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Similarities and differences between female and male sexual functions and dysfunctions

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Abstract

Men and women have 23 pairs of chromosomes. They share 22 of them. In physiologic conditions they differ systematically in only one pair, the sexual one. Females (normally) have what is called an "XX" on the 23rd pair of chromosome, whereas males have an "XY" pair. The striking sexual differences – anatomic, functional, reproductive, psychological and sociocultural – between men and women depends on or derive from the difference in one critical chromosome out of 46, which contains on average the 2% of all the genetic code. Biochemical, neuroendocrine, hormonal, vascular, nervous, metabolic similarities that both sexes do share, based on the common 45 chromosomes and related biologically determined similarities contributing to the secret sexual symmetry between genders, will be briefly reviewed. The role of the genetically determined brain and somatic gender dimorphism, contributing to gender sexual differences will be analyzed. Neuroplasticity and psychoplasticity will be praised as basic mechanisms that bridge together and re-shape the individual biological and psychological world through the continuous interaction with the environment. Enhancement of sexual differences in behaviour, meaning of, and motivation to sex by cultural constructs, by religious and social dynamics, and the continuous interaction of each individual with a usually role-polarized society during the whole life span will be finally acknowledged. To contribute to a better understanding of the shared biological sexual similarities between genders and their dialectic and continuous relationship with biological and socioculturally related sexual differences is the ultimate goal of this introductory and following papers of the series.

Key words: sexual similarities; sexual differences; sexual dimorphism; neuroplasticity; psychoplasticity; physiology of sexual desire; sexual function; sexual dysfunction

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Introduction

Men and women are different, no question about it. But are they so radically different as their genital, somatic and psychological features would suggest or do they share a great deal of similarities? For a clinician, this is a challenging question. What we see, touch, hear, smell, taste is different. However most of the basic vascular, nervous, endocrine, metabolic, immune biological mechanisms are the same, the differences being more quantitative than qualitative. Even in the sexual domain there are considerable similarities (1). A secret symmetry characterizes the biochemical background, behind the striking differences of which we are all aware. Where do we set the borderline in the continuum of similarities? Let's start a debate on this topic as a contribute to reshape our knowledge and challenge obsolete concepts with a view to opening new windows. A parallel approach to studying female and male sexuality might be useful and, hopefully, enriching for both sexes.

The basic fact is that humans have 23 pairs of chromosomes and men and women share 22 of them. Women (normally) have what is called an "XX" pair on the 23rd chromosome, whereas men have an "XY" pair. The difference is therefore written in one "Y" chromosome. All the striking sexual anatomic, functional, reproductive, psychological and, last but not least, sociocultural differences between men and women depend on or derive from the difference in one chromosome out of 46, just over 2% of the human genetic code, only. Biologically therefore we share a great deal more than that which distinguishes us (1-3). Nevertheless, this 2.17% seems to be more appealing and bias inducing than the remaining 97.83%.

The basic biological scenario is, however, further polarized by cultural, religious and social role constructs, with which every person in human societies is required to continuous interact through his or her lifespan. Context-dependent factors have certainly further differentiated the meaning of sexual behaviour, motivation to sex being one of the key differences between men and women (1,4-8). Context-dependent factors also modulate the ethics and norms that in diverse cultures still regulate and judge human sexual behaviour, and the rights to sexual expression that are given to a man or a woman, depending on adherence to religious or shared principles (4-8). Education and gender based conditioning reinforces the differences by inhibiting most female sexual behaviour, particularly when non-conformant to the ideal of their society, while praising and enhancing the expression of male sexual behaviour.

The persisting gender bias

The claimed radical biological differences between men and women are responsible for the sociocultural gender differences and discriminations that persist in most societies. This deeply

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rooted dichotomy has generated two major consequences. In medical sciences, a male-dominated perspective has produced interpretative models of sexual function and dysfunction based on a male frame. This has produced an "overgenitalization" in research and clinical practice. The almost monomaniac focus on erection and erectile disorders has resulted in disappointing consequences in classificatory systems (8-11) and correlated diagnostic and therapeutic approaches. This radical dichotomy has also been maintained in the humanistic sciences of contemporary psychology and psychosexology, where women are more represented, contributing to the misbelief that sexuality is biologically determined in men and psychologically driven in women (12).

Each of these perspectives, the "medicine without soul" and the "psychology without body", suffer from a dimness of vision, which deprives both sexes of a comprehensive understanding of how biology continuously interacts with psychological and context-dependent factors (1,2,4-8,10), neuroplasticity being the dynamic biological and morphological correlate of psychoplasticity (13).

This may explain why:

- sexual research in men and women has followed almost completely separated paths and methods, at least until a few years ago
- the dichotomic thinking between biological and psychogenic dimensions deprives both sexes of a more balanced perspective between biological, psychodynamic and contextual factors; fortunately a new approach is in blossom (1,4,7,8,14,15);
- many effective treatments have been discovered and approved for men (16,17), and only one for women (18)
- the current strong focus on differences between male and female sexual response may shadow important biological similarities in pathophysiology that should be approached in a parallel way.

Despite the obvious anatomic sexual differences, secondary sex characters and reproductive styles and behaviours, the basic extragenital anatomy and multisystemic functions (nervous, vascular, metabolic, immunitary, muscular, and endocrine, with the exception of sexual hormones) are similar in both sexes, usually presenting quantitative more than qualitative differences. This is true also for the basic mechanisms of the sexual response, which is a multisystemic function that in both sexes requires the integrity of the vascular, nervous, metabolic, hormonal, muscular and immune system to work at its best (1,2,3,19). A fact too often overlooked in women.

Focus on similarities

What are the similarities in the neurobiology of sexual desire in men and women? To mention a few: the basic "seeking", appetitive feeling is a positive emotion, mediated by dopamine in both

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sexes (1-3,19) (Table1). It promotes curiosity, interest, expectancy, and has long been known as a "reward" system. Its emotional, perceptive side is to generate the feeling that something good (food, water, sex, protection, shelter etc.) will happen or be obtained if the subject explores the environment or interacts with others (2,19). Its motor side is to promote exploratory behaviour (2,3,19,20). The system is heavily activated during sexual arousal and other appetitive states. In both sexes it is inhibited, among others, by antidopaminergic drugs or drugs that, as a side effect, increase prolactin (20). It is activated when dopaminergic drugs are used (e.g. in parkinsonian patients). In the sexual domain, testosterone plays an important role in priming and maintaining the intensity of the desire and arousal in the hypothalamic/limbic seeking system in both sexes although on average more powerfully in men than in women.

The gratification or "lust" subsystem is an important part of the seeking, appetitive pathway and is associated with gratification, when consummation of appetite is realized (19). The command neuropeptide of this system is endorphin, which can be considered the chemical correlate of feelings of satisfaction and emotional well being in both sexes.

Drugs such as cocaine and amphetamines stimulate the seeking system by artificially generating positive expectancies, and enhancing the perception of sexual drive by generating pseudoappetitive behaviours (2,20) in both sexes. On the other hand opiates, which stimulate the pleasure centres of the lust subsystem directly, mimicking an already obtained gratification (pseudoconsummatory), blunt sexual drive, again in the same way in men and women.

Sustained underarousal of the seeking system, typical of depressed subjects, is also associated with low or loss of sexual drive (1,2,6,7,21,22). Women who on average have lower basic sexual drives than men are more vulnerable to depression from puberty onwards and more susceptible to the further inhibiting effect of depression on sexual drive. Depression and loss of sexual desire can both be triggered by frustration of basic emotional needs, e.g. intimacy and attachment for women, thus explaining the frequent comorbidity of depression and sexual desire from the psychodynamic point of view also. In men, loss of sexual desire in its appetitive, instinctive component, apart from the motivational one, may be the very first symptom of a not yet manifest depression. Comorbidity between erectile deficit and depression is one of the leading features of the clinical presentation of this male sexual disorder.

Similarities in the physiology of sexual function in both sexes correlate with parallel similarities in the pathophysiology of male and female sexual disorders:

- all sexual dysfunctions, in men and women, may have biological, motivational or cognitive causes (1-8,12-22)

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- in both sexes they can be lifelong or acquired, generalized or situational, with different causes (1,4,8,11): biological, psychogenic, mixed (in the majority of cases) or unknown. However, in both sexes even psychogenic causes are biologically based, at least at the (dys)functional level
- comorbidity among different sexual disorders is frequent (although reportedly higher in women) (1,4-8,15,23)
- comorbidity between sexual disorders and metabolic, cardiovascular, endocrine, urological, gynaecological, proctological or neurological disorders is increasingly acknowledged (although still significantly more in men than in women) (1,4,21,24,25)
- age is the worst biological enemy of sexual function in both sexes, for sexual desire disorders (1,7,26), orgasmic disorders (23), and arousal disorders with multisystemic bases (vascular, neurogenic, hormonal etc) that lead to erectile deficit in men (16,17) and vaginal dryness, with or without dyspareunia, in women (15,24)
- age-dependent involution of corpora cavernosa has been shown in both sexes (16,28)
- genital vessels in both sexes derive from the same vascular branches and respond to the same neurovegetative, sympathetic and parasympathetic stimuli. The vascular disorder that is the most important factor leading to erectile deficits, (16,17) can also cause genital arousal deficits in women (26,27). Unfortunately this cause is usually dismissed in the clinical evaluation of female genital arousal and orgasmic disorders
- integrity of central and peripheral nervous system is important in both sexes. Central nervous and peripheral nerve disease such as depression, anxiety, obsessive compulsive disorders, schizophrenia, but also multiple sclerosis, Parkinson disease and paraplegia may strongly affect the nervous bases of the sexual response in men and women, causing the same disorders (desire, from arousal and orgasmic difficulties to total block of the genital sexual response, according to the disease involved) (6,7,22)
- the integrity of pelvic floor muscles is important in both sexes (although its vulnerability to anatomic and functional damages is higher in women for reproductive reasons) (29-31);
- diabetogenic factors, particularly diabetes can impair sexual function in both sexes (16,17)
- elevated prolactin is associated with loss of sexual desire in men and women (20)
- hyperprolactinemic drugs inhibit sexual desire in both sexes (3)
- dopaminergic drugs increase sexual desire in both sexes (32)
- selective serotonin re-uptake inhibitors and other antidepressants, e.g. clomipramine can delay orgasm or lead to complete its block in both sexes, with a dose-dependent effect (20,32)
- iatrogenic sexual disorders, secondary to drug prescription (32), or vascular, nervous, anatomic disruption side-effects of surgery, radiotherapy or chemotherapy are common in both sexes,

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often with exactly the same mechanism of action (although frequently unrecognised by physicians) (16,17,33)

- satisfaction or dissatisfaction after sex is based on comprehensive physical, emotional and cognitively feeling in both sexes and is important in the modulation of the overall positive or negative feed-backs, respectively enhancing or inhibiting all the sexual responses, according to its positive or negative perception of the sexual experience.

Focus on differences

Neurobiologically testosterone primes the seeking-appetitive-lust pathway and the anger-rage pathway much more in men than in women. Plasmatic levels of testosterone are on average ten times higher in men than in women. The drive and strength in these two basic emotion-command systems are therefore biologically stronger in men than in women (Table 2). All four basic emotion command systems, the seeking-appetitive, rage and anger, fear and anxiety, and panic with separation-distress, may influence the perception and expression of sexual desire, of sexual arousal and correlated behaviours. They may also modulate a gender based vulnerability to hypersexual disorders including sexually related aggressive/abusive behaviours in men, and to loss of sexual desire, to sexually avoidant behaviours, and panic-related sexual disorders like vaginismus in women. These gender-related group differences partially overlap. Individual differences, i.e. men biologically less driven to sex, or more vulnerable to anxiety leading to performance anxiety in sexual contexts, or women expressing a high level of anger-driven sexually abusive behaviours, should however be acknowledged.

The clinical correlate of the neurobiological condition is that men have a stronger, more biologically and genitally focused sexual drive, expressed more as lust (7). Women tend to have a romantically driven sexual drive with a more relational expression and emphasis on intimacy (6,7). Women have a stronger oestrogen priming of two other basic emotions command systems, the fear-anxiety and the panic with separation-distress, which contribute to and modulate their parenting abilities and social bonding skills (2,19). The gender-based different biological modulation of seeking pathways in men and women may be an important contributor to different desire vulnerability in the sexes, both in the early phases of a relationship and later stages of a long-term relationship (34,35). Over time women are more vulnerable than men to a loss of interest and frequency of sexual relations but their pleasure from the relations seems to remain relatively stable over the years, well addressing the prevalent "responsive" nature of women's sexual disposition in stable couples (36).

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Hypersexuality, historically regarded as an addiction and an impulse control disorder, a form of self-soothing that includes both paraphilic and non-paraphilic types of sexual behaviour, is more common in men than in women (36). Overall, in its broad meaning, now defined as “paraphilia related disorders”, hypersexuality shows a male:female prevalence ratio of 5:1, and paraphilias a male:female prevalence ratio of 20:1 (37). In women, the changes in the definition of “nymphomania”, which have taken it in and out of various classifications of the Diagnostic and Statistic Manual of Mental Disorders from the first edition in the 1950s to the present fourth edition (38), indicates how clinical judgment is impregnated by socially determined constructs and prejudices. At the opposite end of the continuum of sexual desire, the vulnerability to low sexual desire is twice as common in women than in men (33 vs 16%) (28). The clinical presentation of desire disorders is different between the sexes but again the neurobiological pathways of the seeking-appetitive-lust system, the hormones at play and the key neurotransmitters are almost the same. The same psychoactive drugs are available for men and women, not one being designed and marketed for one sex only. The differences, that are neurobiologically set up by different androgen and oestrogen priming of the four basic emotion command systems, which contribute to cerebral dimorphism, will be discussed in detail in the next papers in this series. These differences are further exasperated by the continuous neural reshaping that life experiences, breeding styles, parental attitudes and affective dynamics induce in the neuronal connections and threshold modulations of sexual behaviour. Education and gender-based conditioning reinforces the disparity by different training of the frontal lobe ability to modulate the outburst of the biological drive. Psychoplasticity, it must be stressed, is the epiphenomenon of a continuous neuroplasticity. With a simple analogy, the basic engine is the same in both sexes; the power of the car may be different, the driving styles are (or may be) highly different, according to the genetic background of the driver, the hormonal intrauterine and postnatal priming levels of the brain, his or her character, personality, education, and sociocultural background.

Conclusions

Similarities in the basic neurobiology of sexual desire, as well as in the pathophysiology of sexual disorders indicate well how much men and women share in their biology. While we can learn from this shared sexual physiology, and pathophysiology of sexual disorders, important differences rooted in the brain and somatic dimorphism, which persist and are amplified in the clinical presentation of sexual disorders in men and women, can help our understanding of how and how deeply the sexes' biology continuously interacts with sociocultural environments. The following papers in this series will explain that apart from the well known differences, similarities are close

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even in the domains of arousal, orgasm (with the obvious exception of ejaculation) and satisfaction. Sexual pain disorders, which affect women more than men for anatomic and reproductive reasons, do nevertheless share some basic pain-dependent mechanisms in both sexes (38-40). To look at this secret symmetry will be the core and the challenge of this series.

References

1. A. Graziottin Similarities and differences between male and female sexual dysfunctions, in Kandeel F. Swerdloff R. Pryor J. Lue T. (eds) Male Sexual Dysfunction: Pathophysiology and Treatment, New York: Marcel Dekker, 2004 (in press)
2. M. Solms, O. Turnbull. The brain and the inner world. London, Karnac Books, 2002
3. JG. Pfaus, BJ. Everitt. The Psychopharmacology of Sexual Behaviour. In: FE Bloom, D Kupfer, (eds.) Psychopharmacology. New York: Raven Press, 1995; 65, pp 743-758
4. M. Plaut, A. Graziottin, J. Heaton. Sexual Dysfunctions. Abingdon, Oxford, Health Press, 2004 (in press)
5. SR. Leiblum, R. Rosen (eds) Principles and Practice of Sex Therapy 3rd ed. New York: Guilford Press, 2000
6. R. Basson. Women's desire deficiencies and avoidance. In: SB Levine, CB Risen & SE Althof (eds) Handbook of clinical sexuality for mental health professionals. New York: Brunner Routledge, 2003, pp111-130
7. SB. Levine. The nature of sexual desire: a clinician perspective. Arch Sex Behav 32; 3: 279-285, 2003
8. R. Basson, SR. Leiblum, L. Brotto, L. Derogatis, J. Fourcroy, K. Fugl-Meyer, A. Graziottin, J. Heiman, E. Laan, C. Meston, J. van Lankveld, W. Weijmar Schultz. Definitions of women's sexual dysfunction reconsidered: advocating expansion and revision J Psychosomatic ObGyn (in press)
9. World Health Organization: ICD-10. International Statistical Classification of Diseases and Related Health Problems, Geneva, World Health Organization, 1992
10. American Psychiatric Association Diagnostic and Statistic Manual of Mental Disorders (DSM-IV) 4th edn Washington DC, American Psychiatric Association, 1994
11. R. Basson, J. Berman, A. Burnett, L. Derogatis, D. Ferguson, J. Fourcroy, A. Goldstein, A. Graziottin, et Al. Report of the international consensus development conference on female sexual dysfunction: definition and classification. J Urol 163: 889-893, 2000
12. A. Graziottin. The challenge of sexual medicine for women: overcoming cultural and educational limits and gender biases. J Endocrinol Invest 26(Suppl.3): 139-142, 2003

DRAFT COPY – PERSONAL USE ONLY

13. ER. Kandel, JH. Schwartz, T. Jessell. Principles of neural science. Norwalk, Appleton & Lange, 2000
14. CM. Meston, PF. Frolich. The neurobiology of sexual function. Arch General Psychiatry 57: 1012-1030, 2000
15. A. Graziottin. Clinical approach to dyspareunia. J Sex & Marital Ther 27: 489-501, 2001
16. A. Jardin, G. Wagner, S. Khoury (eds) Erectile Dysfunction Plymouth: Health Publications, 2000
17. F. Kandeel R. Swerdloff J. Pryor T. Lue (eds) Male Sexual Dysfunction: Pathophysiology and Treatment, New York: Marcel Dekker, 2004 (in press)
18. SK. Wilson, JR. Delk, KL. Billups. Treating symptoms of female sexual arousal disorder with the Eros–Clitoral Therapy Device. J Gend Specif Med 4 (2): 54-58, 2001
19. J. Panksepp. Affective neuroscience: the foundation of human and animal emotions, New York: Oxford University Press, 1998
20. FE. Bloom, D. Kupfer, (eds.) Psychopharmacology, New York: Raven Press, 1995
21. A. Graziottin Libido:the biologic scenario, Maturitas 4(suppl.1): S9-S16, 2000
22. RJ. Levin. Human male sexuality: appetite and arousal, desire and drive. In: C Legg and D Boott, (eds.) Human appetite: neural and behavioural bases. New York and London, Oxford University Press, 1994, pp.127-164
23. K. Mah, YM. Binik. The nature of human orgasm: a critical review of major trends. Clin. Psychol Rev 21:823-856, 2001
24. A. Graziottin . Etiology and diagnosis of coital pain. J Endocr Invest; 26 (Suppl.13): 115-121, 2003
25. A. Graziottin, L Brotto. Vulvar vestibulitis syndrome: clinical approach. JSMT 2004 (in press)
26. T. Tarcan, K. Park, I. Goldstein, I. Maio, A. Fassina, RJ. Krane. Histomorphometric analysis of age related structural changes in human clitoral cavernosal tissue JUrol 161:940-944, 1999
27. I. Goldstein, J. Berman, Vasculogenic. Female sexual dysfunction: vaginal engorgement and clitoral erectile insufficiency syndrome. Int J Imp Res10:S84-S90, 1998
28. EO. Laumann, A Paik, RC Rosen. Sexual dysfunction in the United States. Prevalence and predictors. JAMA 281: 537-544, 1999
29. A. Kegel. Sexual function of the pubococcygeus muscle West J Surg 60: 521-524, 1952
30. JO. De Lancey, CM. Sampsel, MR. Punch, A. Kegel. Dyspareunia: levator ani myalgia caused by overexertion Obstet Gynecol 82: 658-659, 1993
31. U. Wesselmann, AL. Burnett, LJ. Heinberg. The urogenital and rectal pain syndromes Pain 73(3): 269-294, 1997

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32. SeGRAVES RT. Balon R. Sexual Pharmacology- Fast Facts, New York, W.W.Norton & Company, 2003
33. A. Graziottin. Sexual function in women with gynecologic cancer: a review It J Gynec Obstet 2: 61-68, 2001
34. C. Liu. Does quality of marital sex decline with duration? Arch Sex Behav 32 (1): 55-60, 2003
35. A. Graziottin, P Koochaki. Self-reported distress associated with hypoactive sexual desire in women from four european countries. Poster presented at the North American Menopause Society (NAMS) meeting, Miami, 2003, Abstract book, poster n.126, pag 105
36. MP. Kafka Hypersexual desire in men: an operational definition and clinical implications for males with paraphilias and paraphilia related disorders. Arch Sex Behav 26:505-526, 1997
37. MP. Kafka The paraphilia-related disorders. Non paraphilic hypersexuality and sexual compulsivity/addiction in SR Leiblum, R Rosen (eds) Principles and Practice of Sex Therapy 3rd ed. New York: Guilford Press, 2000, pag. 471-503
38. KJ. Berk, A Holdcroft. Sex and gender differences in pain. In: Wall PD & Melzack R "Textbook of pain", Edinburgh, Churchill livingstone, 1999, pp. 951-965
39. AM. Unruh. Gender variations in clinical pain experience. Pain 65: 123-167, 1996
40. KJ. Berckley. Sex differences in pain behavioural and brain. Sciences 20: 371-380, 1997

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Table. 1 Similarities in the seeking-appetitive-lust system, contributing to the biological-instinctual bases of sexual desire, in both men and women	
Neurotransmitter	Dopamine, for the seeking/appetitive side Endorphin, for the consummatory/satisfaction related side
Heavily activated	By mental sexual arousal and appetitive states
Perceptive side	"I need/want/can get something good in the environment"
Motor side	I'll do something to get it (but prevalent proceptive behaviour in males and receptive behavior in female)
Inhibited	By antidopaminergic drugs
Activated	By dopaminergic drugs, like L-Dopa in patients suffering from Parkinson's disease
Drug sensitivity	Cocaine and amphetamines generate pseudoappetitive behaviors Opiates generate pseudoconsummatory feelings
Depression	Inhibits sexual desire and correlated behaviors

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Basic Emotion Command System	Men	Women
Seeking/appetitive and lust	higher	lower
Rage and anger	higher	lower
Fear and anxiety	lower	higher
Panic, separation/distress	lower	higher

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