**Instructor’s Manual**

to accompany

*Discovering Human Sexuality,* Fifth Edition

LeVay • Baldwin • Baldwin

***Chapter 4: Sex Development and Diversity***

## Chapter Overview

Men and women differ genetically, hormonally, anatomically, physiologically, and behaviorally. Sex is initially determined by the presence of either XX or XY chromosomes. The Y chromosome carries the SRY gene, which triggers the development of the testes. The testes secrete AMH, which causes the degeneration of the Müllerian ducts. The embryonic testes also secrete androgens, and this triggers the development of the Wolffian ducts into a male’s internal anatomy. Ovaries develop in XX embryos, and the absence of AMH allows the Müllerian ducts to continue development. The lack of androgens in females triggers the regression of the Wolffian ducts. External genitals develop from a common precursor, but the male external genitals require the presence of DHT, a potent androgen.

Male and female brains differ in anatomy, physiology, and chemistry. Sexual differentiation of the male and female brain occurs both during prenatal development and later during puberty in the presence of sex hormones. Sometimes, sexual development and sexual differentiation goes awry. This can result in several conditions, such as Klinefelter syndrome, Turner syndrome, congenital adrenal hyperplasia, and androgen insensitivity syndrome. The treatment for children with ambiguous genitalia remains a topic of controversy.

Men and women tend to differ in a variety of cognitive and personality traits. Gender identity is a person’s internal sense of being male, female, or some combination of both. Sex roles are social behaviors believed to be characteristic of one sex or the other, or some blend of the two. On average, women outperform men in cognitive tasks such as fine movement, select memory tasks, and verbal fluency. Men, on average, outperform women in visuospatial skills. Men and women also differ in various personality variables such as aggression, sensitivity, and emotional stability. They vary in areas of sexuality as well, such as sex drive, interest in visual sexual stimuli, casual sex, jealousy styles, sexual orientation, and frequency of masturbation.

Many psychological sex differences appear early in life and are influenced by both biological and social factors. Biological factors include genes and sex hormones, while social factors include imitation and the rewards and punishments that accompany sex-typical or sex-atypical behaviors. Boys tend to be more active and aggressive, and girls are often more interested in socializing. Toy preference also differs between boys and girls. Cognitive developmental models emphasize the thought processes that occur as children grow, interpret the social world in which they live, and gradually develop a gendered sense of themselves.

Transgender people do not identify as the gender they were assigned at birth, while transexual people seek to change their anatomical sex. All transexual women, and some transexual men, have childhood histories of gender nonconformity, and generally have sexual attractions to people of the same gender they were assigned at birth. Transitioning is a multistage process involving assessment, psychotherapy, experience living as their preferred gender, as well as hormonal and surgical intervention. For a variety of reasons, not all transgender people seek sex-reassignment procedures. Sex-reassignment surgery tends to have better outcomes for male-to-female reassignments. Many transgender people face discrimination, persecution, and victimization, and some states fail to offer them legal protections.

## Chapter Outline

**4.1 Genes and Hormones Guide Sex Development**

*Learning Objectives:*

*4.1.1 Name the sex chromosomes possessed by females and males and explain how this sex difference arises.*

*4.1.2 Name the precursors of the female and male reproductive tracts, describe what happens to them in both sexes, and identify the hormones that control these events.*

*4.1.3 Identify homologous structures in the external genitals of females and males, and the common embryonic structures from which they develop.*

*4.1.4 Describe or sketch how sex hormone levels change from conception to old age in females and males.*

Female and male reproductive tracts develop from different precursors

Female and male external genitalia develop from the same precursors

The gonads descend during development

Sex hormone levels change over the lifespan

The brain also differentiates sexually

**4.2 Sex Development Is Not Always Binary**

*Learning Objectives:*

*4.2.1 Give two examples of disorders of sex development that are caused by atypical complements of sex chromosomes, and name the chromosomal patterns that cause them.*

*4.2.2 Explain how a chromosomally male fetus develops if it carries a mutation that makes it insensitive to androgens.*

*4.2.3 Explain the possible anatomical and psychological effects of congenital adrenal hyperplasia.*

*4.2.4 Explain the sexual development of a chromosomally male individual that lacks the enzyme 5-alpha-reductase.*

Unusual sets of chromosomes affect growth and fertility

The gonads or genitals may be sexually ambiguous

Box 4.1: My Life with Androgen Insensitivity Syndrome

Box 4.2: Intersex and Sports

**4.3 There Are Sex Differences in Many Mental Traits**

*Learning Objectives:*

*4.3.1 Give examples of gender differences in areas other than sexuality.*

*4.3.2 Give examples of gender differences in the area of sexuality.*

Gender identity does not always match anatomical sex

Women and men differ in a variety of cognitive and personality traits

There are many differences in sexuality

Many sex differences arise early in life

**4.4 Biological Factors Contribute to Sex Differences**

*Learning Objectives:*

*4.4.1 Give an example of how evolution has promoted gender differences.*

*4.4.2 Give an example of how sex hormones during development influence gender differences.*

Evolutionary forces act differently on females and males

Experiments demonstrate a role for sex hormones

Box 4.3: Gendered Play in Primates

**4.5 Life Experiences Mold Sex Roles**

*Learning Objectives:*

*4.5.1 Give an example of how socialization promotes gender differences.*

*4.5.2 Discuss the evidence that imitation is important in the development of gender differences.*

*4.5.3 Explain how “sexual scripts” influence gender differences.*

Girls and boys are socialized differently

Cognitive developmental models emphasize thought processes

**4.6 Transgender People Challenge Society’s Deepest Divide**

*Learning Objectives:*

*4.6.1 Compare the life experiences of transgender people in Western and non-Western societies.*

*4.6.2 Compare the life histories of a typical autogynephilic and nonautogynephilic (“classical”) trans woman.*

*4.6.3 Evaluate different strategies for responding to a child who insists they belong to the other sex from their natal sex.*

*4.6.4 Evaluate the controversy about “rapid-onset gender dysphoria.”*

*4.6.5 Explain some of the stresses and risks to which trans people are exposed.*

Transgender men and women have existed in many cultures

Many transgender people are “beyond the binary”

Transexual individuals are of more than one kind

Changing sex is a multistage process

Early treatment of gender-dysphoric children is controversial

Trans people struggle for awareness and acceptance

Box 4.4 Rapid-Onset Gender Dysphoria

## Chapter Summary

* Sex is usually determined by the sex chromosomes: The XX pattern causes female development, and the XY pattern causes male development. The key player in male development is the gene SRY, on the Y chromosome, which induces the embryo’s genital ridges to become testes. In the absence of SRY, other genes induce the genital ridges to become ovaries.
* The male and female internal reproductive tracts develop from different precursors—the Wolffian and Müllerian ducts. In XY embryos, the testes secrete anti-Müllerian hormone (AMH), which causes the Müllerian ducts to regress, as well as androgens, which cause the Wolffian ducts to develop further and produce the male internal anatomy. In XY embryos lacking functional androgen receptors (a condition called androgen insensitivity syndrome), neither the male nor the female reproductive tract develops. In XX embryos, the lack of AMH allows the Müllerian ducts to develop further, and the lack of androgens allows the Wolffian ducts to regress, producing the female internal anatomy.
* The external genitalia of the two sexes develop from common precursors. The urethral folds give rise to the inner labia in females and to the shaft of the penis in males. The genital swellings give rise to the outer labia in females and the scrotum in males. The genital tubercle forms the glans of the clitoris in females and the glans of the penis in males. Male-typical development of the external genitalia requires the presence of testosterone and its conversion to 5α-dihydrotestosterone (DHT). In female fetuses that are exposed to high levels of androgens (as in congenital adrenal hyperplasia), the external genitalia are partially masculinized.
* Male and female brains differ in structure, chemistry, and function. Some sexual differentiation of the brain occurs prenatally—high levels of androgens drive male-typical brain development, and low levels permit female-typical development. At puberty and thereafter, estrogens become important in establishing and maintaining female-typical body structure and function and also influence the brain.
* Examples of atypical sex development include chromosomal anomalies such as Klinefelter syndrome (XXY or XXXY) and Turner syndrome (XO), as well as genetic conditions that affect sex hormone production (e.g., congenital adrenal hyperplasia) or the body’s sensitivity to sex hormones (e.g., androgen insensitivity syndrome). The proper treatment of children with ambiguous genitalia is a subject of controversy.
* Many psychological characteristics differ to a great or lesser extent between females and males. Gender identity is a person’s core sense of being a female, a male, or a combination of the two. Sex roles are the sets of behaviors that represent a person as male, female, or non-binary.
* On average, women outperform men in fine movements, verbal fluency, and some aspects of memory. Men outperform women in some cognitive traits, such as visuospatial skills. Personality differences include greater aggressiveness in men.
* In the area of sexuality, men and women differ in the strength of sex drive, interest in casual sex, interest in visual sexual stimuli, styles of jealousy, sexual orientation, interest in unusual forms of sexual expression, likelihood of engaging in coercive sex, sexual risk taking, willingness to pay for sex, frequency of masturbation, sexual response cycles, and the duration of reproductive capacity over the lifespan. Most psychological sex differences show considerable overlap between the sexes, and their significance is debated.
* Many gender differences arise early in life. Boys are typically more active and aggressive; girls are more interested in socializing. Boys and girls prefer different toys, and both prefer to associate with children of their own sex. Sex-specific interaction styles develop within these same-sex groups. Differences in other cognitive traits emerge gradually during childhood.
* Biological factors help create these sex differences. These include genes that have evolved to help men and women improve their reproductive success. A role for sex hormones, especially during prenatal life, is illustrated by experiments on animals, by observation of humans affected by endocrinological disorders, and by the study of anatomical markers (such as finger length ratios) that are correlated with gender traits.
* Socialization influences sex differences. This can happen through the innumerable rewards and punishments that children receive from parents and others. Imitation also has an important influence on sex roles.
* Several cognitive developmental models stress the importance of children’s thought processes in the development of gender identity. In sexual script theory, the learning of sex roles involves the social negotiation of roles, such as those to be played by the man and woman in heterosexual relationships.
* Transgender people are those whose gender identity does not fully correspond to their natal sex. Transexuals are transgender people who seek to change their anatomical sex: They may transition from male to female (transexual women) or from female to male (transexual men). The change may involve hormone treatment and sex-reassignment (gender confirmation) surgery, or just hormone treatment. All transexual women and some transexual men have a childhood history of strong gender nonconformity. They dislike the bodily changes induced by puberty and may attempt to conceal them. They are usually homosexual in the sense that they are sexually attracted to persons of the same natal sex as themselves. They usually do not identify as gay, however, but rather as heterosexual individuals of the sex with which they identify. Some transexual women are sexually attracted to women. Some or most of these individuals have a different developmental history, in which their desire to change sex develops from a wish to incorporate the sex characteristics of their preferred sexual partners (women) into their own bodies (autogynephilia).
* Transitioning is a multistage process. It includes assessment and psychotherapy, living for some period in the identity of the other sex, hormonal treatments, and, often, sex-reassignment surgery. Genitals can be transformed into those of the other sex, but the procedure is expensive and, particularly in the case of female-to-male reassignment, can yield inadequate results. Not all people who transition undergo genital surgery. Many transexual women and men are satisfied with the results of sex reassignment and are able to surmount the social and sexual challenges of post-transition life.
* Many transgender people do not seek sex reassignment, for a variety of reasons. They may not fully identify with either sex. Some believe that sex reassignment would be unnecessary if society could be persuaded to abandon its obsession with the binary nature of gender. All transgender people face the possibility of discrimination victimization, and many states fail to offer them specific protections.

## Class Discussion Questions

1. How is gender identity different from biological sex?

2. How might individuals with conditions of intersexuality influence and enlighten our definition and understanding of gender?

3. Revisit **Box 4.2: Intersex and Sports**. Do you agree or disagree with the 2018 IAAF’s ruling that states that intersex women must lower their testosterone levels at least six months before competing in particular sports?

4. Generally, women and men differ in their performance with certain cognitive tasks. Do you think that socialization contributes to these differences? Why or why not?

5. Who do you think should decide which bathroom a person uses? Should it be determined by the individual, the law, larger society, or some other group?

6. You read a newspaper story about a family that supports their 4-year-old son who identifies and dresses as a girl. What interventions do you think would be most appropriate for this child as she begins school?

7. Transgender youth who lack social support are at an increased risk of suicide and suicidal ideation. Considering this, should all transgender youth be offered hormone therapy, even though some treatments are permanent? Why or why not?

## Videos to Facilitate Classroom Discussion

1. [“9 Things You Need to Know about Being Intersex” (MTV)](http://www.youtube.com/watch?v=CTYIjXSdZxA)

2. [“Human Sexuality Is Complicated” (Vlogbrothers)](http://www.youtube.com/watch?v=xXAoG8vAyzI)

3. [“These Gender Reveals Are Out of This World” (Inside Edition)](https://www.youtube.com/watch?v=xnDMxb3l5t0)

4. [“WTF Is Gender?” (As/Is)](http://www.youtube.com/watch?v=j8OnyI7VdX8)

5. [“Transgender Identity, in Their Words” (CNN)](https://edition.cnn.com/videos/us/2017/01/30/transgender-identity-jpm-orig.cnn)

## Teaching Resources

1. [GenderCreativeKids.ca](https://gendercreativekids.ca/) (resources for gender creative kids and their families, schools and communities)

2. [The Genderbread Person](https://www.genderbread.org/) (a teaching tool for breaking gender down into bit-sized, digestible pieces)

3. [“Fooling the Heteros: Vintage Drag Queens” (CLVT Nation)](http://www.cvltnation.com/fooling-the-heteros-vintage-drag-queens/)

4. [“Vaginoplasty: Male to Female Sex Reassignment Surgery” (Lynn Conway)](http://ai.eecs.umich.edu/people/conway/TS/SRS.html)

5. [“How Gender Reassignment Surgery Works (Infographic)” (LiveScience)](https://www.livescience.com/39170-how-gender-reassignment-surgery-works-infographic.html)

6. [Vintage photographs by Nadar of a young intersexed man (Wikipedia)](https://en.wikipedia.org/wiki/Hermaphrodite_%28Nadar%29)

7. Huegel Madrone, K. (2018). *LGBTQ: The survival guide for lesbian, gay, bisexual, transgender and questioning teens,* third edition. Free Spirit Publishing.

8. [“10 Handsome Men (Who Were Born Female)” (Oddee)](http://www.oddee.com/item_98038.aspx)

9. [List of films that address trans and intersex themes (IBDb)](http://www.imdb.com/list/ls051371235/)

10. [Intersex Society of North America website](http://www.isna.org/faq/what_is_intersex)

11. [“Follow a Transgender Teen’s Emotional Journey to Womanhood” (National Geographic)](https://www.youtube.com/watch?v=Uqnpmpj7YD8)

12. Jennings, J. (2016). *Being Jazz:* *My life as a (transgender) teen*. Ember.

13. [“Great Diverse Children’s Books with Transgender, Non-Binary and Gender Expansive Children”](https://www.welcomingschools.org/pages/looking-at-gender-identity-with-childrens-books/)

## Recommended Reading

Baron-Cohen, S. (2012). *The essential difference: Men, women, and the extreme male brain*. Penguin.

Beltz, A. M., Blakemore, J. E. O. & Berenbaum, S. A. (2013). *Sex differences in brain and behavioral development.* In: Rubenstein, J. & Rakic, P. (Eds.), Neural circuit development and function in the brain (Vol. 3 of Comprehensive Developmental Neuroscience). Academic.

Bertelloni, S. & Hiort, O. (Eds.). (2010). *New concepts for human disorders of sexual development*. Karger.

Bornstein, K. & Bergman, S. B. (2010). *Gender outlaws: The next generation.* Seal.

Buss, D. M. (2016). *The evolution of desire: Strategies for mating* (rev. ed.). Basic Books.

Colapinto, J. (2000). *As nature made him: The boy who was raised as a girl*. HarperCollins.

Drescher, J. & Byne, W. (Eds.). (2012). *Treating transgender children and adolescents: An interdisciplinary discussion.* Routledge.

Erickson-Schroth, L. (2014). *Trans bodies, trans selves: A resource for the transgender community.* Oxford University Press.

Mayor, A. (2014). *The Amazons: Lives and legends of warrior women across the ancient world.* Princeton.

Miller, D. I. & Halpern, D. F. (2014). The new science of cognitive sex differences. *Trends in Cognitive Sciences,* 18, 37–45.

Pfaff, D. (2010). *Man and woman: An inside story*. Oxford University Press.

Wade, L. & Ferree, M. M. (2019). *Gender: Ideas, interactions, institutions* (2nd ed.). W.W. Norton.

## Key Terms

5-alpha-reductase deficiency

anal fold

anatomical sex

androgen insensitivity syndrome (AIS)

anti-Müllerian hormone (AMH)

assigned sex

autogynephilia

chromosomal sex

chromosome

cisgender

cloaca

cognitive

congenital adrenal hyperplasia (CAH)

cryptorchidism

disorders of sex development

gender dysphoria

gender identity

genital swelling

genital tubercle

gonadal sex

hijra

homologous

hypospadias

intersex

kathoey

Klinefelter syndrome

mahu

metoidioplasty

Müllerian duct

natal sex

ovotesticular disorder

personality

puberty

rapid-onset gender dysphoria

sex chromosome

sex-reassignment surgery (or gender confirmation surgery)

sex role

sexual orientation

sexual script

SRY

stereotype

transexual (or transsexual)

transgender (or trans)

transitioning

transphobia

transvestism

triple-X syndrome

Turner syndrome

two-spirit person

urethral folds

urogenital sinus

Wolffian duct

X chromosome

XYY syndrome

Y chromosome