Counterpoint: Physiologists should not distinguish sex and gender

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Goal

In the accompanying Opinion, King (11) presents exHORTS physiologists to distinguish the terms sex and gender consistently. As a counterpoint, I present here other perspectives that suggest that we physiologists should not attempt to construct separate sex difference and gender difference categories.

What is gender?

A “proper” use of sex and gender, whether the concepts are used heuristically or operationally, requires that the terms have clear, distinct definitions. Gender has no such definition. King (11) offers three not entirely consistent definitions. The first definition is that gender is a social construction limited to “social, cultural and psychological aspects that pertain to traits, norms, stereotypes and roles …for those whom society has designated male or female” (5) which do not “exist within a person” (7). As used in physiology and medicine, however, “psychological aspects” and “traits” certainly exist within persons. The second definition, from the American Psychological Association (1) limits gender to “use when referring to men and women as social groups.” This definition apparently excludes individuals, so is inconsistent with the first definition. Furthermore, because the main concerns of physiology and medicine are individuals, not groups, it seems irrelevant to physiology. The third definition, from the Institute of Medicine (24), combines elements of the first two: gender includes both an individuals’ self-representation as male or female and how the individual is responded to by “social institutions.” There is, however, a crucial difference. The difference is that the causes of “self representation” are not limited to socially constructed causes. Thus, gender may include biologically caused aspects of self representation. For this reason, this definition seems inconsistent with either of the first two. Which concept of gender are physiologists enjoined to use properly?

What is sex?

Sex can also be difficult to determine. That the ambiguous cases are relatively rare does not make them irrelevant for the purposes of definition and usage. In describing transsexual individuals, King asserts that “sex is the proper term to refer to their anatomy.” This is not quite identical to the definition of the Institute of Medicine (24), that sex refers to “the reproductive organs and functions that derive from the chromosomal complement.” Both are biologically naïve in that they suggest there is an unambiguous definition of male and female sex as physical phenotypes. In their authoritative review, Grumbach et al. (9) write that “sex determination and differentiation are sequential processes that involve successive establishment of chromosomal (and genetic) sex in the zygote at the moment of conception, determination of gonadal (primary) sex by the genetic sex, and regulation by the gonadal sex of the differentiation of the genital apparatus and, hence, the phenotypic sex” (p. 842). Note that anatomy is the third level of this hierarchical determination of sex. In accordance with this biological complexity, the authors distinguish chromosomal (or karyotypic), genetic, gonadal and hormonal sex in adults and describe how the vagaries and complexities of each of these processes can result in different, intermediate outcomes.

Consideration of genetic sex is illuminating. The SRY gene was identified as the testes-determining factor only about 20 y ago (16). Expression of this gene early in development is apparently necessary and sufficient to set male differentiation in motion
In both sexes, however, differentiation involves activation of a cascade of different genes well past early development. Several genetic and chromosomal variants have been identified that interfere with different points in these cascades, resulting in a range of phenotypic outcomes, including varying degrees of sex reversal. Furthermore, in addition to SRY, other genes have been identified whose expression is required throughout life in order to actively repress the Sertoli cell-promoting gene SOX9 in females (9, 22). In mice, failure of this repression at any age causes the ovaries to convert to testes and to secrete testosterone. As Uhlenhaut and colleagues (22) point out, disorders in these genetic mechanisms seem to have the potential to produce varying degrees of physical masculinization at any stage of life. It is conceivable that they have psychological effects as well.

**Determinants of sexuality**

Gender entered the medical lexicon with John Money’s use of the concepts gender role in 1955 and gender identity in 1966 (13, 14). It is noteworthy that Money (14) regards the idea that sex is what you are biologically and gender is what you become socially as “scientifically debased.” Rather, gender identity and role result from complex interactions among genetic, hormonal, and social factors. The concepts are still in wide use in medicine (9, 20). Sadock (20), in a standard psychiatric reference, defines sexuality as gender identity and the associated thoughts, feelings, behaviors and unconscious neural processes. Gender identity, the person’s sense of maleness of femaleness and the consequences of that, is seen as intrinsically connected to biological sexual characteristics on the one side and to personality traits on the other. Thus, gender identity seems to include self representation as described in the Institute of Medicine’s (24) definition of gender.

According to Sadock (20), when biological and social factors are concordant, children typically develop a “firm conviction” of gender identity by age 2-3 y. These early cognitions, feelings and behaviors are of course developed and elaborated through adulthood. Drescher and Byne (6) aptly describe gender identity as phenomena “that are associated with biological sex, but not necessarily determined by it.” The point is that there is no time when biology is clearly not involved. As described above, biological mechanisms that may influence gender identity are still being discovered.

When biological variables are not in concordance, for example in a number of genetic or congenital developmental disorders (9), children are often ambivalent about their gender identity. Gender identity issues also occur in the absence of physical signs. The typical presentation is a child who, despite the parents’ efforts, “behaives like the opposite sex” (8). Very strong feelings of this type constitute gender identity disorder (which includes what was formerly known as transsexualism and transvestism). These disorders appear to have important biological components. Evidence for this includes (i) patterns of familial transmission, (ii) causation by gonadal hormone dysfunction, for example in congenital adrenal hyperplasia or polycystic ovary syndrome, and (iii) sex-atypical volumes and neurochemical phenotypes of the sexually differentiated area of the bed nucleus of the stria terminalis (8, 12). Persons with gender identity disorder usually are pleased with surgical, hormonal and psychological sex-reassignment therapy (8, 21). Conversely, the majority of persons who undergo sex-reassigned early in life without evidence of gender identity disorder later reject the assigned sex roles (8, 19). These data strongly support the idea that biological factors are usually decisive in gender identity.
A physiological view

The back and forth translation between animal and human research embodied in modern physiology is based on the phylogenetic unity of life. According to this view of life, physiologists should seek connections between human and animal physiology, not assume that none exist. The assertion that “non-human animals do not display gender differences” (11) seems to me to ill-advised. It is possible, even likely, that some human mental function has neither phylogenetic roots nor specific physiological mechanisms. I find it unlikely that sexuality (or other behaviors and feelings related to basic biological functions) have no such roots. Rather, I take as a working hypothesis that low-level components of the hierarchical neuronal networks mediating some complex aspects of human sexuality are phylogenetically preserved elements that are also found in some animal species. Furthermore, I suggest that this hypothesis should not be rejected lightly. Doing so may have the unintended consequence of discouraging translational physiology and possibly retarding mechanistic understanding of some aspects of human sexuality. The Institute of Medicine (24) also seems to leave this possibility open: They say that “sex should be used in most studies of non–human animals” – thus, gender is appropriate in some. Absolute exclusions in biology are usually unwise.

Potential bases for such translational research in this area have been established. Male-female differences in many behaviors have been described in a variety of animals, including behaviors not specifically related to reproduction such as activity, play, exploration variety of animals, including rats and mice (17, 23). Furthermore, some higher psychological functions necessary for gender identity seem to be present in some animals. For example, anthropoid apes have a form of self-representation (18) and understand some intentions of others (3, 4). More reductive translational research, involving species that do not form even rudimentary self-representations, can be envisioned. As mentioned above, it is possible that gender identity results in part from brain processes that have phylogenetic roots. If so, it is easy to imagine that useful research on gender identity could be done one day in very reduced models, for example cell culture.

Conclusion

According to the OED (15) gender, like genus, derives from Latin and Greek words meaning “different” and has been in use since the 14th C as a synonym for sex. Should physiologists change this in favor of distinguishing sex and gender according to whether the male-female difference in question is biologically or socially determined? Based on definitional issues, data on sexual differentiation and on determinants of gender identity, underlying physiological theory, and potentially deleterious effects on scientific progress, I conclude that such a distinction is scientifically unworkable and undesirable.

REFERENCES


