

What Affects Male Sexual Activity: A Comprehensive Review

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Abstract

The fundamental importance of sex lies in the need for reproduction and species continuity. For humans, sexual expression is an important source of physical pleasure and emotional intimacy. Healthy sexual expression is closely related to well-being, health and overall quality of life in both men and women. Sexual activity is also considered an important determinant of quality of life. At present, questions about sex are still largely ignored in routine consultations in almost all medical specialties. The factors affecting sexual activity are complex and can be divided into the influence of bio-psycho-sociological factors. Biological influences include anthropometric parameters, sexual function, lifestyle, neuroendocrine system, and diseases; psychological influences include psychological status, mental illness, and sexual attitudes; sociological influences include factors such as marriage, occupation, and economic status. With the epidemic and outbreak of Coronavirus disease 2019 (COVID-19), people's way of life and work has changed, which also has a great impact on sexual activities. This article will provide a systematic review of factors related to male sexual activity.

Keywords

Sexual Activity, Andrology, Sexual Health, Influencing Factors

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1. Introduction

Over the past few decades, awareness of the importance of sexuality has drawn increasing attention from the medical community. In the biological-psycho-sociological sense, the influencing factors of sexual behavior are multifaceted, mainly depending on age, biological conditions, health status and cultural background [1]. Sexual health is closely related to general health, and the former can be seen as a marker of the effectiveness of the latter [2] [3]. For example, decreased erectile function is often indicative of acute myocardial infarction, stroke, sudden death and other cardiovascular diseases [3]. Epidemiological studies have shown that active sexual activity has been shown to have numerous health benefits [4], because endorphins are released during sexual activity, which increases natural killer cell activity [5]; can boost immune function and help prevent infection [6]; It also relieves mental stress by increasing the release of oxytocin [7].

At present, there are many domestic and foreign studies on factors affecting male sexual activity, related factors such as marital relationship, anthropometric parameters, lifestyle, work and sexual function, etc., but no systematic review has been carried out. This paper mainly summarizes the researches on the factors affecting male sexual activity reported in recent years from the dimensions of biology-psychology-sociology and COVID-19 (Figure 1).

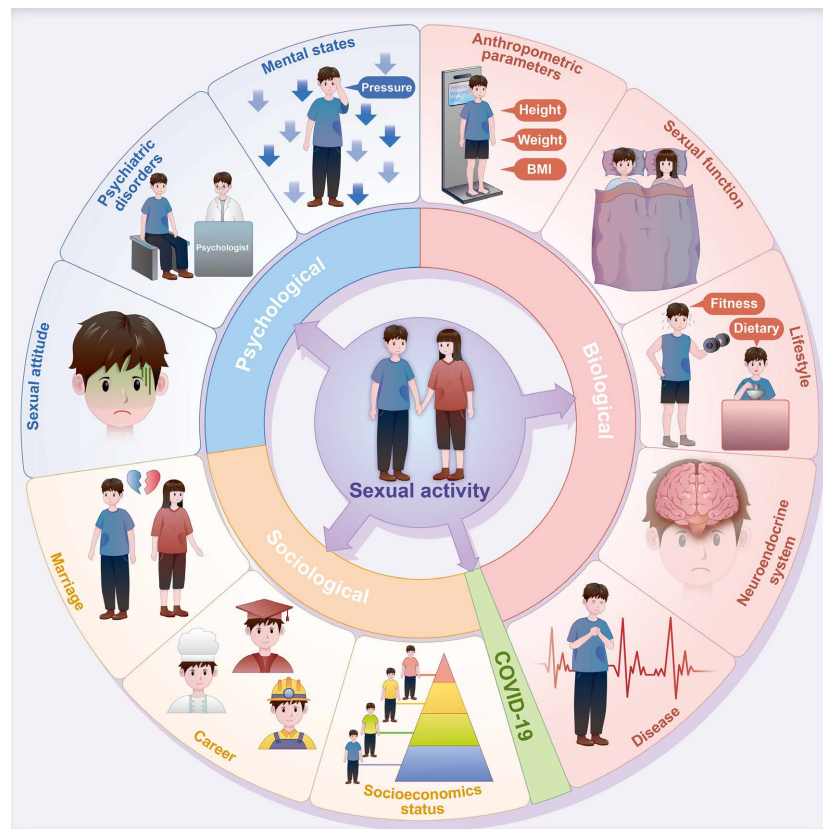


Figure 1. A summary of biology-psychology-sociology and COVID-19 affecting male sexual activity.

2. Biological Factors

2.1. Anthropometric Parameters

Male stature (as characterized by anthropometric parameters such as weight, height, body mass index, and waist circumference) may influence some aspects of sexual activity [8]. Studies have shown that there is a positive correlation between height and frequency of sexual intercourse in men, while no such relationship has been observed in women. The rationale for this finding, although not determinable in the study's outcome data, could be theoretically explained to some extent. Men's height is seen as an attractive trait by women, and tall men may be perceived as more attractive. Multiple studies have consistently found that women are more likely to associate with men who are taller than themselves and taller than the average male, so taller men are considered to be more sexually active [9] [10] [11]. Thus, male height can to some extent predict the chance of monthly sexual encounters [12].

Obesity rates are on the rise globally, and obesity can negatively impact an individual's physical, emotional, and mental health [13]. Some studies have shown a trend of negative correlation between body mass index and male sex frequency ($P = 0.08$) [14] [15]. This result is similar to that of a previous study by Smith *et al.*, which noted an inverse relationship between sexual activity and body mass index in men and women aged 18 - 27 [8]; the team also argued that thinness of men are generally considered more attractive and therefore have more opportunities to engage in sexual activity [8]. There are also studies that believe that BMI is considered a rough proxy for body fat, and that an increase in BMI is closely related to a decrease in the frequency of male sexual intercourse, which can be attributed to the following three aspects: 1) Obesity is associated with depression, anxiety, poor body image and related to depressed self-esteem, all of which interfere with sexual function (e.g., obesity may cause erectile dysfunction or exacerbate pre-existing erectile difficulties). 2) The biochemical activity of adipose tissue in obese patients is associated with the development of metabolic syndrome, a group of pathologies known to adversely affect sexual function (e.g., dyslipidemia, insulin resistance, hypertension, hyperglycemia, cardiovascular disease increased and chronic inflammation). 3) Obesity can also negatively impact sexual relationships by reducing heterosexual attraction and/or opportunities for sexual encounters [16]. In women, it has been demonstrated that the frequency of sexual intercourse does not correlate with body mass index [17].

2.2. Sexual Function

The ability of a man to satisfy a sexual partner during sexual activity is often cited as the most important determinant of sexual confidence for men [18]. Erection Hardness Score (EHS), International Index of Erectile Function (IIEF-5) and Premature Ejaculation Diagnostic Tool (PEDT) are often used in clinical work to assessing the patient's sexual function.

Penile hardness is an essential component of assessing male sexual quality and

is commonly measured clinically using EHS [19]. The erection hardness is closely related to the ability to complete sexual activities, and the success rate of successful sexual activities is positively related to the penile erection hardness score [20]. Concerns about the erection hardness generally reduce confidence in the next sexual activity, and decrease the chances of its success [21]. Satisfactory penile erection hardness can bring a series of psychosocial benefits, such as enhancing self-confidence in erectile function, satisfying self-esteem and overall self-confidence, and improving the overall sexual life and sexual relationship satisfaction of men and their sexual partners be improved [22]. And regular sex activity can maintain satisfactory erectile dysfunction [23]. Erectile Dysfunction (ED) is defined as the inability to consistently obtain and/or maintain a penile erection sufficient for satisfactory sexual intercourse, often accompanied by a decrease in erectile hardness, reduced self-esteem and loss of confidence in sexual function, and can also affect sexual intercourse and partnership issues, etc [24] [25] [26] [27] [28]. Studies have shown that a decrease in the frequency of sexual activity often indicates worsening erectile function [23]. In a Global Sexual Quality of Life Survey of more than 12,500 participants, 95% of men and 88% of women said that having and maintaining good erectile function is essential for good sexual activity [29]. Interestingly, similar results were found in a Swedish study of 1335 women, with women with an erectile dysfunction partner more likely to experience sexual dysfunction than those without an erectile dysfunction partner [30].

Premature ejaculation (PE) is often defined as short ejaculation latency and lack of sensation of ejaculation control; both of which are associated with disturbances in self-perceived control, mental depression, and interpersonal difficulties [31]; and current estimates of the global prevalence of premature ejaculation is about 20% - 30% [32]. The recently updated guidelines for the diagnosis and treatment of premature ejaculation by the International Society of Sexual Medicine propose that premature ejaculation is a disorder of male sexual dysfunction characterized by ejaculation within approximately 1 minute of vaginal penetration (primary premature ejaculation) or a reduction in latency to ≤ 3 minutes (secondary premature ejaculation), uncontrollable delayed ejaculation, and consequent negative emotions in the individual [33]. Notably, premature ejaculation and erectile dysfunction often coexist in some patients [34]. This often negatively affects patient self-esteem, sexual satisfaction, and relationships with sexual partners [32] [35]. This suggests that premature ejaculation has a negative impact on men's overall sexual activity.

2.3. Lifestyle

The relationship between exercise behavior and sexual activity in men is clinically important because exercise can have beneficial effects on men's sexual health and can greatly facilitate and/or improve relationships with sexual partners. Participation in regular and appropriate physical activity may be a key

protective factor for general and sexual health [36] [37]. Exercise behavior itself has long been associated with improving/maintaining male sexual function in both animals and humans [37]. It has been observed in animal experiments that compared with the control group, the male rats undergoing moderate swimming have a reduced penile erection latency and an increased frequency of sexual activity. Therefore, it can be seen that moderate exercise can improve sexual desire and improved sexual function [38]. Similar results have been observed in human studies, where moderately regular physical activity is associated with better sexual activity (e.g., erectile function, libido, orgasmic arousal, and sexual satisfaction) [39]. For example, in data from the Massachusetts Male Aging Study (which included 1156 men aged 40 - 70 followed for 8.8 years), compared to baseline and follow-up, The risk of erectile dysfunction among men who participated in regular physical activity was lowest; whereas sedentary (<200 kcal/day physical activity) were most likely to have erectile dysfunction (95% confidence interval CI: 14% vs 27%, $P = 0.013$). In addition, any sport-related activity greatly increases the opportunity for personal social and sexual activity [40] [41] [42]. Regular and appropriate physical activity (e.g., running for about 1.5 hours per week or rigorous work outdoors for 3 hours per week) and a correct lifestyle play a hugely positive role in the prevention and treatment of male sexual dysfunction [43] [44] [45] [46].

At present, the popular dietary patterns in the world include: Western dietary pattern, Mediterranean dietary pattern, vegetarianism and AHEI-2010 dietary pattern. Among them, Western diets are high in red and processed meat, dairy products, refined grains, processed and artificial sweets, and salt, and low in fruits, vegetables, fish, and whole grains. The Western model is characterized by higher intakes of red meat, high-fat dairy products, and refined grains. There is growing evidence that a Western diet is harmful to health, and adherence to a Western diet increases the risk of overall mortality and multiple diseases, including cardiovascular disease, obesity, metabolic syndrome, stroke, chronic kidney disease, breast cancer, colon cancer, and prostate cancer, etc. The Mediterranean dietary pattern emphasizes eating more vegetables, legumes, fruits and nuts, grains, fish, and olive oil, and less red or processed meat. The Mediterranean diet has grown in popularity over the past few decades due to an increasing number of health benefits shown in randomized controlled trials. The Mediterranean diet is not only associated with a lower incidence of type 2 diabetes, metabolic syndrome, and morbidity and mortality from coronary heart disease and stroke. In addition, adherence to this diet was associated with reduced rates of overall mortality, cardiovascular disease, coronary heart disease, myocardial infarction, malignancy, neurodegenerative disease, and diabetes. A vegetarian diet is characterized by no intake of animal products, especially red meat, and therefore lower intake of saturated fat and cholesterol. Vegetarian foods can also be subdivided into semi-vegetarian (excluding all animal products except fish), lacto-ovo-vegetarian (excluding all animal products except eggs and dairy), ovo-

vegetarian (excluding all animal products except eggs) all animal products) and vegan (free of all animal products). Compared with non-vegetarians, vegetarians have lower ischemic heart disease mortality and overall cancer incidence.

Because vegetarians avoid red or processed meat, vegetarian diets may reduce health risks associated with red meat (e.g., esophageal, gastric, colorectal, prostate, and bladder cancers). The AHEI-2010 dietary pattern emphasizes more fruits, vegetables, whole grains, nuts and legumes, polyunsaturated and omega-3 fatty acids, and less red meat, processed meat, sugar-sweetened beverages, and trans fats of intake [47] [48]. Similar results have been found in several cross-sectional studies, with long-term adherence to the Mediterranean diet or components of the Mediterranean diet (e.g., fruits, vegetables, nuts, and monounsaturated fats) associated with a lower prevalence of erectile dysfunction. Erectile function and testosterone levels appear to improve in obese and overweight men who lose weight through a low-fat, low-calorie diet [49] [50] [51] [52]. Conversely, unhealthy lifestyles such as smoking, excessive alcohol consumption and drug use can negatively impact male sexual function [53].

2.4. Neuroendocrine System

Major brain regions involved in the control of male sexual initiation and behavior include the amygdala, bed nucleus of stria terminalis, medial preoptic area, hypothalamic paraventricular nucleus, and the mesolimbic dopamine system. The medial preoptic area, paraventricular nucleus of the hypothalamus, brainstem, and spinal nuclei control genital reflexes. The sensory and motor aspects are integrated and elicited by the amygdala, the bed nucleus of the stria terminalis, the medial preoptic area, the paraventricular nucleus of the hypothalamus, and the midlimbic and nigrostriatal dopamine tracts, which are also components of other social behaviors. The most critical central integration area for male sexuality is the medial preoptic area, which receives olfactory input from the primary and accessory olfactory bulbs and is processed by the medial amygdala and the bed nucleus of the stria terminalis. Sensory input from the genitalia is transmitted to the medial preoptic area through the spinal cord and subthalamic nucleus [54].

There have been many studies using neuroimaging techniques to assess sexual arousal in healthy men. Sexual arousal is thought to be the result of a complex interplay between cognitive, emotional, motivational and physiological factors [55] [56] [57] [58]. Cognitive factors of sexual arousal include labelling processes (classification as sexual stimuli), assessment (assessment of sexual stimuli intensity), and attention to sexual stimuli. Evidence from these studies suggests that the inferior temporal cortex, right orbitofrontal cortex, and superior/inferior parietal cortex are associated with cognitive function. Affective factors included an assessment of the positive impact component of sexually arousal stimuli (pleasure associated with arousal). The amygdala, primary somatosensory cortex, and posterior insula are all involved in emotional processes. The cranial anterior

cingulate cortex and ventral striatum are associated with initiators involved in male sexual activity by integrating perceived urges for overt sexual arousal. Physiological factors are associated with various responses (*i.e.*, genital, cardiovascular, respiratory changes, etc.) that put subjects in a state of sexual readiness. The anterior insula, putamen, and hypothalamus are involved in physiological components [54]. The fusiform gyrus, amygdala, orbitofrontal cortex, anterior cingulate gyrus and putamen have been found to be involved in the process of sexual arousal, and these regions are involved in the processing of emotional visual information, emotional processing, cognitive processing, initiation, respectively. Kinetic processing is related to the physiological processing of sexual arousal [57]. Neuroimaging studies suggest that the fusiform gyrus may be involved in the recognition and determination of sexual stimuli [56] [57]. General studies of amygdala responses to sexual stimuli suggest that the amygdala plays a key role in assessing the affective aspects of complex sensory information related to sexual stimuli (pleasure levels) [55] [59]. The orbitofrontal cortex and the anterior cingulate gyrus are involved in cognitive and/or motivational processes, the orbitofrontal cortex and the perception of facial attractiveness. In addition, the orbitofrontal cortex may be involved in sexual orientation and inhibition of libido [60] [61] [62]. Physiological components of the putamen involved are closely related to various responses to sexual initiation states (*i.e.*, genital, cardiovascular, respiratory changes, etc.) [56] [57].

Sex hormones are essential for neural circuit development and sex-related specific behavior. For example, testosterone (T) and its metabolites estradiol (E2) and dihydrotestosterone (DHT) are essential for male sexuality and sexual characteristics. Leydig cells in the testes secrete testosterone, which travels through the blood to reach cells outside target of the testes [54] [63]. In addition, androgens play a key role in stimulating and maintaining male sexual function, and they are considered essential for the development, growth, and maintenance of erectile function of penile tissue. It is increasingly recognized that testosterone has profound effects on penile tissues involved in erectile mechanisms, as androgen deprivation causes penile tissue atrophy, altered dorsal nerve architecture, altered endothelial morphology, reduced trabecular smooth muscle content and extracellular matrix changes [64].

2.5. Disease

Sexual activity is an important component of the quality of life of patients with cardiovascular disease and their partners, yet decreased frequency of sexual activity and worsening of sexual function are common among patients with cardiovascular disease [4] [65]. Risk factors for cardiovascular disease and erectile dysfunction (including age, smoking, diabetes, hypertension, dyslipidemia, depression, obesity, and a sedentary lifestyle, among others) are similar because they share a common base of etiology and pathophysiology. It is now generally accepted that most erectile dysfunctions are caused by endothelial dysfunction

[66]. Recent studies have shown that the degree of erectile dysfunction is closely related to the severity of cardiovascular disease, and that erectile dysfunction can be considered a sentinel marker in patients with occult cardiovascular disease [67] [68]. Epidemiological studies have also found that an increase in the number of patients with cardiovascular disease risk factors parallels an increase in the prevalence of erectile dysfunction worldwide [69] [70].

Male sexual dysfunctions (e.g., erectile dysfunction, decreased libido, inability to achieve orgasm, dyspareunia, etc.) are often independent predictors of adverse cardiovascular events [71]. The progression from sexual dysfunction to overt adverse cardiovascular events (acute coronary events, stroke, peripheral arterial disease, etc.) often takes 2 to 5 years. This may be due to the smaller diameter of the blood vessels in male sex organs, which can lead to early clinical manifestations of endothelial dysfunction [66]. In addition, various cardiovascular drugs may also cause erectile dysfunction [72]. For example, antiandrogen side effects leading to decreased sexual function and sexual activity (e.g., decreased libido, erectile dysfunction, and gynecomastia) may occur in some male patients treated with spironolactone [73] [74]. The relationship between sexual activity and cardiovascular disease has been studied since the 1950s [75]. However, little is known about whether and how sexual activity affects cardiovascular risk, and empirical and theoretical research on the effects of sexual activity on cardiovascular health remains scarce and almost exclusively focused on the effect of sexual activity on cardiovascular event risk [72] [76]. For example, a longitudinal study in Wales of 914 men aged 45 to 59 recruited between 1979 and 1983 found that sexually active men had a lower risk of ischemic stroke and coronary heart disease [77]. Another study based on the same Welsh male population database found that men who experienced more orgasms had a lower risk of dying from coronary heart disease [8]. Evidence for the health benefits of sexual activity has also been found in other clinically-based studies and has shown that sexual activity is associated with better mental health outcomes as well as healthier heart rate variability and lower overall mortality [76]. Additionally, sexual activity helps reduce stress hormone levels in men (such as epinephrine, cortisol, etc.) and stimulates the production of endorphins, which are natural emotional signals. Sexual activity, especially during orgasm, also triggers the release of oxytocin, which promotes intimacy, helps relieve stress, and improves cardiovascular health. Not only does oxytocin reduce stress during sexual activity and orgasmic moments, but its effects may persist over time and have positive health effects [78] [79]. It has been reported that, in sexual activity, the key influencing factor for positive health outcomes is the frequency of sexual activity. Medical researchers have linked physical activity to various measures of cardiovascular health through research, emphasizing that physical activity is a key component of promoting cardiovascular health in older adults [80]. Similar to other forms of physical activity, regular sex may enhance the ability of blood vessels to dilate, improve vessel wall function, and more efficiently supply oxygen to muscles, thereby promoting cardiovascular health [80]. In addition, moderate frequency

of sex may promote intimacy in a partnership [81], thereby improving overall relationship quality, which also has positive effects on health. At the same time, however, there are some clinical concerns, such as the potential for acute cardiovascular adverse events associated with sexual activity, especially in patients with a history of cardiovascular disease. However, most clinical studies have concluded that sexual activity has a minimal role in inducing acute adverse cardiovascular events and that this event can be mitigated by regular physical activity [82] [83].

In addition, male sexual dysfunction is a common complication of diabetes, with the prevalence of erectile dysfunction in men with diabetes ranging from 35% to 75% in different reports [84]. Erectile dysfunction occurs at an earlier age in men with diabetes than in healthy individuals; the incidence in men 45 - 49 years of age with diabetes is similar to that in non-diabetic men over the age of 70 [85]. Current research on sexual function in diabetic and non-diabetic patients has focused on erectile dysfunction. In addition to affecting the erectile function of the penis, diabetes also causes male sexual dysfunction by affecting the abnormal ejaculation function and libido [86]. A European study found that 55% of men with type 1 diabetes experienced decreased libido, 34% had erectile dysfunction, and 20% reported orgasm dysfunction [87]. The effects of diabetes on male sexual activity include not only erectile dysfunction, but are also significantly associated with other aspects of sexual dysfunction, including libido, ejaculatory function, and sexual satisfaction [88]. Diabetes can cause erectile dysfunction through a variety of pathways, including metabolic, neurological, vascular, and psychological factors. However, organic factors are the decisive factor in causing erectile dysfunction, and are generally characterized by progressive onset, progressive progression, and especially nocturnal erection difficulties; psychogenic factors are characterized by sudden onset and immediate and complete loss of erection [84].

Hyperglycemia plays an important role in affecting erectile function in men, and it has been demonstrated that glycated hemoglobin levels increase significantly as erectile function declines [89]. Hyperglycemia also leads to an increase in advanced glycation end products, elastin glycation, and promotes the development of macrovascular and microvascular complications, which can further contribute to erectile dysfunction [90]. Higher levels of advanced glycation end products in the corpus cavernosum can contribute to diabetic erectile dysfunction by generating oxygen free radicals, which can induce oxidative cell damage and quench nitric oxide (NO), ultimately leading to cyclophosphate Decreased glycosides (cGMP) and impaired relaxation of cavernosal smooth muscle. Hyperglycemia may also directly impair guanylate cyclase activity, thereby directly reducing cyclic guanosine monophosphate production [91]. Nitric oxide-mediated dysfunction of penile smooth muscle relaxation is one of the mechanisms of diabetes-induced vascular endothelial dysfunction. In several studies in humans, diabetic men with erectile dysfunction have been found to have significantly reduced endothelial vasodilation [92] [93]. In addition, diabetic neuropathy also

plays an important role in the pathogenesis of erectile dysfunction, with 38% of diabetic men with erectile dysfunction due to diabetic neuropathy [94]. The complete erectile function of the penis must have the integrity of both the autonomic and somatic nerves. The mechanism by which autonomic neuropathy causes erectile dysfunction is due to decreased parasympathetic nerve activity required for the relaxation of cavernosal smooth muscle. Diabetic autonomic neuropathy can also lead to urogenital disorders such as bladder dysfunction, erectile dysfunction, and retrograde ejaculation [95]. Parasympathetic excitation results in decreased norepinephrine levels and increased acetylcholine secretion, leading to increased nitric oxide synthase (NOS) activity, resulting in the release of nitric oxide from endothelial cells and from non-adrenergic and non-cholinergic neurons [93]. In addition, diabetic neuropathy can also negatively affect erectile function by reducing neurogenic nitric oxide synthesis [96].

3. Psychological Factors

3.1. Mental States

Psychological factors play an important role in human sexual activity [97]. Mental states of relaxation and low anxiety underlie sexual desire, orgasm, and sexual pleasure. Mental states such as depression, anxiety, and anger are good predictors of male sexual dysfunction [98] [99] [100]. Psychological research has shown that mood disorders such as depression, anxiety and obsessive-compulsive disorder can cause low libido in men [101]. The concept of sexuality has been in the public eye since 1974 and is generally defined as a psychological or subjective state that is important for initiating and maintaining human sexuality, usually occurring during the first phase of the human sexual response cycle [102]. The most direct influencing factor of male low libido is its cognitive ability (such as sexual belief and autonomous thinking, etc.), in addition, cognitive factors can also change sexual desire by adjusting other influencing factors. Sex is an integral part of life, and when physical and/or mental health changes, sexual behavior changes accordingly. Although most patients have difficulty expressing their sexual needs, this does not mean that sex is not important to them [103]. Therefore, we should take corresponding treatment measures when considering treatment options for male sexual dysfunction [97].

3.2. Psychiatric Disorders

Studies have shown that male sexual dysfunction is common among men with psychiatric disorders such as depression, post-traumatic stress disorder, and anxiety disorders [45] [104] [105] [106]. The reasons can be attributed to the following two points: first, mental illness itself can directly have a negative impact on sexual function; second, with the improvement of people's awareness of affective disorders-related diseases, the prescription rate of antidepressants has also decreased. While increasing, antidepressants can also cause decreased erectile function and low libido, affecting the quality of sexual life [45] [105] [107] [108].

Antidepressant drugs may affect male sexual function by decreasing libido, delaying orgasm and less frequently causing arousal difficulties [109]. In fact, serotonergic activity interferes with dopaminergic transmission via serotonin receptors in the mesolimbic area, which is primarily associated with sexual desire and orgasm [110]. Medications used to treat people with psychiatric disorders not only impair their sexual function, but also reduce their adherence to medication [111]. In addition, sexual dysfunction itself can affect mental health [112]. Recently, a clinical study has shown the prevalence and associated factors of anxiety and depression among patients with ED in China. The prevalence of anxiety and depression in ED patients is high, and the severity of ED, education level, age, smoking, onset time, regular sleep, and exercise were associated with anxiety or depression symptoms. Clinicians should not ignore the psychological problems of ED patients, and they should work more closely with psychiatrists to help patients find reversible risk factors such as unhealthy “lifestyle factors” and administer individualized treatment in a timely manner [113].

3.3. Sexual Attitude

Compared with women, men have a more open and purposeful attitude towards sex, and prefer short-term relationships [114] [115]. Men’s explicit sexual attitudes are closely related to sexual desire and sexual satisfaction, that is, men who believe that sexual activity is important in their lives tend to experience higher levels of sexual satisfaction [37] [116] [117] [118].

4. Sociological Factors

4.1. The Relationship with Marriage

Sex is one of the integral and important components of intimacy, sexual expression is an important source of physical pleasure and emotional intimacy, and numerous studies have consistently shown a positive correlation between sex and marital satisfaction [12] [119]. Healthy sexual expression is strongly associated with well-being, physical and mental health, and overall quality of life in both men and women [4]. A harmonious sex life between couples is a prerequisite for maintaining a good relationship between husband and wife, and a good marriage relationship is the cornerstone of a harmonious sexual life between husband and wife [120]. However, the needs of men and women differ during sexual activity, and men placing greater emphasis on physical pleasure [121]. Thus, men are more likely to view sexual satisfaction as an indicator of overall marital relationship quality compared with women [119]. In addition, a decrease in the frequency of sexual activity often indicates a discordant marital relationship [122].

Existing studies have found that the decline in sex frequency is largely due to fewer marriages, with married people having sex more often than unmarried people. A population-based survey conducted in 1991 found that among men aged 20 - 39, the frequency of sexual activity was positively associated with the

marriage factor [123]. This is similar to our team's previous findings, which showed that the frequency of sexual activity decreased with age. According to data from the Ministry of Civil Affairs of my country in recent years, the marriage rate in my country has declined sharply. Therefore, in the results of this study, the frequency of intercourse among men aged 18 - 29 is lower than that of men aged 30 - 50 [124].

4.2. Career

Work-related stress is the result of a high stressful work environment and a lack of control over work-related emotions. Work stress can negatively impact sexual health, largely due to the level and duration of stress at work and the availability of help [125]. From a work environment perspective, workplace and sexual health can interact through at least three causal mechanisms: 1) By affecting the endocrine system; 2) By reducing discretionary time, energy, and libido (due to preoccupation with work difficulties and weakened), etc.; 3) Through negative emotions caused by work [98] [126] [127] [128]. The most concrete evidence on the relationship between work environment and sexual health problems comes from a Norwegian study that surveyed 399 couples aged 22 - 67. The study used a Work-to-Home Valid Negative Inference Scale and found that its scores were significantly associated with lower male libido [129]. In addition, a sample survey of 2112 men in three European countries found that workplace stress was significantly associated with self-reported levels of anxiety and depression, life satisfaction and well-being, and sexual satisfaction. Work-related stress is a risk factor for sexual health, with lack of libido and premature ejaculation being the most affected factors [129]. It is also widely noted that couples with both working partners have less time for intimate contact [130]. For example, couples in which both partners work full-time are less likely to have sex than those in which one partner does not. Meanwhile, research on the relationship between economic and social status and sexual behavior found that higher education, higher social status, and income were associated with better sexual function and active sexual activity [12].

4.3. Socioeconomic Status

Socioeconomic status was assessed using both income level and educational attainment.

Some groups have shown an inverse relationship between socioeconomic status and sexual activity. Research has shown that men had a decreasing rate of coital frequency with education beyond the high school level [8] [12] [131]. However, Laumann *et al.* showed that higher educational attainment and social status were associated with better sexual function [132]. This group hypothesized that lower levels of stress and improved health maintenance in individuals with greater educational achievement lowers the incidence of sexual dysfunction in both men and women. The data of *Michael* team's results is consistent with

data from younger cohorts where lower socioeconomic status predicts increases in sexual activity [12].

5. The Impact of the COVID-19 on Male Sexual Activity

Since the outbreak of the new crown epidemic in December 2019, the new crown pneumonia virus began to spread rapidly around the world in March 2020, and was declared a global epidemic by the World Health Organization. The pandemic has had a profound impact on the way people live, work and socialize. In the early stage of the epidemic, some countries and regions adopted isolation measures, which would have an impact on people's psychology, work, life and social interaction (such as anxiety, depression, sleep and eating patterns, etc.), and even cause trauma-related painful symptoms. This has also had a huge impact on sexual health, with one report showing that IIEF-15 scores in male subjects during the COVID-19 pandemic were significantly lower than before the pandemic ($P = 0.001$) [133]. Emotional changes such as anxiety and depression may directly contribute to a decrease in couples' sexual interest [134]. As previous studies have shown, patients with anxiety disorders have higher rates of sexual dysfunction than controls. Likewise, low libido has been shown to be associated with generalized anxiety disorder [45] [104] [106]. An online survey study in my country assessed changes in sexual behavior of women and men aged 18 - 45 during the outbreak. In this study, 25% of respondents experienced a decrease in libido, more pronounced in men than in women ($P = 0.001$). In addition, the number of sexual partners decreased for both sexes, with 32% of men experiencing a decrease in sexual satisfaction, with low libido and unsatisfactory relationships being important factors influencing sexual behavior. The study also found that the decrease in the frequency of sexual activity among young men during the epidemic can be attributed to the fact that most young Chinese people live with their parents (72% in the study), which is different from reports in other countries [135].

Among all occupations, medical personnel are the group with the most exposure to the new coronavirus and the most knowledgeable about medical science. Due to the speed and speed of the spread of the new coronavirus, it has been reported that 35.5% of medical staff have been infected with the new crown virus in this outbreak, 29.8% of medical staff feel stressed, 24.1% of medical staff feel anxious and 13.5% of medical staff exhibit depressive symptoms [136]. Although the transmission of the new coronavirus along the body fluid route has been found, there is not enough evidence that the virus can be isolated from sperm and vaginal fluid for transmission [137]. Due to the nature of sexual activity, close contact between partners may affect the mutual transmission of the virus. As a result, healthcare workers may be concerned that the virus they have been exposed to from the hospital could spread to their partner. A study of health care workers found that during the pandemic, male health care workers experienced decreased libido, increased use of male condoms, decreased foreplay time and

frequency of sexual activity, fewer sexual activity positions, and greater attention to hand hygiene. In addition, the study found that male medical staff with higher alcohol consumption and anxiety scores were more likely to suffer from sexual dysfunction [136].

6. Conclusion

In summary, despite the important achievements of sexual medicine over the past few decades, questions about sex are still largely ignored in routine consultations in almost all medical specialties. The factors affecting male sexual activity involve a variety of factors such as sociocultural background and demographic characteristics. At present, there is no scientific definition or consensus on the average level of male sexual activity. In addition, relationships between partners that are important to sexual activity were not assessed in most studies. Therefore, more epidemiological and standardized studies are needed in future research to better address issues related to male sexual activity, while also taking into account the complexities of social and psychological factors.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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