nurture accounts, an overall meta-analytic effect generally provides little explanatory insight.

Using meta-analyses to test theories of nature and nurture

The variability that sex differences show across studies does provide an avenue to testing explanatory theories. As the statistical procedures that enable testing meta-analytic models have become more sophisticated (see Borenstein, Hedges, Higgins, & Rothstein, 2009), meta-analysts have routinely examined the moderation of sex differences by settings, response formats, participant populations, and many other variables. The validity of a theory depends on how well it can identify factors that accentuate a sex difference and others that attenuate it. If, for example, a sex difference reflects societal expectations, then its magnitude should vary with the presence of others. Demonstrating this influence, Eagly and Crowley's (1986) meta-analysis on helping behavior revealed that men were more likely than women to offer help to strangers, especially when an audience was present, making normative expectations for men's greater helping more salient.

Moderation by social context also has emerged in meta-analytic tests that track changes in psychological sex differences over time. In many meta-analytic reviews of agentic behaviors and attributes, smaller and sometimes nonsignificant sex differences have been found in more recent studies, due largely to women having become more similar to men in agentic tendencies (e.g., Byrnes et al., 1999; see Wood & Eagly, 2012, for review). Because these changes in traits and behaviors have occurred in the past 50 years, their interpretation requires theories that assume flexible regulation of behavior in response to changing social contexts (e.g., fall of birth rates, entry of women into paid employment, see R. Hausmann, Tyson, & Zahidi, 2011).

Some biologically oriented theories also predict variation across contexts. For example, evolutionary psychologists anticipate that contextual factors such as sex ratios and reproductive stress promote variation in mating preferences, although they also contend that this variation itself reflects genetically preprogrammed strategies that are differentially evoked by context (e.g., Schmitt, 2005). Also, contextual variation of sex differences would be expected in developmental evolutionary models because experiences, especially during maturation, are theorized to regulate synaptic connectivity, neural circuitry, and gene expression and thereby affect brain structure and organization, which, in turn, affects behavior (Lickliter & Honeycutt, 2003).

Along with predicted variation in sex differences, sometimes the absence of variation in meta-analytic findings is taken as support for a particular explanation. In particular, researchers may consider biological theories more plausible to the extent that effect sizes are consistent across studies and any moderating factors have little influence. For example, as Papadatou-Pastou, Martin, Munafò, and Jones (2008) argued, "showing that a sex difference in handedness is present in every comparison . . . provides support for the theories that explain handedness with biological factors pertinent to sexual differentiation" (p. 691). In this view, uniformity of the direction of the sex difference suggests biological causes, notwithstanding that the magnitude of this difference shifts with cultural contexts, as Papadatou-Pastou et al. also demonstrated.

To illustrate in more detail the ways in which nature- and nurture-oriented theories of gender have developed in the past couple of decades, we trace these perspectives in two important areas of gender research: socialization and mate preferences. In these domains, researchers from the nature and nurture camps have competed for explaining the same phenomena. This competition is less apparent in many other domains of gender research, such as sex-linked visual-spatial abilities, in which researchers have tended to emphasize one account and disregard the other.

Examples of the Yin and Yang of Nature and Nurture

Debates about nature and nurture explanations of sex-related differences have been especially intense with respect to (a) the developmental research area of socialization as an influence on sex-differentiated behavior and (b) the social psychological topic of the mate preferences of men and women. Despite nature–nurture debates, meta-analyses have been important in clarifying findings in both of these areas of research.

Socialization

Socialization, understood as a "process by which individuals acquire social skills or other characteristics necessary to function effectively in society or in a particular group" (American Psychological Association, 2013), is a prominent nurture explanation of sex differences. The theme also has engaged the advocates of nature, who often discount the influence of socialization. It is thus not surprising that the explanatory viability of socialization has fluctuated over the years in psychological science. For the past quarter century, the nature–nurture dynamic was defined in part by developmentalists' gradual retreat from an overriding emphasis on parental socialization, which

was a legacy of psychoanalytic theory (e.g., Freud, 1927) and social learning theory (Bandura, 1977; Mischel, 1966). Thus, from the 1960s onward, developmental psychologists had noted the considerable inconsistencies in the evidence that parents treat boys and girls differently (e.g., Huston, 1983; Maccoby & Jacklin, 1974; Sears, Rau, & Alpert, 1965).

In the last 25 years, developmental psychologists have increasingly recognized the complexity of nurture influences (Leaper, 2013). Researchers have documented a wide range of such influences, including that of peer groups (J. R. Harris, 1995; Maccoby, 1998) and teachers (e.g., Jussim, Eccles, & Madon, 1996), and many have emphasized interactions between children's traits, developmental processes, and sociocultural contexts (e.g., Bronfenbrenner & Morris, 2006). Concerning the processes through which socialization operates, many studies have addressed the formation of gender cognitions through which children regulate their own behavior (Bussey & Bandura, 1992; Ruble & Martin, 1998). Moreover, developmentalists also recognize the social interactive processes of emulation and conformity (e.g., Wiese & Freund, 2011) as well as the pervasive nonconscious processes whereby children absorb cultural stereotypes from their social context, including media (Signorielli, 2012). The scientific understanding of socialization has thus become considerably more complex during the past quarter century.

The rise of nature interpretations of child behavior. Along with the growth of nurture theories in the last quarter century, the rise of nature interpretations of child behavior reflects in part the erosion of blank slate notions of children. Thus, even much earlier, Bell (1968) argued that research supported “the effects of congenital factors in children on parent behavior” (p. 81) and pointed out that the direction of causation between parental and child attributes is ambiguous in correlational data. Also, research had produced evidence of robust, early-emerging sex differences in temperament, which are generally understood as broad biologically influenced tendencies that are precursors of adult personality. Despite progress in investigating biological causes of these sex differences (Berenbaum & Beltz, 2011; Berenbaum, Blakemore, & Beltz, 2011), the mechanisms underlying them have remained unclear (e.g., Fine, 2010; Jordan-Young, 2010). For example, the hypothesized effects of prenatal androgens on humans' brain lateralization have not received consistent support (e.g., see meta-analysis by Pfannkuche, Bouma, & Groothuis, 2009).

Whatever the specific underlying causes, even young children differ mainly on two aspects of temperament: *surgency* and *effortful control* (see meta-analysis by Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006). The greater surgency of boys includes motor activity, impulsivity, and

experience of pleasure from high-intensity activities. In contrast, girls' effortful control emerges in the self-regulatory skills of greater attention span, ability to focus and shift attention, and inhibitory control, and it includes their greater perceptual sensitivity and experience of pleasure from low-intensity activities. In meta-analytic estimates based on studies analyzing these two dimensions as multiattribute factors, these sex differences were large on effortful control ($d = -1.01$) and moderate on surgency ($d = 0.55$). Such research lent credence to nature interpretations of sex-differentiated child behavior.

Also furthering the plausibility of nature interpretations of sex differences and similarities were the results of a meta-analysis by Lytton and Romney (1991), which produced little evidence that parents differentially encourage broadly defined psychological attributes such as aggressiveness in sons and daughters. Although evolutionary psychologists have taken this meta-analysis as evidence that socialization matters little in child development (e.g., Campbell, 2012), nurture-oriented developmentalists have countered such claims by moving beyond the simple socialization theories that thrived in the 1950s and 1960s.

The resurgence of nurture explanations of child behavior. With increased understanding of the complexity of socialization, researchers now take account of variables that can modulate the effects of parental behavior. Research guided by such theories has discovered sex-differentiated socialization practices within narrower categories of behavior, critical periods in development, naturalistic settings, and varying family contexts (see reviews by Blakemore, Berenbaum, & Liben, 2009; McHale, Crouter, & Whiteman, 2003). For example, mothers tend to use more supportive speech and talk more with daughters than sons (see meta-analysis by Leaper, Anderson, & Sanders, 1998), and parents grant less autonomy to their daughters than their sons and discourage their physical risk taking (e.g., Morrongiello & Hogg, 2004; Pomerantz & Ruble, 1998). Moreover, the Lytton and Romney (1991) meta-analysis documented parents' differential treatment of girls and boys in one important domain: Parents encourage and expect gender-typical behavior in play and household chores and discourage gender-atypical activities ($d = 0.43$), thereby creating affordances for conventionally gender-typed behaviors (e.g., nurturing for girls).

Even when evidence of differential treatment of girls and boys is established and associated with predicted sex differences in children's behaviors, causal links can remain uncertain. Given mutual influence between parents and children as well as the possible influence of the genetic similarity of parents and children (Plomin, 1994), the nature–nurture implications of correlational findings

can be unclear. To isolate the parent-to-child aspect of mutual influence, developmental psychologists have occasionally relied on experiments. However, ethical restraints essentially limit experiments manipulating parental socialization to interventions designed to yield better parenting or marital relations (see Cowan & Cowan, 2002). Experiments specifically targeted to explaining sex-typed behavior have been conducted in school settings by varying educational materials, teachers' behaviors, or children's social contexts (e.g., Banerjee & Lintern, 2000; Karniol & Gal-Disegni, 2009). For example, in an experiment by Hilliard and Liben (2010), teachers who did make gender salient in their classrooms produced stronger gender stereotypes among their pupils as well as less positive attitudes toward peers of the other sex and less willingness to play with them. Quasi-experiments have exploited changes in local environments (e.g., the introduction of television in a remote Canadian town; Kimball, 1986) to demonstrate gender-relevant effects such as increased stereotyping. Research using experimental methods has thus substantiated some of the causal pathways that link socialization to sex-differentiated outcomes. Also, statistical techniques designed to estimate causal relations in correlational data (e.g., longitudinal designs, structural equation modeling) have proven successful in clarifying socialization processes (e.g., Simpkins, Fredericks, & Eccles, 2012).

Possibilities for nature-nurture interactive theories. Studies of socialization would benefit from more integrative nature and nurture approaches to developmental processes. Possibilities abound for researchers studying how proposed biological mechanisms interact with social influences. Such research might, for example, clarify interactions between early-emerging temperamental differences and children's subsequent experiences. For example, the tendency for parents and other socializers to engage in more physical, rough-and-tumble play with boys than girls (Lindzey & Mize, 2001) may emerge at least in part from the greater pleasure that boys experience from such activities.

Although psychologists who are partial to nature explanations continue to discount the influence of socialization, they occasionally recognize some very specific processes that fit within the larger framework of evolutionary psychology (e.g., Campbell, 2012; Confer et al., 2010). For example, Confer et al. acknowledged the greater efforts of parents to control the sexual behavior of their daughters than their sons, a tendency that they ascribed to evolutionarily relevant principles such as preserving their daughter's mate value.

Advocates of sociocultural causation also would benefit from broader, more integrative models acknowledging the relevance of evolution to understanding socialization. One way that evolution is important to socialization is that

humans' evolved dispositions include the fundamental human predisposition to imitate others and engage in social processes of emulation, collaborative learning, and teaching (Hill, Barton, & Hurtado, 2009; Meltzoff, 2007). These predispositions orient children to quickly acquire skills and knowledge suited to the social context in which they live. Moreover, the long juvenile period of humans magnifies the importance of social learning.

All in all, the study of socialization is ripe for the development of more interactive models. The impressive advances during the past quarter century have laid the groundwork for the emergence of theories that cross nature–nurture boundaries.

Mate preferences

The contrast between nature and nurture explanations has been drawn sharply in the study of sex differences in preferences for a mate. Historically, many researchers have evaluated what women and men desire in their romantic partners, but this question became prominent in the late 1980s as a result of the important role of reproduction in evolutionary psychology (Buss, 1989; Kenrick, Maner, & Li, 2005). Based on the logic of sexual selection theory, women were predicted to invest more than men in reproduction (e.g., gestation, lactation) and thus to gain fitness (i.e., the ability to survive, reproduce, and propagate their genes) from mates who support them and their offspring. In this view, men, in contrast, gain fitness from being sexually promiscuous with fertile women.

Sex differences in promiscuity. Spurred largely by these predictions of evolutionary psychology, researchers documented a variety of ways in which men are more promiscuous than women (see Buss & Schmitt, 2011). However, the accuracy of this basic generalization about sexuality has been challenged, based in part on questions about the appropriate statistical treatment of highly skewed distributions of self-reported preferences (Pedersen, Putcha-Bhagavatula, & Miller, 2011). Moreover, specific findings suggesting men's greater promiscuity have been increasingly linked to nurture causes—especially social norms for sexuality. For example, the classic finding that men are more likely than women to agree to have casual sex with a stranger (Clark & Hatfield, 1989) depends on the social context and the sexual opportunity. No sex differences in interest in casual sex emerged when the potential partner was a famous, attractive person or someone reputed to be sexually skilled (Conley, 2011). Furthermore, although men report more diverse and earlier sexual experiences than women when their responses might become known to others, these sex differences in reported sexuality decreased and sometimes reversed when accuracy was paramount

(Alexander & Fisher, 2003). Also, the lesser selectivity of men than women is influenced by the social norm in which men approach women. In a speed-dating context, the physical act of approaching potential romantic partners engendered more favorable assessments of them, and the sex difference in selectivity disappeared when the women approached and the men stayed put (Finkel & Eastwick, 2009). In these ways, nurture-oriented researchers explain the sex difference in promiscuity emphasized by evolutionary psychologists.

Sex differences in partner preferences. Sexual selection theory also anticipates differences in the specific attributes that men and women desire in a partner, and these were documented in a series of meta-analyses published in the early 1990s. As summarized across questionnaire studies, women placed higher value than men on attributes linked to resource provision, yielding moderate to large effect sizes for socioeconomic status ($d = 0.75$) and ambitiousness ($d = 0.55$) and smaller ones for character, intelligence, and humor (d s = 0.22 to 0.29; Feingold, 1992), with comparable sex differences found in studies examining personal ads. Also, men valued physical attractiveness in interaction partners and potential mates more than women across five different research paradigms, with larger sex differences in studies examining self-reports compared with behavioral measures (d s ranged from 0.32 to 0.54; Feingold, 1990). However, the limited time frames and the largely North American samples in the reviewed research did not allow for sophisticated tests of whether, as predicted by evolutionary psychology, these preferences were universal across cultures and time periods (see Feingold, 1992).

Providing evidence of social influences on mate preferences, subsequent research highlighted the striking changes that have occurred in the sexes' preferences over the last half century in industrialized societies, as women have entered the labor force in increasingly large numbers. According to nurture theories, individuals value attributes in a partner that they believe will enable them to reproduce and prosper, given the current division of labor in their society. In support of this assumption, men in more recent years increasingly prefer women with good financial prospects, education, and intelligence and decreasingly prefer skill at cooking and housekeeping, whereas women increasingly desire men with good looks and decreasingly desire good financial prospects, ambition, and industriousness (Boxer, Noonan, & Whelan, in press; Buss, Shackelford, Kirkpatrick, & Larsen, 2001). These preferences for financial support and education appear to influence actual mate choices: The traditional tendency for men with higher earnings and higher education to be more likely to marry has recently been

extended to women, whose greater earnings and education now predict greater likelihood of marriage (England & Bearak, 2012; Macunovich, 2011; Sweeney, 2002; Sweeney & Cancian, 2004). These changes over time, as well as the narrowing of the age gap at first marriages (U.S. Census Bureau, 2012), have encouraged nurture theorists to emphasize the social construction of mate preferences to accommodate the social roles of women and men in society.

The contrast between nature and nurture predictors of mate preferences is brought into sharp relief by the repeated analyses, conducted by different research groups, of an innovative data set of self-reported preferences in 37 cultures initially collected by Buss (1989). In his initial analysis of these data, Buss noted a universal pattern of sex differences across cultures consistent with the evolutionary psychology assumption that women have evolved preferences for long-term mates who are older and possess resources (e.g., ambition, social status), whereas men have evolved preferences for younger, physically attractive mates.

A decade later, Eagly and Wood (1999) reanalyzed these data to evaluate the extent to which mate preferences varied with the roles of men and women, in particular with the extent to which nations had a gender-unequal division of labor in which women were homemakers and men primary family providers. When sex differences in mate preferences within each society were correlated with indicators of the relative status of women provided by the United Nations, the preferences of men and women differed more in countries with greater gender inequality and less comparable roles between the sexes. That is, in less gender-equal societies comprised of women as homemakers and men as providers, women were more likely to seek an older mate with resources and men were more likely to seek a younger mate with homemaking and childcare skills. In addition to this influence of gender equality on the size of the sex differences, in all 37 cultures, men placed more emphasis on mates' homemaker qualities and women placed more emphasis on mates' economic resources. Eagly and Wood (1999) argued that this uniformity likely reflects not biologically encoded preferences, but the lower status and power of women than men that existed in all nations in the sample, despite variability in the amount of this inequality.

Buss and colleagues (Gangestad, Haselton, & Buss, 2006) subsequently argued that evolved dispositions could explain the variation in sex differences across cultures. Specifically, they reported that the prevalence of parasites in each culture predicted the size of several sex differences, including women's greater preference for men's intelligence and men's greater preference for

women's attractiveness. Furthermore, nation's gender equality had little impact after statistically controlling for parasite prevalence and other national factors (e.g., income, distance from the equator). These results were taken as evidence that women and men possess specialized mating adaptations that are activated in response to environmental cues associated with fitness in evolutionary history. In this "evoked" cultural view, variation in sex differences arises across cultures as circumstances evoke different biological adaptations.

This debate about how to account for mate preferences across cultures was resolved by researchers not identified with either of the earlier analyses. Zentner and Mitura (2012) used a recently developed, more accurate indicator of national gender equality, which captures the gap between men and women independently of other cultural and socioeconomic factors. Also, these researchers predicted sex-differentiated mate preferences on a more reliable measure aggregated across the mate attributes and on measures of the individual attributes. In the original 37 cultures sample and in a new, Internet sample, they demonstrated smaller sex differences in more gender-equal societies. This research also ruled out a number of potential confounds in interpreting the differences across cultures, thereby demonstrating that nations' gender equality predicted mate preferences even after controlling for such factors as nations' geographic distance from the equator and gross domestic product. The overall pattern suggests that women and men construct mate preferences within a particular division of labor and value partners with attributes that are useful for male and female roles in the society.¹

The controversy over interpretations of the cross-cultural data on mate preferences is noteworthy because it directly contrasts nature and nurture accounts for the same data. More commonly, researchers in each tradition attempt to account for sex differences and similarities without testing for the potential impact of the other set of factors. Yet, persuasive support for any perspective requires tests of alternative hypotheses along with tests of the postulated mechanisms that produce the sex difference outcomes. Evolutionary psychology, because of its gene-centered approach, ultimately requires biological evidence for the postulated sex-specific mental modules that are presumed to have evolved early in human history due to enduring sexual selection pressures. If human behavior is largely an expression of evolved genetic programs, then supporting evidence ultimately rests on a plausible genetic account, accompanied by evidence concerning associated hormonal processes and neural structures (see Lickliter & Honeycutt, 2003). Social constructive theories also require direct tests of mediation, in this case involving sociocultural causes of mate preferences (for example, see Eagly, Eastwick, & Johannesen-Schmidt, 2009; Witt & Wood, 2010). Both evolutionary

and cultural theories of psychological sex differences fall short if they fail to provide direct evidence supportive of the presumed causal mechanisms underlying sex-typed behaviors.

Mating theories that integrate hormonal influences and social roles. More sophisticated, interactive models appear to be emerging in the study of mate preferences, especially with respect to the hormonal and neural mechanisms involved in social interaction. In humans, mating no doubt invokes multiple neural and hormonal systems and also is highly responsive to social contexts (see Wood & Eagly, 2012). These biological systems were shaped in part through ancient selection pressures associated with perceptual, sensory, and motivational processes that humans share with other animals. Across human evolutionary history, these relations also were shaped by biological systems that evolved within complex social groups (Heatheron, 2011). As a result, hormones such as testosterone and oxytocin may be implicated in the neural circuitry involved in self-regulation and control with respect to social choices such as mating (see Mehta & Beer, 2010).

Given the complex role of hormones in human mate choice, some relatively simple tests of endocrine mediation have received little support (e.g., effects of menstrual cycles on mate preferences; C. R. Harris, 2011; see the meta-analysis by Wood, Kressel, Joshi, & Louie, 2012). Nonetheless, reproductive roles have striking influences on hormonal processes. Men and women in close relationships have lower testosterone levels (Booth, Granger, Mazur, & Kivlighan, 2006; van Anders & Watson, 2007), and men and women seeking relationships show higher testosterone levels, presumably because of the competition they experience (Gettler, McDade, Feranil, & Kuzawa, 2011; van Anders & Goldey, 2010). By demonstrating how hormonal processes are embedded in social mating and parenting relations, such studies allow researchers to begin to build interactive models that integrate nature and nurture (see van Anders, Goldey, & Kuo, 2011). In general, this research highlights how the evolution of sophisticated neural and hormonal systems enabled women and men to tailor their behaviors to meet prevailing social demands.

Interactionist Theories That Integrate Nature and Nurture

Despite the widespread acknowledgement among gender researchers that sex differences and similarities in behavior reflect both nature and nurture, most theoretical analyses emphasize one or the other set of causes. Few theories at present are truly interactionist by considering the intertwined contributions of biological and sociocultural influences. More typically, researchers focus on one

type of potential causal mechanism without outlining a clear role for the other type. Thus, theories of genetic and hormonal influences often do not consider the social context in which these processes function, whereas social construction theories often do not recognize the biology that is being construed.

The idea that nature and nurture causation can be partitioned is inherent in the sex versus gender separation that emerged from feminist discussions in the 1970s (e.g., Unger, 1979). However, if the attributes of men and women stem from intertwined nature and nurture causation, this distinction is at best scientifically awkward. Our solution is to define the term *sex* by its common-language meaning of categories “into which humans and most other living things are divided on the basis of their reproductive functions” (Oxford English Dictionary, 2013). Observed differences between women and men are termed *sex differences*, regardless of their causes. The term *gender* is then free to refer to the meanings that individuals and societies ascribe to males and females (e.g., gender stereotypes).

In moving beyond dualistic sex/gender thinking, psychologists can treat culture and biology not as separate influences but as interacting components of nature and nurture. One challenge in constructing specific interactive theories is that both nature and nurture are multifaceted. Given that biology is a complex array of factors as are sociocultural environments, each interactionist theory of sex differences models only a portion of potential biosocial interactions. To illustrate such approaches, we describe several efforts, each of which theorizes particular interactions and thereby provides a partial mapping of intertwined nature and nurture.

Genetic influences depend on the social environment

In one important type of nature–nurture interaction, genes function not as encapsulated units of heredity, but as response systems that are highly contingent on environmental input (Lickliter & Honeycutt, 2003). Therefore, the genetic sex difference does not simply program males and females for different behavior. As Fisher (2006) wrote in relation to the brain, “Genes do not specify behaviors or cognitive processes; they make regulatory factors, signaling molecules, receptors, enzymes, and so on, that interact in highly complex networks, modulated by environmental influences, in order to build and maintain the brain” (p. 270).

The timing of menarche in adolescent girls illustrates this kind of interactionist thinking (see Allison & Hyde, 2013). Age of onset is regulated biologically by the maturation of the adrenal glands and the regulatory effects of

the hypothalamic–pituitary–gonadal axis. This biological phenomenon varies in important ways due to contextual factors, as suggested by girls beginning menstruation as early as 12 years in some urban postindustrial areas and as late as 18 years in rural highland Papua New Guinea or high altitude Nepali groups. Research extending over many years has shown that aspects of some girls’ social environments, especially father absence and family disruption, are associated with earlier menarche.

To account for the various influences on menarche, Ellis and his colleagues have proposed an evolutionary-developmental model whereby father absence and maternal depression negatively affect the quality of family relationships (Ellis, 2004; James, Ellis, Schlomer, & Garber, 2012). In girls but not boys, lower familial quality accelerates pubertal maturation, signaled by earlier menarche and younger sexual activity. In view of the similar effects of low socioeconomic status, these effects are assumed to be mediated in girls by the release of stress hormones (cortisol and epinephrine) via the hypothalamic–pituitary–adrenal axis, which also releases adrenal androgens that facilitate the initial stage of pubertal development and in turn stimulate the development of the gonads and secondary sexual characteristics. This research area thus integrates certain environmental variables with biological processes critical to female sexual maturation.

Biological and social vulnerabilities in depression

Sex-related aspects of clinical depression provide another example of interactive theorizing. Research has identified multiple biological and environmental factors associated with women’s greater incidence of depression, thus calling for interactionist theories that take these factors into account. In their cognitive-vulnerability/transactional-stress theory, Hankin and Abramson (2001) incorporated genetic cognitive factors that combine with negative events to produce the negative affect that can precipitate depression. In their ABC (i.e., affective, biological, cognitive) theory of women’s greater incidence of depression, Hyde, Mezulis, and Abramson (2008) considered interactions among multiple sources of vulnerability: the affective propensity of emotional reactivity; biological propensities such as genetic vulnerability, pubertal hormones, and pubertal timing and development; and cognitive propensities such as cognitive style, objectified body consciousness, and rumination. When combined with negative life events, these vulnerabilities heighten girls’ rates of depression beginning in adolescence. These two efforts thus illustrate the emerging understanding of biosocial interactions in clinical psychology.

Evoked culture

Evolutionary psychologists offer a different form of interactionism, known as the *evoked culture model* (Tooby & Cosmides, 1992). In this approach, natural selection endowed humans with many cognitive modules that address specific adaptive problems that occurred frequently in the ancestral past (e.g., abundance vs. famine). Current environmental cues then can evoke one or a set of these domain-specific, inherited behavioral strategies, thereby producing variability in behavior (Buss & Schmitt, 2011). The metaphor of a jukebox provides an apt description of this theory (Tooby & Cosmides, 1992). Different behaviors (metaphorically, songs) were genetically coded early in human history, and the current social and cultural context triggers them. This model is interactionist in the limited sense that current environmental cues evoke mechanisms built into the minds of ancestral humans. Yet the fact that human fitness estimated by population growth has spiked under relatively recent, evolutionarily novel conditions involving social technology and dense urban living conditions challenges the sufficiency of a model that focuses primarily on adaptations to prehistoric environments.

Biosocial constructionist theory

According to another important type of interactionist thinking, sociocultural factors shape the meanings that individuals and societies ascribe to men and women—meanings that rest on a biology in which most individuals possess *XX* or *XY* chromosomes. This biological difference emerges in human societies as a division of labor as the effects of male and female biology are moderated by the social environment. Our own biosocial constructionist theory takes this approach to understanding nature–nurture interactions (Wood & Eagly, 2002, 2012). This account emphasizes humans' evolved capacities to innovate and communicate with others and thereby to produce a cumulative culture in which beliefs and practices are shared and subsequently modified. These capacities, arising from the novel, nonrecurring environments of the late Pleistocene Era, are a product of humans' adaptation not primarily to particular environmental features, but to variation itself, which favored capacities for responsiveness to novel environments (Richerson & Boyd, 2005).

In human societies, psychological flexibility is constrained in both sexes by a female–male division of labor that varies in form across societies. Through proximal mediators, this division of labor yields the familiar psychologies of women and men. The specific activities that comprise the division of labor derive in part from male and female biology—that is, their evolved physical

attributes, especially women's reproductive activities and men's size and strength, which can allow some activities to be more efficiently performed by one sex or the other depending on the socioeconomic and ecological context. Human biology thus interacts with the environment to produce a division of labor.

Within societies, the division of labor is created and perpetuated through social psychological processes involved in forming gender role beliefs that make the contemporaneous division of labor seem natural and inevitable. Gender roles encourage most adults to conform to these shared beliefs, given that other people generally accept and support individuals who act in accordance with these roles. Gender roles also are internalized as personal standards for individuals' behavior, thus facilitating self-regulatory behavior. These social psychological influences act in concert with biological processes involving hormones to support the sociocultural factors that guide masculine and feminine behaviors within cultures (Wood & Eagly, 2010, 2012).

In this model, subcortical structures interact with more recently evolved, general purpose, higher brain functions associated with the neocortex that allow people to respond flexibly to others' expectations and their own identities (Heatherton, 2011; Panksepp & Panksepp, 2000). Thus, by a confluence of biological and social processes, the sexes organize behavior into patterns that are tailored to their contemporary conditions.

The various interactive models we consider are certainly not the last word on the dynamic interrelations between nature and nurture that guide sex differences and similarities. Many additional models are likely to develop in future years to capture research developments that help to clarify the ways that nature and nurture interact. It will remain challenging to create models that take into account the large number of biological and sociocultural processes that influence the psychology of women and men.

Implications of Research on the Psychology of Gender

The psychology of gender is an extremely active area of scientific psychology, with a very large production of journal articles during the last quarter century (see data in Eagly et al., 2012). One overriding theme in much of this research is an emphasis on features of either nature or nurture as causes of sex-related behavior. In this article, we provided a historical context for some of the trends in psychologists' attention to nature and nurture. We considered past work that treated each cause as independent of the other along with work that competitively tested each cause against the other. Finally, we noted instances of integration by biosocial models that outline

interactions between the nature and nurture underlying the psychology of women and men.

Regardless of the nature or nurture focus of research on sex and gender, it often attracts popular attention. People are interested in these topics because they touch on issues of personal identity and their own life choices. The considerable media attention devoted to many investigations of sex-related attributes is thus not surprising. Two recent examples are research on the mathematical abilities of girls and boys (Hyde, Lindberg, Linn, Ellis, & Williams, 2008, reported by Park, 2008) and research on social identity threats for women in male-dominated work settings (Holleran, Whitehead, Schmader, & Mehl, 2011, reported by Vedantam, 2012). Of course, such media reports provide highly condensed summaries of scientific articles, very often presenting mere snippets of complex research programs. Such publicity potentially informs popular beliefs, given experiments that have demonstrated belief shifts after participants read articles ascribing sex differences to biological versus sociocultural causes (e.g., Brescoll & LaFrance, 2004). However, these effects may be short lived outside of the lab. The extent to which the public retains media reports over time and uses them to inform their broader theories about gender is unknown. We suspect that the brevity and often contradictory quality of reports of scientific findings diminish their influence.

The lack of influence of psychological research on public discourse about broad gender-related topics, which we illustrated by the Slaughter (2012) article, should give pause to the community of psychological researchers. We ascribe this inattention at least in part to psychology's inconsistent messages about nature and nurture causes of sex-typed behavior. Without a more integrative stance, psychology provides little clear basis for public reasoning about gender issues. Yet some writers do focus on parts of psychological science by, for example, favoring an evolutionary psychology narrative of evolved dispositions or a social psychological narrative of prejudice, stereotype threat, and backlash effects. The diversity of psychology's theories and findings allows lay people to select freely from them on the basis of their own ideology.

A coherent message from psychology would require integration of the diverse streams of research on gender into biosocial interaction theories that acknowledge causal roles for both biological and social influences on the psychology of women and men. Research that tests interactive theories is more difficult to design than research testing simple, sovereign theories. Also hindering such integrative theories, psychological scientists, like people in general, have biases that limit their own understanding of the psychology of gender. As seen in research on biases in judgment and decision making, scientists are

clever about setting up tests and conducting analyses to favor their own theories and are highly critical of findings that challenge their ideas (Mahoney, 1977; Wagenmakers, Wetzels, Borsboom, van der Maas, & Kievit, 2012).

Research on gender may be especially subject to biasing beliefs, given that investigations of gender and sex are relevant to scientists' own social identities. In social psychology, bias in favor of the groups in which people have membership is a well-established phenomenon (see Yzerbyt & Demoulin, 2010). Ingroup bias, presumed to emerge from a need for positive social identity, motivates people to evaluate their own social groups more favorably than other groups (Ellemers & Haslam, 2012). Because most people, including scientists, are profoundly identified with their gender (Witt & Wood, 2010; Wood & Eagly, 2009), they may unwittingly reason in favor of their own group. For example, several meta-analyses testing for sex-of-author effects have found that male and female researchers produced findings that portrayed their own gender more favorably than did researchers of the other sex (e.g., Anderson & Leaper, 1998; see Eagly, 2012, for review). Even more troubling are experiments that manipulated the favorability of research findings to each sex and established that participants of both sexes were more positive about findings that portrayed their own sex favorably (Morton, Haslam, Postmes, & Ryan, 2006). This effect was more pronounced among participants who possessed at least some scientific training, thus raising doubts about whether scientific training or knowledge mitigates this type of bias. All in all, it is likely that ideological and ingroup biases cloud scientific knowledge about the psychology of gender.

Conclusion

We believe that the future of science pertaining to gender and sex differences lies in overcoming ideological and identity biases and formulating theories that effectively integrate principles of nature and nurture into interactionist approaches. Yet, the complexity of such theories presents intellectual challenges for psychological scientists who try to model the intrinsic dependence of nature on nurture and vice versa. Perhaps as a result, research has tended to focus on one or the other type of cause, yielding a muddled scientific voice in public discourse. Adding further difficulties, the media and public need simplifying frameworks that facilitate using scientific evidence to reason about gender in daily life. Excellent communication is essential because any messages from psychological science on gender issues compete with robust informal reasoning based on ideology, everyday observation, and cultural traditions. Among the competing informational sources on sex and gender, science may not be winning.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Note

1. Cross-cultural comparisons, especially in self-reports of personality traits and preferences, do not always reveal smaller sex differences in societies with greater gender equality. Instead, as Wood and Eagly (2012) argued, these ratings may depend on the comparison standards against which respondents compare themselves. A shifting standard of comparison could disguise sex differences in gender-unequal societies if people compare with same-sex groups in gender unequal societies but mixed-sex groups in more gender equal ones (Biernat, 2003).

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