

CHAPTER 3



Sexual Arousal and Response

PHYSICAL

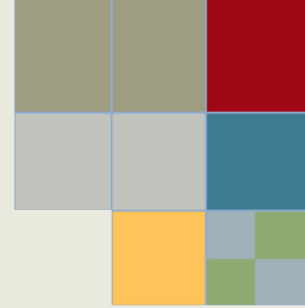
SOCIAL

EMOTIONAL

SPIRITUAL

COGNITIVE

- **One Advantage of Being *Homo sapiens***
Unlike other mammals, human females are continuously responsive to and available for sexual activity, independent of ovulation.
- **Biological Foundations for Sexual Arousal and Response**
The brain and central nervous system, including the five senses, play roles of varying importance in human sexual arousal and response.
- **Sex Hormones**
The sex hormones, including testosterone, the estrogens, progesterone, oxytocin, and vasopressin, play crucial roles in regulating sexuality.
- **The Sexual Response Cycle**
There are a number of theories regarding the events of sexual arousal and response, including Masters and Johnson's EPOR model; Kaplan's model of desire, excitement, and orgasm; and Reed's ESP model.
- **Orgasm**
Men and women experience orgasm, the peak of sexual arousal, somewhat differently. The events and frequency of female orgasm vary more than those of male orgasm.
- **Sexuality and Disabilities**
Although they may interfere with sexual arousal and response, physical and psychological disabilities don't necessarily preclude sexual expression.



Sexual arousal, a heightened state of sexual interest and excitement, has both psychological and physical bases. There is much more to sex than the physical process of intercourse. Without the subjective feeling of pleasure, physiological arousal will not occur. However, knowledge of the physical changes that occur during sexual arousal is essential to a complete understanding of human sexuality. Sexual arousal and response are influenced by a number of factors. Of course, what one person finds sexually arousing, another might not. The patterns we will describe in the following pages can vary from person to person, and even from experience to experience.

Other biological factors and sensory processes also play significant roles in the **sexual response cycle**, the series of physiological processes and events that occur during sexual activity. In this chapter we focus primarily on the biology of sexual response. Later chapters will describe the influences of our emotional, social, and cultural needs on our sexual experiences.

ONE ADVANTAGE OF BEING HOMO SAPIENS

Unlike most species, humans engage in a great deal of sexual behavior that is not reproductive. But how much of our sexual response is preprogrammed, or biological, and how much is learned, either through personal experience or cultural expectations? This question has particular significance in the discussion of individual variations in sexual arousal as well as the differences between males and females.

Is mating, even among animals other than humans, just about reproduction? The **estrous** cycle, sometimes referred to simply as *estrus*, is the periodic state of sexual excitement in the female of most mammals, excluding humans, that immediately precedes ovulation and during which the female is most receptive to mating.

The cycle may range in length from 18 to 35 days (Jolly, 1972), a period that is much longer than necessary simply for fertilization. It is unlikely that all of the behavior that occurs during this time is for the purpose of reproduction. For example, females mate with many more males than is necessary for fertilization (Hrdy, 1981). Furthermore, although estrus is usually absent during pregnancy, some mammals may continue sexual activity during this time.

We can be certain that no member of the genus *Homo* ever experienced estrus. However, we can only guess at whether any of our pre-*Homo* ancestors were ever “in heat.” One sure sign that evolution is progress is the unique capability of human females for continuous response to and availability for sexual activity, independent of ovulation (see CONSIDERATIONS box).

BIOLOGICAL FOUNDATIONS FOR SEXUAL AROUSAL AND RESPONSE

Which body parts do you most closely associate with sex? Although vaginal lubrication and an erect penis are more obvious physical signs of sexual arousal, it is important to remember that the genitals are not the only organs involved in sexual arousal and response; many body systems contribute to this process.

Sexual Arousal: heightened state of sexual interest and excitement

Sexual Response Cycle: physiological processes and events that occur during sexual activity

Estrous: the cycle of most female nonprimate mammals when they are most sexually receptive to males

Prime Mates

CONSIDERATIONS

Because *Homo sapiens* share about 98 percent of their genetic material with both chimpanzees and bonobos, studying these evolutionary relatives can be useful in our understanding of human behavior.

The bonobos were described by Frans de Waal in his 1997 book *Bonobo: The Forgotten Ape*. Unlike their chimpanzee cousins, who are known for violence, male domination, and sexual efficiency, bonobos are peaceful, egalitarian, and lead sex-filled lives in the tropical forests of the Republic of Congo in Central Africa. According to de Waal, bonobos, not humans, appear to be the most sexual primates. They are constantly having sex of every variety, both heterosexual and homosexual, and with partners of all ages.

Adult male bonobos grab and mouth each other's genitals. Females regularly have sex with each other by placing their pelvises together, either face-to-face or rear-to-rear, and rubbing each other rapidly. Juvenile male bonobos suck on each other's penises and allow adult males to fondle them. They also participate whenever adults have sex by poking fingers and toes into the adults' body parts. Male and female bonobos copulate in both the typical mammalian back-to-front position and the face-to-face position, either standing or lying down with either the male or female on top. Furthermore, bonobos manually stimulate themselves and each other.

What makes bonobo sexuality of interest to researchers is that they use sex not only for reproduction but also just for the fun of it. Bonobos suggest that our idealization of private, monogamous sexual behavior might be a relatively recent deviation from our evolutionary heritage. Like bonobos, our ancestors may have used sex on a daily basis to form alliances, trade goods and favors, establish friendships, and keep the peace (Small, 1995).



According to Frans de Waal, bonobos, not humans, appear to be the most sexual primates. They are constantly having sex of every variety, both heterosexual and homosexual, and with partners of all ages.



Why should we be interested in bonobo sexuality?

- Do you think that studying bonobos adds to our knowledge of human sexual behavior?
- Do you think that primates and humans are too different for us to learn much from them?

Orgasm: the peak state of sexual excitement; it is marked by rhythmic contractions of the pelvic floor muscles

Cerebral Cortex: thin outer layer of the brain's cerebrum that is responsible for higher mental processes including perception, thought, and memory

Limbic System: a group of interconnected deep brain structures that especially influence motivation and emotion

The Brain

We may talk about following our hearts, but it is actually our brains that direct a great deal of our sexual behavior. The male erection and female vaginal lubrication may be triggered by direct stimulation, but it is the brain that interprets the stimulation and begins the process of sexual arousal and response. Motivation, desire, and behavior also are part of the thinking brain, the “executive function” that exercises volition, choice, and self-control. Even when we think we’re “behaving like animals,” very little of our conduct is really automatic.

Fisher and Byrne (1978) tested the arousal value of sex films on both male and female participants. Half the viewers in their study saw soft-core films in which the actors and actresses kept their underwear on, while the rest saw hard-core films with full nudity and explicit sex. To the researchers' surprise, the participants were equally aroused regardless of how explicit the film was. In this same study, the researchers tested the role of the thought process in sexual arousal. Prior to viewing the film, viewers were given different story lines for the sex scenes they watched. Some were told that the people on

the screen were newlyweds. Others were told they were a prostitute and a client. Still others were told the scene involved a young man and woman who had just met each other at a dance. The context had a great degree of influence on how aroused the subjects became. Both male and female viewers were more aroused when they thought they were watching sex between two people who had just met. The prostitution and newlywed themes elicited lower levels of arousal (on both self-report and physiological measures), even though viewers were seeing exactly the same video clip. In other words, arousal depended less on what people actually saw than on what they thought it meant.

While various parts of the brain are involved in sexual response and behavior, the two most important are the **cerebral cortex** and the **limbic system** (Figure 3.1). The upper part of the brain, the cerebral cortex, is the “thinking center” of the brain, and is the area of the brain responsible for sexual fantasies, desires, thoughts, and images (it is also responsible for nonsexual thought processes). When the brain receives arousing messages, the cerebral cortex interprets this sensory information and transmits messages through the spinal cord causing an increase in heartbeat and respiration (breathing), which can alter muscle tension (or myotonia), send blood to the genitals, and increase skin sensitivity. Your ability to consciously identify these physical changes can actually contribute to your sexual arousal.

The limbic system, located within the cerebrum in the area below the cortex, consists of the *thalamus*, the *hypothalamus*, and other structures important to sexual arousal. This complex group of structures controls our emotions, motivations, memories, and behavioral drives (Everitt, 1990). In 1939, Heinrich Klüver and Paul Buey first demonstrated the importance of the limbic system in regulating sexual behavior in animals. When they destroyed certain areas of the limbic system, it tamed wild monkeys, but also triggered an increase in the frequency, intensity, and ability to perform sexual behaviors.

Sex and the Senses

The five human senses—*touch*, *sight*, *smell*, *hearing*, and *taste*—all contribute to sexual arousal and to the sexual response cycle. However, the same sensory stimulation can evoke different responses in different people. In one study (Herz & Cahill, 1997), researchers asked men and women to rate the importance of olfactory (smell), visual (sight), auditory (sound), and tactile (touch) information on their sexual response. Males rated visual and olfactory information as equally important in the selection of a

FAQ:

Can you have an orgasm just by thinking about sex?

The brain has been called our most important sexual organ. Sexual sensations, including **orgasm**, may be triggered by sexual stimulation that originates in the brain in the form of thoughts, fantasies, or memories. We can become aroused by images, words, aromas, and sounds, or without any outside sensory stimulation whatsoever in the form of thoughts, fantasies, or memories. Your brain, glands, nervous system, circulatory system, and reproductive system are all involved in your sexual fantasies. The fact that many people become sexually aroused during sleep, sometimes even to the point of orgasm, is one important sign that the brain contains all the information necessary to produce sexual arousal (at least sometimes).

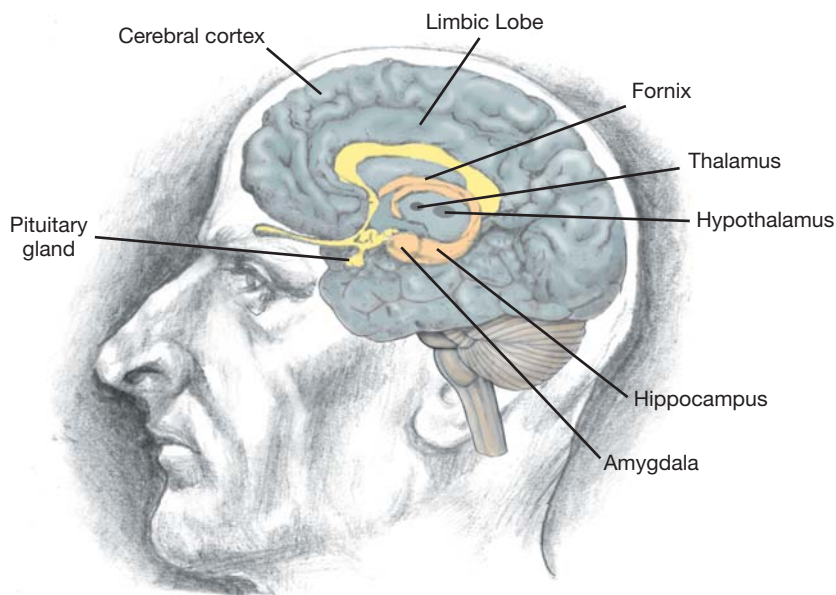


FIGURE 3.1 The limbic system of the brain, associated with emotion and motivation, is important in human sexual function.

FAQ:**What are erogenous zones?**

Nerve endings are unevenly distributed throughout the body, causing some areas to be more sensitive to touch than others. Those body areas most sensitive to tactile stimulation are sometimes referred to as **erogenous zones**. The erogenous zones of the human body include the genitals, buttocks, anus, perineum, breasts, and inner surfaces of the thighs, neck, ears, navel, armpits, and mouth. As you have already learned, areas that may be extremely sensitive in one person may provoke no reaction, or even a negative reaction, in another. The only way to determine the location of your partner's erogenous zones is through experimentation.

Erogenous Zones: parts of the body that are especially sensitive to stimulation



Touch is probably the most frequent method of sexual arousal and has the most direct effect on sexual response.

lover, while females considered olfactory information to be the single most important variable; in the words of an old television commercial, "If he stinks, forget it!" (The ad was for deodorant, of course!) When considering what sense had the most negative effect on sexual desire, females rated body odor highest; males regarded smells as being much more neutral stimuli for sexual arousal (Herz & Cahill, 1997).

Touch The skin is the largest organ in the human body. Stimulating an area of the body by touch is probably the most frequent method of sexual arousal and has the most direct effect on sexual response. A soft kiss on the lips, a tender touch on the arm, or a gentle lick on the ear all can be highly arousing, as can stroking a penis or the brushing of lips across a nipple.

Sight Visual information plays a major role in sexual arousal. The fashion, diet, and cosmetic industries, as well as the market for erotic photographs and movies, reflect the emphasis our society places on visual arousal. Animals other than humans also use visual cues to signal sexual attraction. The peacock's plumage and the lion's mane may be the animal kingdom's version of a low-cut blouse or skin-tight jeans.

Studies show that men and women respond differently to visual stimulation. In one study, 54 percent of the men but only 12 percent of women became erotically aroused when they were shown photos and drawings of nudes (Reinisch, 1991).

Smell Recent research indicates that the sense of smell may control human sexual activity, compatibility, group behavior, and other social activity, just as it does in animals (Stern & McClintock 1998). In Chapter 2 we introduced pheromones, naturally produced chemicals that affect behavior through the sense of smell. The pheromones produced by a queen bee inhibit the sexual development in other females, who then become workers. Male mice use pheromones to promote the sexual development of nearby females, and if a sow or a cow in heat smells the pheromones contained in male urine she will take a mating stance (see **CROSS-CULTURAL PERSPECTIVES** box).

Only recently has the presence of human pheromones been confirmed. One study evaluated the effect of synthesized male pheromones placed in an aftershave lotion on six behaviors in men: petting, formal dates, informal dates, sleeping next to a romantic partner, sexual intercourse, and masturbation. Pheromone users had increased rates of intercourse, sleeping with romantic partners, petting, and informal dates; there was no effect on masturbation or formal dates (Cutler et al., 1998). Although the full extent to which pheromones influence human sexual behavior is unknown, researchers suspect that different pheromones may control different activities.

CROSS-CULTURAL PERSPECTIVES**Sex Scents**

Olfactory preferences are determined in large part by culture. Women in some societies use their vaginal secretions as a perfume, rubbing some behind the ear or on the neck to attract and arouse sexual partners. Sweat is an almost universal ingredient in love potions throughout the world. In parts of the Balkans and Greece some

men carry handkerchiefs in their armpits during festivals and offer these as tokens to women they invite to dance. In contrast, in America, most people think that the smell of a moist vagina or sweaty armpit would not be appealing, and indeed many people regularly use deodorants to conceal these odors from a dating partner.



Visual cues play a major role in sexual arousal.



Our sense of hearing influences sexual arousal and response. Sex and love have been the inspiration for music and music is often used to set a romantic mood.

Hearing Our sense of hearing also influences sexual arousal and response. For some, romantic music may set the mood (see CONSIDERATIONS box). Others may be sexually aroused when their lovers “talk dirty” or moan during lovemaking.

Tiny hair cells in the inner ear vibrate to transmit sounds. By examining these cells, researchers have found women’s ears to be more sensitive than men’s. Females hear high-pitched sounds better than males while men are more comfortable with louder sounds than women (Bloom, 1998).

In one study, male college students were shown 60-second erotic videos both with and without the accompanying audio. There was a significant positive correlation between male sexual arousal and sound, as measured by penile plethysmograph and self-report (Gaith & Plaud, 1997).

Another study found that a male partner’s silence during lovemaking inhibited the female partner’s sexual response (DeMartino, 1990). However, silence might be preferable to some other sounds, such as your partner burping during an embrace or the ringing of the phone. Many people find the sound of the words “I love you” to be the most arousing of all.

Taste The role of taste in human sexual arousal has not been fully investigated. Some individuals may be sexually aroused by the taste of vaginal secretions or seminal fluid. It is possible that genital secretions contain chemicals that have an arousing effect, or it may be the psychological association of the flavors with past sexual pleasure that cause the excitement.

Aural Sex

CONSIDERATIONS

Whether it is Ravel’s “Bolero” or Barry White, music can simulate or stimulate sexual activity. Sounds of ecstasy have been a staple of pop music since the 1960s. Songs that contain sounds of female orgasm include: Marvin Gaye’s “You Sure Love to Ball” (1973), Donna Summer’s “Love to Love You Baby” (1975), Duran Duran’s “Hungry Like the Wolf” (1982), Prince’s “If The Kid Can’t Make You Come” (1984), and Prince’s “Orgasm” (1995). Sounds of male sexual pleasure are rarely heard in music. Perhaps this is because sound may be the only indication that some men have of women’s orgasm, whereas women have more obvious physical evidence of a male partner’s climax (Corbett & Kapsalis, 1996). The disembodied female vocalist

“oohing” and “aahing” herself into the throes of ecstasy “may stand as the most prominent signifier of female pleasure in the absence of other more visual assurances. Sounds of pleasure . . . seem almost to flout the realist function of anchoring body to image, halfway becoming aural fetishes of the female pleasures we cannot see” (Williams, 1989, pp. 122–123).

? *Is there a song that almost always puts you in the mood for love?*

—What sounds, or words, do you like most, and least, to hear when making love?

—Can you think of a sound that would be an absolute turnoff?

FAQ:

What smells arouse men the most? What do women like best?

A research study measured changes in penile response and vaginal blood flow in response to different odors (Hirsch, 1998). In contrast to what the floral and perfume industries would have us believe, the study reported that the odors found most arousing were not flowers or cologne. The aromas that evoked the greatest response in men were pumpkin pie and lavender, while women were most stimulated by the smell of licorice coated candy (Good & Plenty), cucumbers, and baby powder. None of the odors tested was found to inhibit the sexual desire of men. However, smells that inhibited vaginal blood flow in women included cherries, charcoal-barbecued meat, and men’s colognes. This same researcher theorized that odors might act directly on the link between the olfactory sense and the brain’s limbic system (Hirsch, 1998).

In a 1980 study, Farb and Armelagos noted that the tradition of giving a box of chocolates on Valentine's Day might have arisen because chocolate contains phenylethylamine (PEA), a chemical believed to produce a lovelike sensation. Then again, foods such as salami and cheddar cheese have even higher levels of PEA—although few people would consider a deli sandwich an appropriate romantic gift. Chocolate also contains cannabinoids, the compound responsible for marijuana's high, although the amount isn't remotely close to that found in marijuana. In addition, the stimulants caffeine and theobromine are hidden in those delicious chocolate bars. The fat and sugar in chocolate candies are also likely to increase the volume of the brain chemical serotonin, which among other functions is responsible for making us feel good.

SEX HORMONES

The word *hormone* comes from the Greek *horman*, which means to arouse, to excite, to urge—which is exactly what our hormones do. Hormones, chemical substances secreted by your endocrine system (Table 3.1) arouse, excite, and influence your sexuality throughout your life. The endocrine system is a separate control system for the body, apart from the nervous system, and is comprised of ductless glands that release secretions directly into the bloodstream. There are several different types of hormones. For example, if you are in a stressful situation, hormones are deposited into the bloodstream by the adrenal, pituitary, thyroid, and other glands, resulting in an increase in heart rate, muscle tension, blood pressure, and perspiration. Sexual arousal works in a similar way. When you are aroused by a sexual stimulus, your endocrine system is activated, hormones are secreted, and changes occur in your body. Although androgens (from the Greek *andros*, for male) are commonly referred to as male sex hormones and estrogen (from the Greek *oistros*, for gadfly or frenzy) as the female sex hormone, neither hormone is gender exclusive. The difference is how much hormone circulates in the bloodstream.

Testosterone

Testosterone, the most important androgen, is secreted in small amounts by the adrenal glands in both males and females and in much larger amounts by the testes (Figure 3.2 on page 82). On average, men have at least 10 times more testosterone than women do (Worthman, 1999). Women produce testosterone in their ovaries and adrenal glands. The brain can convert testosterone into estradiol (a form of estrogen) so that the so-called male hormone becomes the so-called female hormone. In women, testosterone increases the flow of estrogen to the center of the brain that controls sexual motivation and drive. Each of us inherits a certain baseline level of testosterone, but testosterone levels are not constant; they fluctuate on a daily cycle and in response to daily events. Research has shown that testosterone levels change in response to physical, emotional, and intellectual challenges (Booth et al., 1992; Booth et al., 1995). On average, testosterone levels of U.S. males tend to go into a steady decline after age 20; the hormone's concentration in the blood decreases by about 30 percent by the time a male reaches 80.

In the developing human fetus, testosterone provides the early signal for the development of a male body, and it is responsible for the primary differences in male and female appearance. Even in adults, an imbalance in testosterone levels can alter body shape. It is clear that testosterone interacts with the nerve cells that make up the brain. We are not certain, however, what role the hormone plays in the development of personality and behavior (Blum, 1997).

A decrease in testosterone often is associated with a decline in male sexuality. In an attempt to restore their virility, in the 1920s physicians actually grafted monkey testes onto aging men (Blum, 1997). However, this pattern of hormone decline with aging is not universal. A cross-cultural study (Worthman, Beall, & Stallings, 1997) indicated that male subjects in Bolivia had a modest decrease in testosterone levels after

TABLE 3.1

Hormones of the Reproductive System

Hormone	Source	Regulation of secretion	Primary effects
Gonadotropin-releasing hormone (GnRH)	Hypothalamus	Males: inhibited by testosterone and possibly by inhibin. Females: GnRH pulse frequency increased by estrogens, decreased by progestins	Stimulates FSH secretion, LH synthesis
Follicle-stimulating hormone (FSH)	Anterior pituitary	Males: stimulated by GnRH, inhibited by inhibin. Females: stimulated by GnRH, inhibited by inhibin	Males: stimulates spermatogenesis through effects on sustentacular cells Females: stimulates follicle development, estrogen production, and oocyte maturation
Luteinizing hormone (LH)	Anterior pituitary	Males: stimulated by GnRH. Females: production stimulated by GnRH, secretion by the combination of high GnRH pulse frequencies and high estrogen levels	Males: stimulates interstitial cells to secrete testosterone Females: stimulates ovulation, formation of corpus luteum, and progestin secretion
Androgens (primarily testosterone and dihydrotestosterone)	Interstitial cells of testes	Stimulated by LH	Establish and maintain secondary sex characteristics and sexual behavior; promote maturation of spermatozoa; inhibit GnRH secretion
Estrogens (primarily estradiol)	Granulosa and thecal cells of developing follicles; corpus luteum	Stimulated by FSH	Stimulate LH secretion (at high levels); establish and maintain secondary sex characteristics and sexual behavior; stimulate repair and growth of endometrium; increase frequency of GnRH pulses
Progestins (primarily progesterone)	Granulosa cells from midcycle through functional life of corpus luteum	Stimulated by LH	Stimulate endometrial growth and glandular secretion; reduce frequency of GnRH pulses
Inhibin	Sustentacular cells of testes and granulosa cells of ovaries	Males: stimulated by factors released by developing spermatozoa. Females: stimulated by developing follicles	Inhibits secretion of FSH and possibly of GnRH

SOURCE: Martini, 2000, p. 1057.

age 30, with hormone levels remaining relatively stable after that time. On the other hand, testosterone levels in Tibetan males do not peak until the late 50s and then fall precipitously during the 60s and 70s. Neither the cause nor the possible significance of these variations is known.

There is as much controversy about the connection between blood levels of testosterone and measures of sexual desire, or **libido**, as there is about the connection

Libido: sexual desire

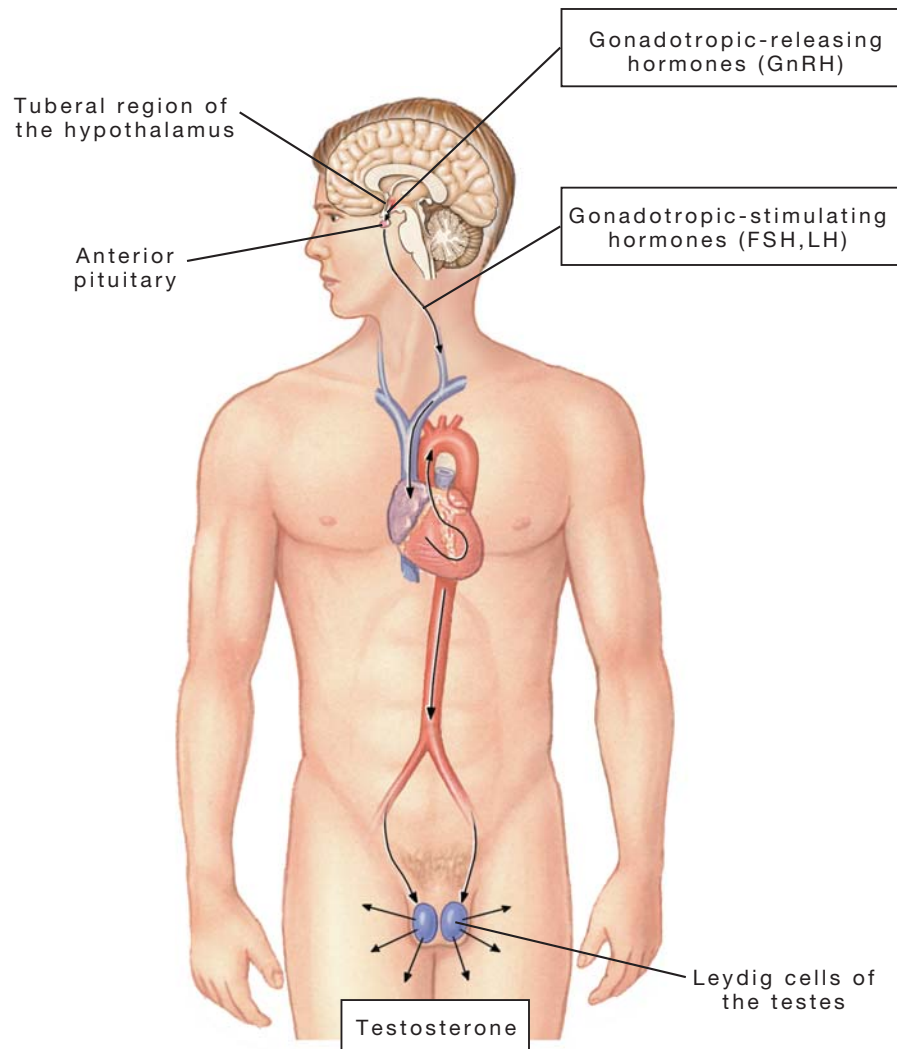


FIGURE 3.2 The Production and Release of Testosterone in Males. Stimulation of the tuberal region of the hypothalamus causes the release of gonadotropic-releasing factor, which causes the anterior pituitary to secrete luteinizing hormone (LH). LH then travels through the bloodstream to stimulate the Leydig cells of the testes to manufacture and release testosterone.

between testosterone and aggression (see CONSIDERATIONS box). Researchers at the Yerkes Primate Research Center at Emory University found that when male monkeys win a contest their T-levels increase for about 24 hours; the T-levels of the losers remain lower for even longer than a day. However, if the loser simply sees a sexually receptive female, his testosterone level shoots back up. “So now you know [what accounts for] the popularity of strip bars: they’re where male losers go to get their T back up,” claimed one of the Yerkes researchers (Wallen, 1997 quoted in Tierney, 1998, p. B1).

One of the best overviews of research on testosterone, *Heroes, Rogues, and Lovers* (Dabbs, 2000), portrays testosterone as a mixed blessing, with both good and bad features. According to Dabbs, high levels of testosterone (in both men and women) lead to more sexual activity, which of course helps make more babies. But it also leads people to become more fickle and restless, so they are less likely to stay around to nurture and support the children. Remarkably, nature seems to have instilled some mechanisms to make parents stick around. Dabbs reports that testosterone levels are high in single men, drop when the men get married, and drop even more when their wives

“Roid” Rage

When most people hear the word *steroid* they think of **anabolic steroids**, the drugs that bodybuilders and other athletes take in an effort to inflate their strength and bulk. These drugs usually are a synthetic version of testosterone. When scientists first created synthetic testosterone it was thought to be a “wonder drug” that would keep men young and strong well into old age. We now know better.

People, usually athletes, take anabolic steroids to improve their physical appearance and their performance. Steroids can also cause heart attacks, strokes, liver injury, damage to the reproductive system, and personality changes (Todd, 1987). It has been reported that steroid use in adolescents causes premature closing of the epiphyseal growth plates in the skeletal system, leading to shorter stature (Yesalis, Wright, & Bahrke, 1989).

Steroids also have a reputation for making men violent and aggressive. Violent criminals tend to have higher-than-average levels of testosterone. Separate studies in men’s and women’s prisons have found that murderers have higher levels of testosterone than other convicts, and, more generally, violent criminals have higher testosterone levels than nonviolent convicts. Although several studies have linked high testosterone levels (T-levels) to aggressive behavior in both animals and humans, others question the link between testosterone and aggression. Only three studies have reported a link between aggression or adverse overt behavior and anabolic steroid use (Bahrke, Yesalis, & Wright, 1997). Studies administering moderate doses of testosterone for clinical purposes reveal essentially no adverse effects on male sexual and aggressive behavior (Ibid., 1997).



Anabolic steroids, taken by some men to improve their physical appearance and performance, can cause heart attacks, strokes, liver injury, damage to the reproductive system, and personality changes.

Other studies look to psychosocial factors that may bring about the aggression attributed to steroids (Sharp & Collins, 1998). For example, the effects of previous psychiatric history, environmental and peer influence, and individual expectations remain unclear. One researcher hypothesizes that behavior we sometimes attribute to steroid abuse is actually the “nasty personality of some athletes reinforced by a sports culture that glorifies the physical response” (Yesalis, 1997).

? Do you know anyone who uses anabolic steroids?

—Have you ever used or considered using steroids?

have babies. In one study, expectant fathers who held a baby doll wrapped in a blanket experienced a statistically significant drop in testosterone within just half an hour (Storey et al., 2000). Men who remain single throughout life have high testosterone levels (but not as high as those who marry and then divorce). In general, men with high levels of testosterone are more likely to seek out sex and aggression, but are less reliable providers for their wives and children. In numerous species (including our own), males with low testosterone levels live longer (Worthman, 1999). Testosterone level also affects the workplace—or is it the other way around? (See CONSIDERATIONS box).

There may also be a link between T-levels and libido in women (Crenshaw, 1996; Hutchinson, 1995; Rako, 1996). At the onset of menopause, a woman’s ovaries and adrenal glands begin to produce less testosterone and other androgens. As a result, the amount of testosterone circulating in the body is reduced by at least half. While some women may react to this change by experiencing a noticeable drop in sexual desire, others may not notice any difference. One study showed a decrease in sexual desire among premenopausal women whose ovaries were surgically removed

Anabolic Steroids: synthetic derivative of testosterone

High “T”

In a survey of various occupations, Dabbs found that testosterone levels varied widely. Comparing T-levels of nonlawyers, attorneys, and trial lawyers, Dabbs (1998) found that although the testosterone levels of attorneys matched those of doctors and similar professionals, they lagged behind those of construction workers and others in blue-collar jobs. However, trial lawyers had testosterone levels that were about 30 percent higher than other lawyers. And it wasn't just the men. Female trial attorneys had higher testosterone levels than those who didn't go to court. Farmers and white-collar workers such as office workers had low levels of testosterone, and ministers had the lowest of all occupations tested. Blue-collar workers had high levels of testosterone, and actors—especially ones favoring outrageous roles—had the highest, outranking even professional football players on the testosterone scale.

One study (Urdu, Morris, & Kovonock, 1995) found that women who choose a professional career tended to have higher T-levels than women who stayed home to raise their children. The high-T women were less likely to have children and less interested in becoming parents. When they did have children, their daughters also tended to have high testosterone levels. It is unknown if these results reflect a genetic predisposition for high testosterone, or if the high-testosterone mothers treated their daughters differently than mothers with lower T-levels.

Dabbs (2000) found that testosterone levels were high among the chronically unemployed, probably because their inclination to adventure made them poor prospects for steady work. On the other hand, losing a job may cause a decrease in testosterone, because many men experience that as a blow to their masculinity. People with low testosterone tend to get better grades in school, and enter into higher-status occupations (although within many competitive areas, high-testosterone people seem more likely to fight their way to the top). Low-testosterone men have happier



Both the male and female trial attorneys on *Ally McBeal* might be expected to have high testosterone levels.

marriages, feel closer to their friends and families, and smile more genuinely than high-testosterone men. Dabbs quoted various observers about the smiles of men with high testosterone. One described that smile as “wolfish,” having a kind of dangerous or predatory aspect. Another, the political observer Myra MacPherson, said the high-testosterone smile is “a politician’s smile—the kind that never reaches the eyes” (Dabbs, 2000, p. 156).

? What other professions do you think might have high testosterone levels?

- What professions do you think might have low testosterone levels?
- Do you think that a male with a low-T-level job is less masculine or a woman in a high-T-level job is less feminine?

during a hysterectomy. When these women received estrogen and testosterone therapy, there was a significant increase in libido (Sherwin, 1996). However, there is more to libido than hormones. As we will discuss in Chapter 4, a lack of sexual desire may have a number of causes.

Estrogens

Estrogens are present in both men and women, but they circulate at the highest levels in women. The male testes and the female ovaries produce the estrogens. Men make estradiol while women make other estrogens as well. Early in female adolescence, the brain begins secreting regular bursts of hormones that stimulate the

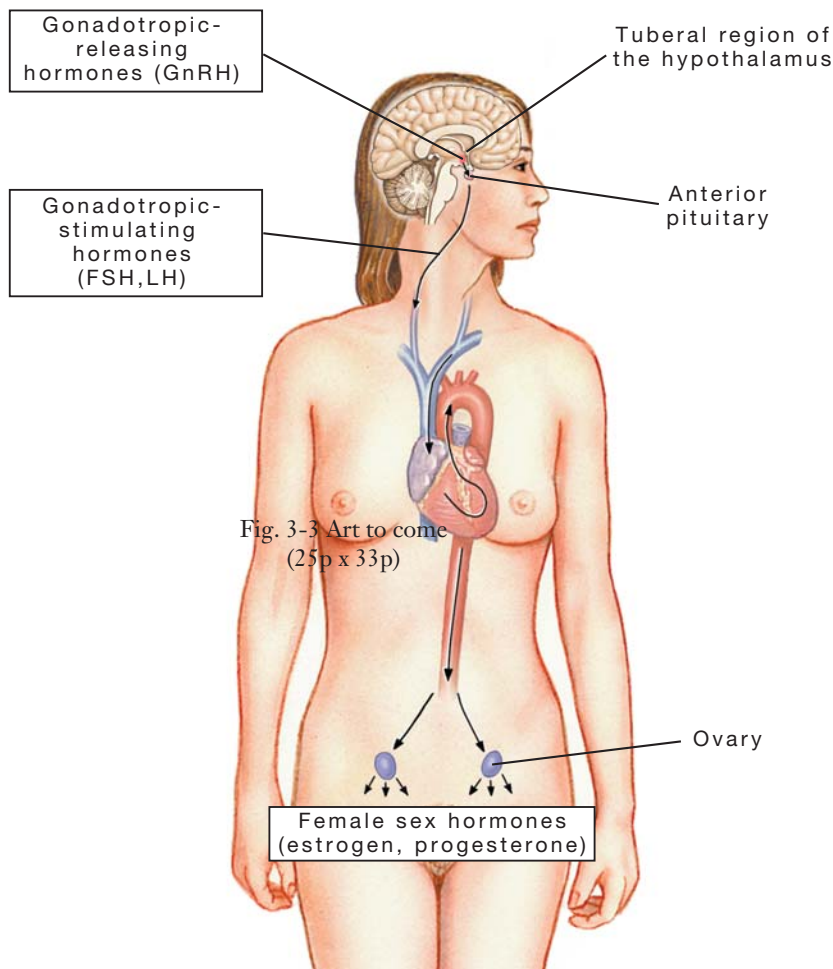


FIGURE 3.3 The Production and Release of Female Sex Hormones. Stimulation of the tuberal region of the hypothalamus causes the release of gonadotropic-releasing factor, which causes the anterior pituitary to secrete gonadotropic-stimulating hormones. The gonadotropic-stimulating hormones then travel through the bloodstream to the ovaries, stimulating the production and release of the female sex hormones.

ovaries (Figure 3.3). The ovaries in turn discharge estrogen, which encourages the development of the adult female body and regulates the menstrual cycle. At one time it was believed that the ovaries were a source of female weakness; one historical treatment for moodiness was removal of a woman's ovaries (Blum, 1997). Today it is known that, rather than a source of problems, the estrogens have beneficial effects in both men and women. As a matter of fact, the estrogens, especially estradiol, appear more directly necessary to survival than the androgens.

To make estrogen, the body needs an enzyme called **aromatase**. With aromatase, a tissue of the body can transform a precursor hormone into estrogen. The precursor may be testosterone (which women make in their ovaries, adrenal glands, and possibly in the uterus and the brain) or another androgen. The ovaries produce aromatase as well as testosterone, so the androgen can instantly be converted into estrogen. Other tissues that contain aromatase include fat, bones, muscle, blood vessels, and the brain. Give any of these tissues a bit of precursor hormone, and they'll convert it to estrogen.

There are at least 60 forms of estrogen in the body, the most important of which are *estradiol*, *estriol*, and *estrone*. Generally, different tissues of the body produce

Aromatase: an enzyme that converts androgen to estrogen

“The difficulties of correlating estrogen to human sexual behavior are considerable. What sort of behavior are you looking at? What are the relevant data points? Frequency of intercourse? Frequency of orgasm? Frequency of masturbation or sexual fantasy? The sudden urge to buy *Cosmopolitan*?”

(ANGIER, 1999, P. 217)

the different estrogens, though there is a lot of overlap, redundancy, and unknowns. **Estradiol**, the principal estrogen of women’s reproductive years, is the product of the ovaries. It flows out of the cells of the follicles and from the corpus luteum. In men, the testes produce estradiol. Estradiol is considered the most potent of the three estrogens. Estradiol production in girls begins to rise slowly at about age 8 and continues its ascent until the onset of puberty, at which point it levels off. It remains dominant until menopause, except during pregnancy when estradiol production shuts down. **Estriol** is generated by the placenta, and, to a lesser extent, by the liver. It is the major “pregnancy estrogen,” the source of many of the symptoms of gestation such as morning sickness. Estriol levels remain high until after childbirth, when estradiol kicks back in. **Estrone** is the primary estrogen of menopause. As the ovaries stop producing estradiol at menopause, the fat cells start making estrone. As we discussed in the previous chapter, it is the decreased level of estrogen that is thought to cause health problems in some postmenopausal women.

Estradiol appears to stimulate the immune system and direct the immune response to where it is needed (Morrell, 1995). Estradiol is also essential to a healthy heart. It seems to make blood platelets slightly less active, which makes them less prone to clumping and clotting the arteries (USDA, 1995). Researchers at Johns Hopkins University have found that a form of estrogen compound increased the blood flow to the heart in men with coronary artery disease by nearly one third (Blumenthal et al., 1997). Researchers investigating estradiol’s effects on brain function have found evidence that estradiol may protect against Alzheimer’s disease. The discovery of a specific structure on the estrogen molecule responsible for estrogen’s ability to protect nerve cells from death may prove useful in treating and preventing Alzheimer’s disease (Gordon et al., 1997).

While estrogen performs many valuable functions, there can be too much of a good thing. Excess estrogen in men can result in erectile difficulties and enlargement of the breasts. Hormonal fluctuations, which can aggravate endometriosis and uterine fibroid tumors (disorders discussed in Chapter 2), can increase with excess estrogen. In addition, evidence is accumulating that high levels of estrogen may increase the risk of breast cancer.

The Link Between Estrogen and Female Sex Drive A female mouse can’t mate if she is not in estrus. Unless she is in estrus, her ovaries do not secrete estrogen and progesterone, and without hormonal stimulation, the mouse can’t assume the mating position (lordosis) in which she arches her back and flicks aside her tail, which makes her vagina accessible to the male mouse’s penis. But, as you learned in Chapter 2, human females, and other female primates, have been freed from hormonal control and can have sex throughout the menstrual cycle. Researchers have long wondered whether the hormonal process that regulates the menstrual cycle affects female sexual behavior as the estrus cycle affects the behavior of other mammals.

Stanislaw and Rice (1988) found that in any given menstrual cycle, sexual desire was usually first experienced a few days before the basal body temperature (BBT) shift, around the date of expected ovulation. These events are correlated with changing hormone levels. While these results suggested that hormonal factors do in fact contribute to sexual desire, other studies have found no association between rates of intercourse and where a woman is in her ovulatory cycle (Wilcox et al., 1995).

The endocrine system plays an important role in human sexual behavior, but the effects of hormones and their relationship to the various sexual behaviors is not yet fully understood. We do know that hormones are necessary to maintain a satisfying human libido, but we also know that hormones alone are not enough. In women, estrogens prime the central nervous system and sensory organs for sex (Graziottin, 1998), but there are other as yet unknown factors that contribute to the female libido as well.

Estradiol: principal estrogen produced by the ovary during a woman’s reproductive years

Estriol: an estrogen hormone found in the urine during pregnancy

Estrone: a weaker estrogen found in urine and placental tissues during pregnancy

Progesterone

Estrogens tend to work in concert with another set of hormones, the **progestins**. These hormones essentially wait to perform their function until pregnancy, when they are responsible for all kinds of managerial functions. The best-known progestin is **progesterone**, the so-called hormone of pregnancy that prepares the endometrium for implantation of the fertilized ovum; and later is used by the placenta to prevent rejection of the developing embryo and fetus. Progesterone promotes weight gain and nutrition storage and helps stimulate the breasts for milk production. By inducing the growth of muscle cells around capillaries in the uterus they protect women from the dangers of hemorrhage when pregnancy does not occur and the fertilized egg is washed away in the menstrual cycle. It is the progestins that are responsible for the complaints of swollen ankles and puffiness; inducing fluid retention increases the volume of blood circulating in the body to ensure that mother and baby both get enough blood and oxygen.

Oxytocin and Vasopressin

When you think of sexual behavior, romantic love and parental love, the first words you think of are probably *not* **oxytocin** and **vasopressin**. But scientists believe that these sex hormones have a great deal of influence on our sexual and romantic experiences. Both males and females possess these “love hormones,” but oxytocin plays a stronger role in females and vasopressin has more influence in males. It is unknown why the sexes might need two different hormones to achieve the same purpose. Oxytocin and vasopressin are both produced in the hypothalamus and are **peptide hormones**, as opposed to **steroid hormones** like estrogen or testosterone. Steroid hormones slip back and forth from the brain to the bloodstream and back to the brain, but peptide hormones move only from brain to blood. We do not understand the roles of oxytocin and vasopressin completely, partly because each of them serves a number of different functions.

Oxytocin has been found to cause uterine contractions during orgasm and labor, increase sexual receptivity, speed ejaculation, and increase penile sensitivity (Newton, 1978; Pedersen, 1992). Oxytocin is released by the pituitary gland, and is present in a range of nerve cells throughout the brain. The concentration of oxytocin is highest in the limbic system but it is also found in the brain stem and spinal cord. Through its association with the sense of smell, oxytocin also orchestrates the body’s response to pheromones.

In mammals, oxytocin in combination with estrogen increases sensitivity to touch and encourages mating, grooming, and cuddling in both sexes. Infusing oxytocin into the brains of nonpregnant female rats rapidly induced maternal behavior toward young pups (Pedersen et al., 1992). Similar findings have been reported in ewes, which usually are hostile to offspring other than their own (Kendrick et al., 1987). Furthermore, it appears that oxytocin not only fosters the bond between mothers and children, but it may also increase sexual activity. When oxytocin was infused into the brains of female rats, which are not very sexually receptive when not in estrus, their sexual activity increased considerably (Caldwell et al., 1984). It has been suggested that oxytocin can stimulate sexual behavior in humans (Anderson-Hunt & Dennerstein, 1994). In one study, women were asked to masturbate to climax, and their blood levels of oxytocin were measured before and after orgasm. The concentration of oxytocin climbed slightly, but measurably, with climax, and the greater the increase, the more pleasurable the women reported their orgasm to be (Pedersen et al., 1992).

Vasopressin is secreted from the brain’s posterior pituitary and causes the contraction of vascular and other smooth muscles. While vasopressin resembles oxytocin in its chemical structure, in most respects it opposes the influence of oxytocin. Vasopressin acts as an antidiuretic, which prevents water and salt depletion, stimulates

Progestin: generic term for any substance, natural or synthetic, that effects some or all of the biological changes produced by progesterone

Progesterone: an antiestrogenic steroid produced by the corpus luteum and placenta or prepared synthetically that stimulates proliferation of the endometrium and is involved in the regulation of the menstrual cycle

Oxytocin: pituitary hormone that stimulates uterine contractions during labor and facilitates the secretion of milk during nursing

Vasopressin: a pituitary hormone that causes blood vessels and smooth muscles to contract

Peptide Hormones: group of hormones such as oxytocin and vasopressin that are produced in the hypothalamus

Steroid Hormones: group of hormones that include estrogen and testosterone

Excitement Phase: first stage of Masters and Johnson's sexual response cycle; characterized by erection in the male and vaginal lubrication in the female

Myotonia: muscle tension

Vasocongestion: engorgement of blood vessels in response to sexual arousal

blood vessel constriction, and helps control blood pressure. In men, vasopressin levels increase when arousal occurs. Some researchers believe that vasopressin enhances mental alertness and moderates emotional response, allowing us to notice and respond to subtle sexual cues such as a glance or a gesture (Beckwith et al., 1990; deWied et al., 1989).

THE SEXUAL RESPONSE CYCLE

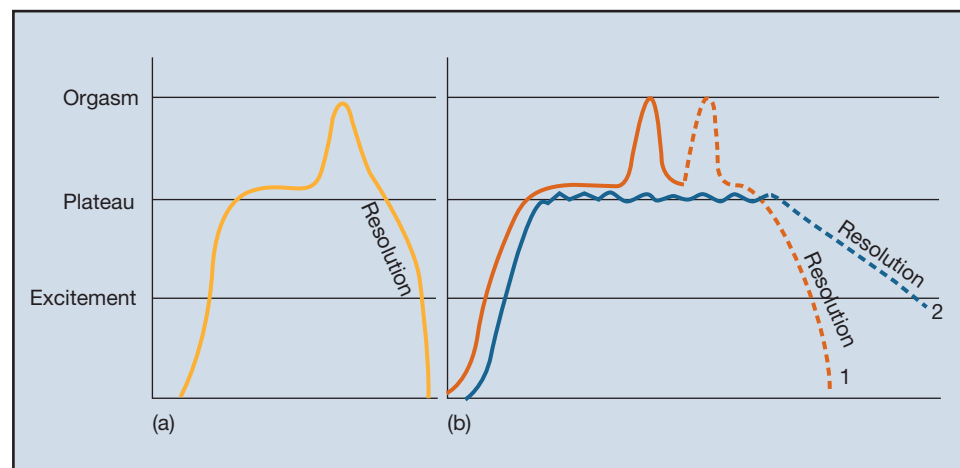
The cycle of human sexual response, the series of physiological processes and events that occur during sexual activity, is as complex and varied as the people who participate. However, it is useful to have models that describe common physiological changes and patterns in order to determine whether our experiences fall within the expected range (not to worry—almost everyone's do). Through their research, Masters and Johnson (1966), Helen Singer Kaplan (1979), and David Reed (1998) have come up with three ways of describing the events that occur during a sexual encounter.

Masters and Johnson's EPOR Model

Masters and Johnson recorded more than 10,000 cycles of sexual arousal and orgasm over a period of 12 years to arrive at a model of sexual arousal and response. There are four successive physiological phases to the sexual response cycle in their model: excitement, plateau, orgasm, and resolution (EPOR) (Figure 3.4).

The **excitement phase** is the first phase of the EPOR model. Both males and females may experience erection of the nipples, and increases in **myotonia** (muscle tension, spasm, or rigidity), heart rate, and blood pressure. In males, the excitement phase also produces penile erection because of the increased flow of blood to the erectile tissues. The time between the onset of stimulation and erection may be much shorter in young males than in older men. Also during this phase, the skin of the scrotum thickens, the testes increase in size, and the testes and scrotum are pulled up next to the man's body. In females, vaginal lubrication may begin within 10 to 30 seconds after the onset of sexual stimulation. **Vasocongestion**, the engorgement of blood vessels in response to sexual arousal, swells the clitoris and the labia majora, causing the labia to spread apart. The labia minora also increase in size, and the walls of the inner two thirds of the vagina expand. As the vaginal walls thicken, the increase in blood flow causes the normally pink tissue to darken. The uterus also becomes engorged with blood and is elevated further up into the body cavity. The breasts enlarge and blood vessels near the skin's surface may become more pronounced.

FIGURE 3.4 Masters and Johnson's four phases of the human sexual response. (a) Male sexual response; (b) two patterns seen in females; in pattern 1, the female experiences one or more orgasms, and in pattern 2, she does not experience an orgasm.



The **plateau phase** is an advanced state of arousal that precedes orgasm. By this phase a reddish rash called the **sex flush** may appear on the chest or breasts in about one fourth of males and three fourths of females. Myotonia may cause spasms in the hands and feet, as well as facial grimaces. Breathing becomes rapid, and the heart rate and blood pressure continue to rise. Males show a slight increase in the circumference of the coronal ridge of the penis and the glans turns purplish as a result of vasocongestion. The testes are pulled further in toward the man's body and may swell to 1½ times their previous size. At this time a few drops of fluid from the Cowper's glands may appear at the tip of the penis. Vasocongestion swells the outer third of the female's vagina, producing the **orgasmic platform**. The inner part of the vagina expands fully and the uterus becomes fully elevated. The clitoris shortens and withdraws beneath the clitoral hood. The labia minora become redder; this is sometimes referred to as the **sex skin**. The areolas become so engorged with blood they may swell around the nipples. A mucuslike fluid is secreted from the Bartholin's glands on either side of the vaginal opening.

If an individual does not reach orgasm, myotonia and vasocongestion may take an hour or more to disappear. Continuing vasocongestion may cause a feeling of pelvic discomfort or fullness known as "blue balls" in males, a harmless condition that can be relieved by masturbation or by the passage of time (but time may appear to move very slowly to someone who is experiencing this condition). A woman who becomes highly stimulated but does not get sexual release may experience similar sensations, which can also be relieved by masturbation or the passage of time (Barbach, 1975).

In the **orgasmic phase**, rhythmic muscle contractions begin throughout the body in both males and females, while blood pressure, respiration, and heart rate continue to increase. The man experiences two stages of muscle contractions, sometimes referred to as the emission expulsion stage. In the first, the vas deferens, the seminal vesicles, the ejaculatory duct, and the prostate gland cause seminal fluid to collect in the urethral bulb, which expands to accommodate the fluid. The internal sphincter muscle of the bladder contracts to prevent seminal fluid from entering the bladder and urine from being ejaculated with the semen; if this muscle malfunctions, seminal fluid may enter the bladder rather than be ejaculated, an uncommon but harmless event called a *retrograde ejaculation*. At this time the man may experience a subjective feeling of impending ejaculation. In the second stage of the male orgasmic phase the external sphincter muscle of the bladder relaxes to allow the passage of semen. The muscles surrounding the urethra, the urethral bulb, and the base of the penis then contract rhythmically to propel the ejaculate out of the body and produce the pleasurable sensations associated with orgasm.

Female orgasm is marked by contractions of the pelvic muscles surrounding the vagina and release of vasocongestion that alleviates the muscle tension built up during the previous phases and produces a subjective feeling of release. Females also experience rhythmic contractions of the uterus and the anal sphincter during this phase. However, it should be noted that not all females enjoy orgasm with every experience of coitus.

The **resolution phase** follows orgasm. During this phase the body returns to its prearousal state. In both males and females myotonia decreases within a few minutes after orgasm, and blood pressure, heart rate, and respiration return to normal levels. Many individuals find their bodies covered in sweat and experience a general feeling of relaxation and satisfaction.

After ejaculation a male loses his erection in two stages. Within a minute, half the size of the erection is lost as blood from the corpora cavernosa, the tissues that engorge with blood, recedes. Then the remaining swelling subsides as the blood in the corpus spongiosum, a chamber on the underside of the penis, decreases. At this point the testes and scrotum return to their relaxed forms and positions. In females, swelling of the areolas and nipples decrease, and the sex flush rapidly disappears. The clitoris, vagina, uterus, and labia return to their relaxed states, and the "sex skin" returns to its prearousal coloration.

Plateau Phase: the second phase of Masters and Johnson's sexual response cycle in which muscle tension, heart rate, and vasocongestion increase

Sex Flush: rash that appears on the chest or breasts of some individuals during the sexual response cycle

Orgasmic Platform: the thickening of the walls of the outer third of the vagina that occurs during the plateau phase due to vasocongestion

Sex Skin: reddening of the labia minora that occurs during the plateau phase

Orgasmic Phase: the third phase of Masters and Johnson's sexual response cycle in which orgasm occurs

Resolution Phase: the fourth phase of Masters and Johnson's sexual response cycle during which the body gradually returns to its prearousal state

Refractory Period: period of time following orgasm during which a male is no longer responsive to stimulation

After resolution males enter what Masters and Johnson call a **refractory period** during which they are physiologically incapable of another orgasm or ejaculation. This period may last from a few minutes in adolescent males to a much longer period for older men. Females do not experience a refractory period. They may be restimulated quickly to the orgasmic phase.

Kaplan's Model of Sexual Response

In contrast to the four phases in the Masters and Johnson model, over many years of research sex therapist Helen Singer Kaplan (1974, 1979, 1987) developed a model of sexual response consisting of three independent components: desire, excitement and orgasm (Figure 3.5).

Desire is the most important element of Kaplan's model; it demonstrates the role of psychological and cognitive needs in the human sexual response cycle. Excitement and orgasm are described as primarily physiological components. The *excitement* phase consists of initial vasocongestion of the genitals, resulting in erection in the male and vaginal lubrication in the female. The *orgasm* phase is marked by pelvic muscle contractions in males and females, and ejaculation in males. In Kaplan's model, these three components are independent and not entirely sequential. For example, an individual might experience sexual excitement and perhaps orgasm without much desire. Other individuals may find that excitement stimulates sexual desire.

This model is useful for therapists precisely because it distinguishes desire as an independent component of the sexual response cycle, and, as you will discover in Chapter 4, lack of sexual desire is the most common problem clients bring to sex therapists. As we will discuss more fully in Chapter 4, an individual who lacks desire may not seek sexual stimulation or be able to respond when it is present.

Reed's ESP Model

David Reed's *Erotic Stimulus Pathway (ESP)* theory (1998) divides the sexual response cycle into four phases that contain elements of both Kaplan's and Masters and Johnson's models (Figure 3.6) as well as elements of the five basic needs discussed in Chapter 1. The first phase of Reed's model is *seduction*, the phase when an individual learns how to attract someone sexually. A seduction translates into memories and rituals. As a teenager you might have gone through a series of grooming rituals before going on a date. These rituals may have helped you feel you look good, which can translate into feeling good about yourself. The better you feel about yourself, the better you are at attracting others. These positive feelings are translated into sexual desire and arousal; the seductive techniques are stored in memory and can be activated at a later time.

In the *sensation phase*, the senses enhance sexual excitement extending it into a plateau phase, which makes us want to continue the pleasurable moment over a longer period of time. According to Reed, these seduction and sensation experiences are the psychological input to the physiology of sexual response.

In the *surrender phase*, orgasm occurs. Reed's theory purports that people with orgasmic dysfunction (which will be discussed in Chapter 4) may be in a power struggle with themselves or with their partners or with the messages received from society about sex. Overcontrol or undercontrol can affect orgasmic potential and the ability to allow all of our passion to be expressed.

The final phase of Reed's model is the *reflection phase* where meaning is brought

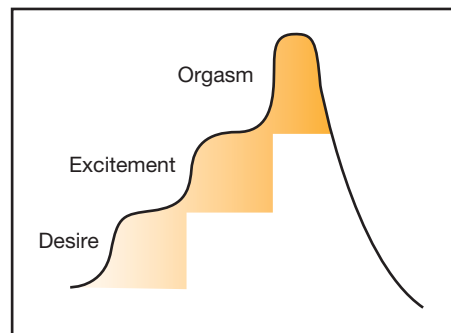


FIGURE 3.5 Kaplan's three-stage model of the sexual response cycle. This model is distinguished by its identification of desire as a prelude to sexual response.

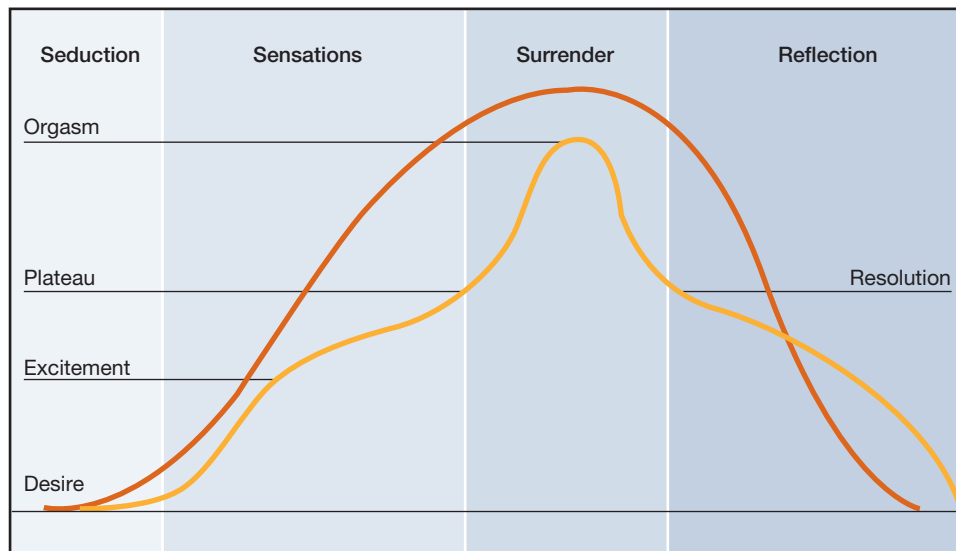


FIGURE 3.6 Reed's Erotic Stimulus Pathway.

to a sexual experience. Whether the experience is interpreted as positive or negative may determine the desire for subsequent sexual activity or under the same specific circumstances.

ORGASM

Why does the psychobiological experience of orgasm warrant so much attention? Our view is that orgasm is a complex response to a wide variety of social, physical, and mental stimuli. The differences in the behavioral expression of orgasm and the reported changes in consciousness and involuntary movements associated with orgasm in some individuals once led people to worry about its potential for harm both morally and biologically. During the 19th century, some medical professionals were so worried about the “dangers” of orgasm that they debated who should have orgasms and how often (Laumann et al., 1994).

The roots of the word *orgasm* include the Greek word *orgasmos*, meaning to grow ripe, swell, and be lustful, and the Sanskrit *urja*, meaning nourishment and power. From an evolutionary perspective, the importance of sex is reproduction, and while male orgasm is inextricably linked to reproduction, females don't have to have an orgasm to procreate. If you're trying to have a baby, male orgasm may be important to you, but for most of us, the importance of orgasm is pleasure, not procreation.

Studies comparing the orgasms of males and females indicate that they are more similar than you would think; there is more variation among individuals than between males and females (Proctor, Wagner, & Butler, 1974; Vance & Wagner, 1976; Wiest, 1987). Both women and men experience pleasurable sensations—orgasms “feel good.” Both men and women describe the approach to a level of excitement beyond which it becomes progressively difficult to maintain voluntary control—the “point of no return.” Other sensory perceptions may fade in the heat of the moment; people may experience some numbness in their senses and may not be very sensitive to painful stimuli (Katchadourian & Lunde, 1975).

Young men in adolescence and their early 20s report more frequent orgasms than older men do, while women generally experience their highest number of orgasms from their mid-20s to their mid-40s. However, these statistics do not reflect how often a man or woman would like to have sex or how much they are enjoying it. One reason for this possible orgasmic difference between men and women is that as



CAMPUS CONFIDENTIAL

“All orgasms are not created equal. Some are like a whisper . . . gentle and soft, others are more like a raging scream . . . intense and dramatic. I don’t really care if my orgasm is clitoral or vaginal, as long as it feels good.” ●

women become older they learn more about their sexuality and may feel more secure in their relationships, but as men age the lengths of their arousal, response, and refractory periods increase (Reinisch, 1991).

Biologist Stephen Jay Gould has argued that female orgasm is simply a byproduct of human development. Recall that the clitoris develops from the same tissue that produces the penis. Gould argues that the female orgasm exists because the clitoris is the homologue of the penis—“the same organ, endowed with the same anatomical organization and capacity of response” (Gould, 1987, p. 16).

Anthropologist Melvin Konner (1990) believes that female orgasm is the result of gender differences in selective pressures during the evolution of our species. For males in many mammalian species, reproduction is as simple as inseminating a female. For most females, mammalian reproduction inevitably entails gestation, labor, and nursing. Thus, in an evolutionary sense, males are rewarded for copulation, while females do best by choosing carefully among suitors and trying to sustain a bond with one.

Anthropologist Helen Fisher believes that human female orgasm does have a reproductive purpose. “I think female orgasm evolved for genuine purposes: to encourage females to seek sex, to make an intimate connection with a reproductive mate or extra lover, to signal enjoyment to this partner, and to aid fertilization” (Fisher, 1992, p. 183). There is some common-sense appeal to the notion that females who enjoy sex will be more likely to do it, and hence more likely to reproduce, than other females.

Sarah Hrdy (1996) proposes that while the female orgasm is not currently adaptive, it might have provided motivation for our female primate ancestors to mate with a range of partners. Such behavior would confuse the issue of paternity and increase the likelihood that a female could extract food and protection for her offspring from a number of different males. Hrdy raises the depressing possibility that, because the female orgasm is no longer functional, it is on its way out in an evolutionary sense; if she’s right, our descendants may never share this glorious experience!

Randy Thornhill and Steven W. Gangestad (1996) speculate that female orgasm is an *atavism*, a trait that occurs in an individual because it occurred in an ancient ancestor. However, these University of New Mexico scientists also have proposed a theory with a rather unscientific name, the “upsuck theory,” that the muscle contractions of female orgasm help suck the sperm into the fallopian tubes. Popular wisdom has sometimes upheld the belief that a woman cannot get pregnant unless she has an orgasm—wrong! But it is plausible that an orgasm might facilitate the process of getting pregnant in some way.

Men rarely wonder whether or not they have had an orgasm because of the obvious physical signs of ejaculation. Although the terms are often used interchangeably, *ejaculation* and *male orgasm* are not synonyms, but related physical events. A man cannot ejaculate without experiencing an orgasm, but it is possible for him to have an orgasm without ejaculating, for example in men with disease of the prostate, those practicing Tantric sex, or in prepubescent boys.

The physical signs of orgasm are not as obvious in women, and vary to a much greater extent, so a woman (and/or her partner) may not even know whether she has experienced an orgasm (see CONSIDERATIONS box).

Variation in Female Orgasm

Female orgasm has assumed a more convoluted role in the scientific understanding of sexuality. In the early 1900s, Sigmund Freud (1905) theorized that there were two distinct types of orgasm, vaginal orgasm and clitoral orgasm. Moreover, he took what appeared to be the anatomical locus of an orgasm to be a measure of developmental maturity. According to Freud, orgasms caused by clitoral stimulation were immature; by the time a woman entered puberty and was physically ready to have intercourse with a man, her center of orgasm should be transferred to the vagina (see CAMPUS CONFIDENTIAL feature for one woman’s perspective). This theory influenced

Faking It

The psychological goal of orgasm that is so pervasive in many cultures may pressure some people, almost always women, to pretend they are having an orgasm. One study (Elliott & Brantley, 1997) of college students found that 60 percent of heterosexual college women and 71 percent of lesbian or bisexual women had faked having an orgasm, while only 17 percent of heterosexual college men and 27 percent of gay or bisexual men had faked it.

The most common reason given by women for faking an orgasm was to avoid disappointing or hurting their partners (Darling & Davidson, 1986). Other factors related to faking orgasm may include poor communication, limited knowledge of sexual techniques, a need for partner approval, an attempt to conceal a deteriorating relationship, protection of a partner's ego, or having given up hope of changing the partner's behavior (Lauersen & Graes, 1984).

If you usually climax when you're with your partner, but every now and then for some reason it's just not happening and what you really want to do is go to sleep, occasionally faking an orgasm might not be a big deal. But feigning orgasm most or all of the time can be far more problematic. It is hard to tell your partner that you have been faking enjoyment, but your partner deserves to know what is really going on.



As anyone who has seen the 1989 movie *When Harry Met Sally* knows, some women can do a very effective job of faking orgasm.

? Can you think of a good reason why someone might want to continue faking orgasms?

- Can you always tell if a partner is faking?
- What are other reasons why someone might fake orgasms?
- What are some ways that you might approach talking with your partner about this problem?

thought on female sexual response for decades. Women who did not reach orgasm by the movements of the penis in their vagina were considered physically or psychologically inferior or abnormal.

The research of Masters and Johnson (1966) was crucial in dispelling Freud's theory by showing that there is no measurable physiological difference between female orgasms resulting from clitoral stimulation and those from vaginal stimulation. It is now widely thought that all female orgasms are the result of direct or indirect clitoral stimulation. The clitoris can be directly stimulated by hand, mouth, or vibrator, or indirectly during certain positions of intercourse. However the clitoris is stimulated, the center of the orgasmic response is around the vagina or around the uterus. In other words, all female orgasms "are triggered by stimulation of the clitoris and expressed by vaginal contractions" (Kaplan, 1974, p. 31). As you learned in Chapter 2, the clitoris is not necessary for reproduction and is thus the only human organ with the sole purpose of providing pleasure.

Josephine and Irving Singer (1972) postulated that in addition to noting observable physiological changes, emotional satisfaction is an important factor in the female orgasmic response. The Singers describe three types of female orgasm: vulval, uterine, and blended. According to their theory, a vulval orgasm may result from either manual stimulation or coitus. The vulval orgasm is accompanied by contraction of the orgasmic platform and is not followed by a refractory period. A uterine orgasm occurs only as a result of intercourse and is typically characterized by a woman holding her breath and then explosively exhaling at orgasm. This type of orgasm is said to produce a great deal of relaxation and satisfaction and is followed by a refractory period. The blended orgasm is a combination of vulval and uterine orgasms.

“[Some women] never bought Freud's idea of penis envy; who would want a shotgun when you can have a semiautomatic?”

(ANGIER, 1999, P. 63)

FAQ:**Are men as capable of having multiple orgasms as women?**

It is not uncommon for a woman to have several sequential orgasms, separated in time by only a brief interval, while the spacing of male orgasms typically is more protracted. There is evidence that some men are capable of teaching themselves to be multiply orgasmic (Comfort, 1972; Robbins & Jensen, 1978). Researchers found one man who experienced six orgasms in the laboratory, with an interval of 36 minutes between the first and the last orgasm, and who maintained an erection during the entire period (Whipple & Myers, 1998). Other researchers (e.g., Dunn & Trost, 1989) report that some men are able to have multiple orgasms, delaying ejaculation until their final climax.

Multiple Orgasms: experiencing one or more additional orgasms within a short time following the first

Simultaneous Orgasm: partners experience orgasm at the same time

**EXPLORING SEXUALITY ONLINE****Virtual Orgasm**

Technology is a wonderful thing. A new form of sexual experience is being developed as an offshoot of virtual reality. Virtual reality is envisioned as a way to enhance the pleasure of viewing an erotic scene or activity. Instead of watching others perform, the person participates, providing a much more satisfying experience. The viewer puts on a helmet or enters a virtual reality room and participates in a realistic sexual experience of his or her choice without fear of disease, rejection, or embarrassment. Visual imagery can be

enhanced with electronically simulated sensations such as odors, tastes, touch, and pressure. Virtual sex has the potential not only to enhance normal sensations but also to create sensations never before experienced. Visionaries predict that virtual sex programs will not only be available for solo use, but for experiences in which the participant can select one or more partners from a wide range of choices. Couples would be able to use virtual sex to enhance their sensations and explore alternate styles and preferences (Maxwell, 1997).

For most women, penile thrusting is less efficient in causing female orgasm than direct clitoral stimulation. In a famous study by Sheri Hite (1976), for example, only about 30 percent of the women could reach orgasm regularly from intercourse without more direct manual clitoral stimulation. However, approximately 44 percent of those tested experienced regular orgasm from manual stimulation of the clitoris (as “foreplay”), either by a partner or through self-stimulation, and 42 percent experienced regular orgasm during oral stimulation of the clitoris. By comparison, 99.5 percent of women were able to experience orgasm during masturbation.

Multiple and Simultaneous Orgasms

The much-sought-after phenomenon of **multiple orgasms** occurs when one orgasm quickly (although no one has ever defined just how “quickly”) follows another. Women are biologically far more likely to have multiple orgasms than men, because of the refractory period that men experience. Some women are able to have several orgasms only seconds apart; men usually need much more time. Although only a small portion of the female population experiences them, Masters and Johnson (1966) and Fisher (1992) suggest that nearly all women are physically capable of multiple orgasm. Many factors could account for the discrepancy between experience and capability, but the most likely is that, once orgasm is reached, stimulation usually stops.

Some couples think that having **simultaneous orgasms** is the ultimate sexual experience. Others believe that while climaxing together might be nice, if and when it occurs, having simultaneous orgasms is no more satisfying than sequential orgasms. The Janus Report (1993) found that the vast majority of men and women surveyed did not feel that simultaneous orgasm is necessary for gratifying sex. It’s difficult for two people to “choreograph” the coordination of their orgasms. To do so, you and your partner must time your response cycles so that you know approximately how long it takes for each of you to reach orgasm during a typical sexual experience. As we have discussed, the sexual response cycle varies widely from experience to experience, and the stress of “timing it just right” may very well defeat the purpose. It is more important that partners enjoy one another. Another disadvantage of simultaneous orgasm is that the partners are so wrapped up in their own responses they cannot enjoy each other’s orgasms.

Rx: More Orgasms

CONSIDERATIONS

A statistical study in the *British Medical Journal* found that men who have more orgasms live longer. According to the analysis, having regular sex reduces the risk of death by about half. Men who said they had sex twice a week had a risk of dying half that of those reporting they had sex only once a month. The authors of the study said they had tried to adjust the study's design to account for other factors that might explain

their findings, for example, that healthier, fitter men generally engaged in sex more often. Even with this adjustment, the differences in risk could not be explained. Hormonal effects on the body resulting from more frequent sexual activity could be one possible explanation of this phenomenon (Davey-Smith et al., 1997). Until a more complete explanation is found, go ahead and improve your health!

SEXUALITY AND DISABILITIES

In a society where “sexy” is often equated with “healthy,” we tend to desexualize the disabled, preferring not to think about their sexual needs and potentials. Those who are physically dependent to any extent are seen as being childlike; because of this, involvement in sexual relationships is considered inappropriate. Many individuals make the assumption that the chronically ill or disabled are unable to have erections, reach orgasm, or enjoy sexual pleasures. These are myths that we hope to dispel in this section.

Arthritis

Rheumatoid arthritis is a chronic multisystem disease characterized by a persistent inflammation of peripheral joints. Inflammation of the joints can interfere with sexual activity. Several small clinical studies have shown that approximately half of arthritic men and women experience sexual problems including fatigue, weakness, pain, and limited movement in joints. Pain and stiffness of the hip joints are the main causes of sexual difficulty for arthritis sufferers, though some report a loss of libido or sex drive. Moreover, some arthritis drugs, especially corticosteroids, have been shown to reduce sex drive (Reinisch, 1991).

Sexual dysfunction in arthritic patients may be difficult to manage for several reasons. The nature of the problem may be difficult to diagnose because it often is complicated by the underlying medical condition. In addition, chronic illness places a great deal of stress on patients and their relationships (Nadler, 1997). Those suffering from arthritis, need to experiment to find one or more positions that avoid or reduce pain and pressure on the affected joints.

Cardiovascular Disease

In the United States 68 million individuals have some form of *cardiovascular disease*, heart-related disorders including coronary artery disease and *arteriosclerosis* or hardening of the arteries. Sexual problems following a heart attack are common. Although researchers have generally agreed that sexual activity initially tends to decline after an acute cardiac event, there usually is an eventual return to the previous level of sexual activity (Stitik & Benevento, 1997). Sexual problems following cardiovascular disease often are due to anxiety or lack of information. While blood pressure does increase during sexual activity, sex is not hazardous to people with high blood pressure if the condition is under control. Most physicians prohibit sexual activity only in severe cases. However, anyone suffering a heart attack should consult a physician before resuming sexual activity.

Arteriosclerosis is among the more common causes of erection problems in older men. This disease can result in a reduction of blood supply to the penis. Erectile problems may be an early symptom of arteriosclerosis. Although common, this problem often responds to treatment.

FAQ:**Can a paralyzed person still have sex?**

Christopher Reeve's book *Still Me* (1998) and films, such as *Coming Home*, *Born on the Fourth of July*, and *The Waterdance*, have dispelled the myth that men with SCI have no sexual feelings. All too often personal discomfort or fear prevents normal sexual interactions. The effect of SCI on sexual functioning depends on the location and severity of the injury. Erection and ejaculation may be affected in men and lubrication and orgasm in women (Sipski, 1997). (See CONSIDERATIONS box.) While intercourse may be impossible or different than before the injury, sexual play may be emotionally and psychologically satisfying. There are many methods of sexual interaction besides intercourse (touching, massage, using a vibrator, oral-genital sex etc.). For erectile difficulties, the woman-on-top position may be beneficial, or a penile implant may be used. Vaginal lubricants also may prove useful. If genital sensations are decreased or absent, interactions may focus on other erogenous zones of the body.

Cerebral Palsy

A mild to severe loss of muscle control, which may disrupt speech, facial expression, balance, and body movements, characterizes *cerebral palsy*, a chronic condition most often caused by damage to the brain during or before birth. Genital sensation is not disturbed by cerebral palsy; sexual interest, the capacity to have orgasm, and fertility are similarly unimpaired. There may be limitations to some sexual activities; for example, certain positions for intercourse may be difficult or impossible, depending on the nature and degree of muscle spasticity. Partners can adjust positions and find alternative ways of pleasuring one another.

Cerebrovascular Accidents

Although *cerebrovascular accidents (CVA)*, more commonly known as *strokes*, are the third leading cause of death in North America, little is known regarding sexual problems and sexual expression and adjustment following CVA. Overall, stroke may affect both physical and psychosocial aspects of sexuality. Common physical problems include erectile dysfunction in men and poor vaginal lubrication in women (Monga, 1993; Monga & Osterman, 1995). In addition, *aphasia* (the absence or impairment of the ability to communicate, which can be caused by stroke) and other impairments of language skills can affect sexual relationships (Kinsella & Duffy, 1979). Alternate positioning and means of sexual expression can be helpful for many stroke victims.

Diabetes

Approximately 16 million Americans have *diabetes*, a complex disorder that affects the ability of the body to produce or properly respond to insulin. Sexual problems may result from nerve damage, a routine complication of diabetes (Masters et al., 1992). In a small number of cases, sexual dysfunction may be due to circulatory problems related to the disease. Both the nerve damage and the circulatory problems tend to be permanent and untreatable. Diabetes is the leading organic cause of erectile problems in men. Half of all men with adult-onset diabetes report difficulty or inability to attain or maintain an erection. The use of medications such as Viagra or penile implants are common treatments. Women with adult-onset diabetes are more susceptible to vaginal infections, which can result in decreased vaginal lubrication.

Multiple Sclerosis

Multiple sclerosis (MS), a neurological disease of the brain and spinal cord characterized by degeneration of the protective covering of the nerves, is the most common disabling neurological disease of young adults, affecting approximately 350,000 people in the United States each year (Anderson et al., 1992). Complications of the disease include cognitive, sensory, and motor dysfunction. Effects on sexual functioning depend on which areas of the brain or spinal cord are involved. The level of disease activity, the duration of the disease, and the degree of fatigue, depression, spasticity, and bowel and bladder problems also affect sexual functioning. Many men with MS have difficulty achieving and maintaining erections. In women, numbness and tingling in the vaginal area and difficulty in lubrication are common. In one study, 63 percent of people with MS reported their sexual activity had declined since their diagnosis; other surveys suggest that as many as 91 percent of men and 72 percent of women with MS may be affected by sexual problems (Hendley, 1996). Medications for spasms and pain may be helpful. For problems with fatigue, positions that require less exertion can be used. Other options include medication, penile implants, and lubricants.

Psychiatric Illness

Decreased libido is one of the symptoms of depression, the most frequently diagnosed psychiatric disorder in the United States. *Depression*, the most common form of mood

disorder, is characterized by problems with appetite, sleeping, loss of energy, lack of interest and pleasure in usual activities (including sex), depressed or sad mood, and negative self-concept. Unfortunately, many antidepressants prescribed to treat depression have the side effect of decreased sexual desire. Other psychiatric illnesses, such as *bipolar disorder* (formerly called manic-depressive illness, which includes periods of depression that may suddenly lift and are followed immediately by periods of mania in which the person exhibits exaggerated energy and elation) or *schizophrenia* (a serious mental illness characterized by a loss of contact with reality, problems with incoherent thought patterns, and attention, motor, and perceptual problems), also may affect sexual desire and behavior.

There are many misconceptions about sexuality and the mentally disabled. Although many believe otherwise, the “mentally handicapped are more likely to be victims than perpetrators of sexual exploitation” (Reinisch, 1991, p. 283). While research has shown that the sexual development and behavior of the mentally and intellectually disabled is similar to the nondisabled, the physical and emotional changes of puberty may be difficult for them to handle. “Without special education programs to help them learn about physical changes and our society’s rules for handling sexual feelings, some inadvertently behave in socially unacceptable ways” (Reinisch, 1991, pp. 283–284). Treatment of any mental illness should include counseling regarding appropriate sexual expression.

Sensory Impairment

Impairment of one of the senses, such as vision, hearing, or speech, does not directly affect genital responsiveness. For example, the 1991 Kinsey Report notes, “Some research on the sexual behavior of visually impaired people has established that their feelings, attitudes, and behavior are similar to those of sighted people” (Reinisch, 1991, p. 284). Sexual difficulties may be related to a lack of sex education or decreased self-confidence resulting from the impairment. Psychological problems associated with the impairment are far more likely to interfere with a sexual relationship than the impairment itself. Deafness or blindness, particularly if it occurs in adolescence or adulthood, may cause depression, social withdrawal, distorted body image, and/or fear of rejection. These emotions can have an adverse affect on anyone’s sexuality. Counseling may be appropriate for anyone with sensory impairment.

Spinal Cord Injuries

Spinal cord injuries (SCI), injuries to the spinal cord from events such as automobile accidents, serious falls, or diving accidents, affect approximately 200,000 Americans. *Spinal cord disease* may affect an additional 300,000 (Sipski, 1997). Such events may cause *paraplegia* (paralysis of the legs) or *quadriplegia* (paralysis of all four limbs) and loss of all sensations below the level of the injury or disease. Normal bladder and bowel function usually is lost, and the individual is apt to have significant loss of sexual function.

You can have sex in a wheelchair, while suffering from arthritis, or after heart surgery. Although there may be difficulties due to physical limitations, the individual’s adjustment to the disability, or the availability of partners, individuals with disabilities have the same sexual needs and feelings as anyone else. In any person, able or disabled, a healthy attitude is the most important factor in achieving a healthy sex life.

If a disability occurs early in life it may affect socialization; a smaller social circle limits the opportunity for sexual learning and the availability of sexual partners. A condition can cause direct or indirect effects on sexual functioning. A direct effect is any difference in function of your genitals or another body system that specifically affects sexual response. For example, erectile dysfunction can be a direct effect of prostate cancer. An indirect effect can be symptoms such as pain or fatigue caused by the condi-



Despite his spinal cord injury, Christopher Reeve and his wife Dana maintain a sexual relationship.

The Orgasm Pill

Researchers Barry Komisaruk and Beverly Whipple (1997) believe that they have isolated a chemical that produces orgasms in women, even those who have suffered spinal cord injuries. Through experiments with rats, researchers isolated the neurotransmitter that is believed to cause the sensation of orgasm in the brain. These findings might one day lead to a pill that would give the same sensation as an orgasm.

? *Aside from its obvious use, can you think of any potential abuse for such a pill?*


- If a pill were available that would provide you with the sensations of orgasm, would you be interested?
- Do you think such a pill might replace your desire and need for coitus?
- What might be the long-term social implications of such a pill?

tion that diminishes your ability for and/or interest in sexual activities. For example, those suffering from severe arthritis may have such extreme discomfort that sexual activity becomes undesirable.

Medical treatments can interfere with sexual responses, as can the psychological effects of being sick, injured, or disabled. A belief that you are less attractive or less sexually desirable because of your condition can reduce your willingness to pursue sexual relationships. Your partners' reactions also have an impact. For example, a sexual partner may be afraid that sexual activity will hurt you or worsen your condition. As indicated above, a positive attitude on the part of the disabled person and his or her partner can make all of the difference in the expression of their sexuality.

REVIEW

CHAPTER 3



Sexual Arousal and Response

P

P

P

P

- **One Advantage of Being Homo sapiens**
Unlike other primates, humans engage in a continuous cycle of sexual receptivity and are available for sexual activity independent of ovulation.
- **Biological Foundations for Sexual Arousal and Response**
The brain and central nervous system, including the five senses, play a role in sexual arousal and response.
- **Sex Hormones**
The sex hormones, including testosterone, the estrogen, progesterone, and oxytocin, play a role in sexual arousal and response.
- **The Sexual Response Cycle**
There are a number of theories regarding the extent of sexual arousal and response, including the Masters and Johnson (1966) model, the Whipple and Komisaruk (1997) model, and the Health ESP model.
- **Orgasm**
Men and women experience orgasm, the peak of sexual arousal, separately. The extent and frequency of both responses vary over the course of adult life.
- **Sexuality and Disability**
Although they may interfere with sexual arousal and response, physical and psychological disabilities do not necessarily preclude sexual experiences.

ONE ADVANTAGE OF BEING HOMO SAPIENS
Unlike other primates, humans engage in a great deal of sexual behavior that is not reproductive. We have much of our sexual response independent of ovulation. This gives us the ability to have sexual intercourse at any time of the year. In many other primates, including humans, the sexually permissive period is limited to a specific time of the year. Sexual arousal and response are affected by the nature of the stimulus. In humans, the sexual response cycle, the series of physiological processes that occur that cover sexual arousal, excitation, and orgasm, is a continuous cycle of sexual receptivity. These sexual responses are influenced by the nature of the stimulus, social, and cultural factors on the sexual experience.

SEX HORMONES
The sex hormones, including testosterone, the estrogen, progesterone, and oxytocin, play a role in sexual arousal and response. Testosterone is the primary sex hormone in males, and estrogen is the primary sex hormone in females. Oxytocin is a hormone that is released during sexual intercourse and is believed to be involved in the process of orgasm.

THE SEXUAL RESPONSE CYCLE
There are a number of theories regarding the extent of sexual arousal and response, including the Masters and Johnson (1966) model, the Whipple and Komisaruk (1997) model, and the Health ESP model. The Masters and Johnson model is based on the observation that sexual arousal and response are a continuous cycle. The Whipple and Komisaruk model is based on the observation that sexual arousal and response are a continuous cycle. The Health ESP model is based on the observation that sexual arousal and response are a continuous cycle.

ORGASM
Men and women experience orgasm, the peak of sexual arousal, separately. The extent and frequency of both responses vary over the course of adult life. The extent and frequency of both responses vary over the course of adult life. The extent and frequency of both responses vary over the course of adult life.

SEXUALITY AND DISABILITY
Although they may interfere with sexual arousal and response, physical and psychological disabilities do not necessarily preclude sexual experiences. The extent and frequency of both responses vary over the course of adult life. The extent and frequency of both responses vary over the course of adult life.

Most female primates undergo an **1** _____ cycle that includes a period of sexual receptivity followed by ovulation. However, human females are capable of being continuously receptive to and available for sexual activity independent of ovulation. While the physical responses to sexual arousal vary with the individual, the most obvious physical signs of sexual arousal are vaginal **2** _____ for females and penile **3** _____ for males.

The brain may be the most important human sexual organ since it processes emotions, thoughts, fantasies,

and desires. Some typical correlates of sexual excitement are increases in heartbeat, blood to the genitals, **4** _____ (or breathing), and skin sensitivity. In addition, the body may experience **5** _____ (or muscle tension) and engorgement of blood in the genitals.

All five human senses may contribute to sexual arousal. For example, touch or tactile stimulation and smell or olfactory stimulation can increase sexual arousal. **6** _____ are naturally produced chemicals that affect behavior through the sense of smell.

7 _____ are chemical substances secreted by the endocrine system. There are three primary categories of sex hormones: **8** _____, _____, and _____. All three are present in varying amounts in males and females. The most important androgen is **9** _____, which is produced by the testes, ovaries, and adrenal glands.

The endocrine system plays an important role in sexual behavior. The hypothalamus regulates the production of sex hormones and sends signals to the pituitary gland that in turn directs the production of androgens in males and estrogens in females. The feedback loop is completed when the testes or ovaries send hormonal

signals to the hypothalamus and the pituitary to help self-regulate the system. The chemicals **10** _____ and _____, produced by the pituitary, also can be triggered by sex and desire.

Masters and Johnson have proposed the EPOR model of sexual response for males and females. The four phases of this model are: **11** _____, _____, _____, and _____. Helen Kaplan has proposed a model of sexual response consisting of three independent components: **12** _____, _____, and _____. David Reed's ESP model has four phases: **13** _____, _____, _____, and _____.

Studies indicate that the orgasms of males and females feel similar, and that there is more variation among individuals than between males and females. However, females are much more likely than males to experience more than one orgasm, or **14** _____. Since the female orgasm is not necessary for human reproduction, much debate continues regarding its evolutionary significance.

A healthy body is not a prerequisite for a healthy sex life. A healthy attitude about your sexuality and yourself

is the most important factor. The specific impact of illness or disability on sexual function depends on: (1) the severity of the impairment; (2) personal factors, such as age; (3) partner factors, including sexual history and the nature of past relationships. While it is common to desexualize the disabled, individuals with disabilities can have the same sexual needs and feelings as anyone else.

Cerebral palsy affects muscle control but it does not affect genital sensation, sexual interest, the capacity to have orgasm, or fertility. Multiple sclerosis is the most common neurological disease of young adults in the United States. **15** _____, or hardening of the arteries, and diabetes are common causes of erectile problems. Decreased libido may result from depression; moreover, medications prescribed to treat depression also may decrease sexual desire.

Injuries of the **16** _____ may cause paraplegia, paralysis of **17** _____, or quadriplegia, paralysis of all four limbs. When all sensations are lost below the level of the injury, normal bladder and bowel functions and significant sexual function may be affected, although sexuality can be expressed in alternative ways.

SUGGESTED READINGS

Blum, D. (1998). *Sex on the Brain: The Biological Differences Between Men and Women*. New York: Penguin USA.

Blum examines the structure and function of the male and female brains.

Crenshaw, T. (1997). *The Alchemy of Love and Lust: How Our Sex Hormones Influence Our Relationships*. New York: Pocket Books.

Crenshaw, a sex therapist, discusses the role of hormones in the different sexual stages and how hormones determine the course of human relationships.

Love, S. (1997). *Dr. Susan Love's Hormone Book*. New York: Random House.

This book offers information about hormones and hormone replacement therapy. The emphasis is that

menopause is not a disease that needs to be cured but a natural stage of life.

Masters, W., & Johnson, V. (1966). *Human Sexual Response*. Boston: Little Brown & Company.

This is the classic text on the biological patterns of human sexual response.

Sipski, M. L., & Alexander, C. (Eds.). (1997). *Sexual Function in People with Disability and Chronic Illness*. Gaithersburg, MD: Aspen Publications.

This collection offers a comprehensive overview of how various illnesses and disabilities affect sexual function, along with treatment options.

ANSWERS TO CHAPTER REVIEW

1. estrous; **2.** lubrication; **3.** erection; **4.** respiration; **5.** myotonia; **6.** Pheromones; **7.** Hormones; **8.** androgens, estrogens, progesterones; **9.** testosterone; **10.** oxytocin, vasopressin; **11.** excitement, plateau, orgasmic, resolu-

tion; **12.** desire, excitement, orgasm; **13.** seduction, sensation, surrender, reflection; **14.** multiple orgasms; **15.** Arteriosclerosis; **16.** spinal cord; **17.** the legs