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The Effects of Oxytocin on Sexual Disorders

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A B S T R A C T

Purpose: This study aimed to investigate the effects of oxytocin on sexual function by reviewing evidence from both animal and human studies, with a focus on its physiological, neurochemical, and psychological mechanisms.
Methods and Materials: The article employed a comprehensive narrative review of experimental and clinical research conducted between 2007 and 2023, including studies on animal models (notably Wistar rats) and human participants. The studies explored oxytocin's effects through various administration routes (intraperitoneal injection, intranasal spray, and vaginal gel), utilizing both randomized controlled trials and observational methodologies. Parameters such as sexual behavior indices (e.g., mount latency, ejaculation latency), hormonal levels (oxytocin, cortisol, prolactin), subjective sexual function scores (e.g., FSFI, FSDS, SQOL-F), and physiological responses (e.g., blood flow, erectile function, vaginal pH) were evaluated across multiple interventions.
Findings: Animal studies demonstrated that oxytocin, alone or in combination with adrenergic modulators, significantly enhanced sexual behaviors and reproductive parameters in male rats. In ischemia-reperfusion models, oxytocin improved spermatogenesis without altering sex hormone levels. Human trials revealed that intranasal and vaginal oxytocin improved sexual desire, arousal, lubrication, and satisfaction in women with sexual dysfunction, including postmenopausal subjects. In women treated with SSRIs, oxytocin levels correlated positively with sexual function scores. However, some studies indicated placebo-level or inconsistent results in healthy individuals. Despite oxytocin's notable increase in subjective arousal and hormonal changes (e.g., epinephrine elevation), measurable behavioral effects varied.
Conclusion: Oxytocin plays a multifaceted role in modulating sexual behavior and function through central and peripheral mechanisms, including neural activation, hormonal modulation, and emotional regulation. While the evidence supports its therapeutic potential in specific sexual dysfunctions, especially stress- and hormone-related cases, further studies are needed to optimize dosage, delivery methods, and identify individual response variability.
Keywords: *oxytocin, sexual disorders, neuropeptide, hormone.*

1. Introduction

Oxytocin is one of the most significant hypothalamic neuropeptides, playing a broad role in regulating social, emotional, and physiological behaviors. This hormone, primarily secreted from the paraventricular and supraoptic nuclei of the hypothalamus, exerts profound effects on social interactions, emotional bonding, stress, anxiety, and sexual behaviors through its release into the bloodstream and direct action on specific receptors in the central nervous system. In addition to its prominent role in reproductive processes, such as stimulating uterine contractions during childbirth and lactation, oxytocin also has direct effects on physiological and psychological responses associated with sexual function (Ghorbani & Mirghafourvand, 2023). Extensive research has demonstrated that oxytocin can influence sexual desire, arousal, and orgasm by modulating the activity of brain regions involved in sexual and social behavior, such as the amygdala, hippocampus, and mesolimbic areas. This neuropeptide enhances the sense of pleasure and sexual satisfaction by increasing activity in reward-related areas, including the nucleus accumbens and prefrontal cortex. Furthermore, by reducing amygdala activity—a region central to the processing of fear and stress—oxytocin can alleviate stress and anxiety related to sexual performance, a factor that significantly exacerbates symptoms in individuals with sexual dysfunctions (Cera & Vargas-Cáceres, 2021).

Sexual disorders, including hypoactive sexual desire, arousal disorders, anorgasmia, and dyspareunia (pain during intercourse), are common issues that affect individual well-being and interpersonal relationships. Studies have shown that deficiencies in the oxytocin system may contribute to the emergence of these disorders. Decreased levels of this hormone have been reported in individuals suffering from hypoactive sexual desire disorder (HSDD). Additionally, in men with erectile dysfunction, alterations in oxytocin-related neurotransmission pathways have been observed, indicating the role of this hormone in maintaining vascular and neural function in the genital regions. From another perspective, oxytocin, as a social modulator, can also influence sexual behavior from a psychological standpoint (Alley & Diamond, 2020; Pettigrew & Novick, 2021). This hormone facilitates improved marital relationship quality by increasing trust, empathy, and emotional bonding between sexual partners. Clinical studies have shown that intranasal administration of oxytocin in individuals with anxiety and depressive disorders—conditions often accompanied by reduced sexual desire—has produced positive results in enhancing sexual arousal and motivation. On the other hand, the dual effects of oxytocin, depending on individual circumstances and environmental factors, can occasionally lead to changes in reward-related behaviors, which in some cases may negatively affect sexual function. Given the extensive impact of oxytocin on various aspects of sexual behavior, an in-depth exploration of its mechanisms of action may offer new therapeutic strategies for managing sexual dysfunctions. The use of oxytocin analogs or drugs that modulate its receptors could be considered innovative approaches for treating problems such as low sexual desire, orgasmic disorders, and performance anxiety in the context of sexual relationships. Overall, oxytocin can be regarded as a potential therapeutic target for enhancing sexual performance and improving interpersonal relationship quality, and further investigations in this domain may contribute to the development of more effective therapeutic methods (Quintana, 2024).

Beyond its effects on sexual desire and arousal, oxytocin plays a key role in regulating emotional interactions and interpersonal bonding, which indirectly influence sexual health. Recognized as a bonding hormone, numerous studies have shown that elevated oxytocin levels during romantic relationships lead to increased commitment, empathy, and marital satisfaction. In this context, neuroimaging research has demonstrated that oxytocin, by activating brain regions associated with positive emotional memory, enhances positive feelings toward one's sexual partner—thereby directly influencing increased desire and improved sexual relationship quality. Conversely, dysregulation in the oxytocin system can lead to functional and behavioral disturbances in sexual relationships. Research has indicated that reduced oxytocin secretion, accompanied by heightened stress and anxiety, can result in conditions such as erectile dysfunction in men and arousal disorder in women. This issue is particularly pronounced in individuals suffering from anxiety disorders, depression, or post-traumatic stress disorder (PTSD), as these conditions may be associated with decreased oxytocin receptor activity in the central nervous system. Conversely, in certain contexts, higher oxytocin levels can negatively affect sexual behavior (Dale Ii et al., 2024; Giovanna & Damiani, 2020). For example, studies have shown that in some individuals, high doses of oxytocin may lead to increased emotional sensitivity and excessive dependence on a sexual partner, which under specific conditions could cause heightened interpersonal tension or even social anxiety.

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One key area of recent research involves examining the effects of oxytocin on neurohormonal mechanisms in individuals with sexual dysfunctions such as low libido and orgasmic disorders. Some studies have proposed that the use of oxytocin as an adjunct therapy could help improve these conditions. For instance, in women with sexual arousal disorder, intranasal administration of oxytocin has been shown to increase blood flow to the genital area and heighten sensitivity to sexual stimuli. Similarly, in men with erectile dysfunction, oxytocin can improve erectile function by acting on nitric oxide receptors in penile tissue (Flanagan & Chatzittofis, 2022). Therefore, the objective of this study was to provide a comprehensive review of the effects of oxytocin on sexual disorders.

2. Methods and Materials

This study is a systematic review conducted with the aim of evaluating existing research on the effects of oxytocin on sexual disorders. A systematic search will be carried out across reputable databases such as PubMed, Scopus, Web of Science, and Google Scholar using relevant keywords including "Oxytocin," "Sexual Dysfunction," "Libido," "Erectile Dysfunction," and their equivalents. The search will be performed without time restrictions; however, priority will be given to articles published in the last ten years. Inclusion criteria encompass studies that examine the effects of oxytocin on sexual functioning, including both human and animal studies. Exclusion criteria include articles in which data on oxytocin are incomplete or unusable.

3. Findings and Results

3.1. Oxytocin

Oxytocin is a peptide hormone with broad regulatory roles in physiological and behavioral processes in mammals. It was first identified in the early 20th century through the work of Henry Dale, who investigated its uterotonic effects. Later, in 1953, Vincent du Vigneaud successfully determined the chemical structure and synthesized oxytocin, marking one of the earliest full syntheses of a peptide hormone in scientific history. Chemically, oxytocin is a nonapeptide composed of nine amino acids, forming a disulfide bridge between two cysteine molecules and a side chain extending from the ring. Its amino acid sequence includes cysteine, tyrosine, isoleucine, glutamine, asparagine, cysteine, proline, leucine, and glycinamide. Structurally, it is closely related to vasopressin, another nanopeptide secreted by the posterior pituitary that plays roles in blood pressure regulation and fluid homeostasis (Carson & Guastella, 2013).

Oxytocin is primarily synthesized in the paraventricular and supraoptic nuclei of the hypothalamus and transported via neuronal axons to the posterior pituitary, where it is released in response to stimuli such as nipple stimulation during lactation or uterine contractions during labor. Upon release, oxytocin binds to G-protein-coupled membrane receptors on target cells, activating intracellular signaling pathways that increase intracellular calcium levels and cause smooth muscle contraction. Physicochemically, oxytocin has a short physiological half-life of approximately 3 to 5 minutes due to rapid degradation by exopeptidases and endopeptidases in the bloodstream (Monks & Palanisamy, 2021). Its molecular weight is around 1007 Daltons, and due to its disulfide bonds, it possesses greater structural stability compared to other short peptides. It is highly soluble in water and remains stable in acidic to neutral pH environments but degrades rapidly in alkaline conditions or in the presence of proteolytic enzymes.

Beyond its classical physiological roles in labor and lactation, oxytocin exerts wide-ranging effects on social behaviors, emotional bonding, stress, anxiety, and interpersonal interactions. Studies have shown that oxytocin administration in animals and humans can enhance attachment behaviors, increase trust, reduce stress responses, and improve social interactions. Conversely, dysfunction in the oxytocin system has been associated with neuropsychiatric disorders such as autism spectrum disorder, schizophrenia, and depression (Osilla & Sharma, 2023).

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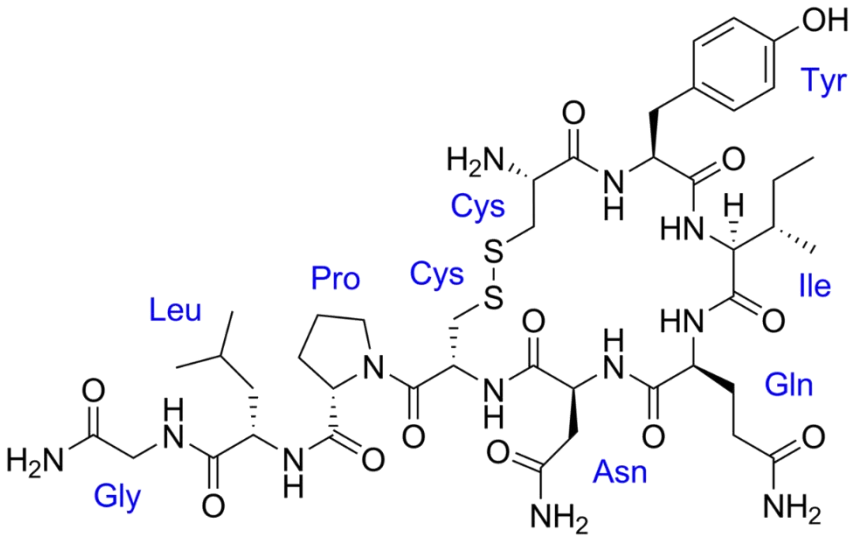
Figure 1

*Oxytocin (*Szabó & Whittaker, 2023*)*



At the cellular level, oxytocin acts via its specific receptors expressed in various tissues, including the uterus, mammary glands, brain, heart, and lungs. These G-protein-coupled receptors, when activated, increase intracellular calcium levels, thereby triggering signaling pathways involved in muscle contraction, neurotransmitter release, and behavioral modulation. One of oxytocin's most critical roles is in childbirth, where it stimulates receptors in uterine muscles to increase contractions and facilitate delivery (Stadler, 2020). This effect is clinically utilized with synthetic oxytocin (e.g., Pitocin) for labor induction and postpartum hemorrhage control. During lactation, oxytocin induces contraction of myoepithelial cells surrounding the milk ducts, promoting milk ejection and facilitating infant feeding.

From a behavioral perspective, oxytocin plays a significant role in emotional regulation and social interactions. It is vital for forming emotional bonds between mothers and infants, between partners, and even in friendships and broader social relationships. Studies indicate that elevated oxytocin levels enhance empathy, altruism, reduce social anxiety, and improve the quality of emotional relationships. Animal research supports these findings, showing increased social bonding and reduced aggression following oxytocin administration.

In terms of therapeutic applications, oxytocin has gained attention as a pharmacological target in several neuropsychiatric disorders. For example, intranasal oxytocin administration has improved social functioning, increased eye contact, and enhanced empathy in individuals with autism spectrum disorder. It has also shown positive effects in treating depression and anxiety, likely due to its ability to reduce stress hormone levels such as cortisol and exert calming effects on the brain (Hyodo, 2021).

From a biosynthetic perspective, the oxytocin gene is located on human chromosome 20 and encodes a protein precursor that includes the oxytocin peptide. After being synthesized in the endoplasmic reticulum, the precursor undergoes post-translational modifications, and the active oxytocin is stored in secretory vesicles until released in response to specific stimuli.

Another notable feature of oxytocin is its role in modulating immune responses and reducing inflammation. Studies suggest that oxytocin can inhibit the production of pro-inflammatory cytokines, offering protective effects against chronic inflammatory conditions such as rheumatoid arthritis and cardiovascular diseases. Additionally, evidence indicates oxytocin may aid in wound healing and tissue regeneration, possibly due to its influence on immune cells and growth factors.

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In evolutionary biology, oxytocin is regarded as one of the most ancient peptide hormones, conserved across various species from invertebrates to mammals. In some species, oxytocin is involved in regulating complex social behaviors such as group formation, parental care, and mate selection, underscoring its evolutionary significance in survival and reproduction (Pierzynowska & Gaffke, 2023).

3.2. The Effect of Sexual Activity on the Brain

Sexual activity is one of the most complex human behaviors, exerting profound effects on brain function that range from molecular and neurochemical processes to structural and functional changes over time. This process is influenced by a combination of biological, psychological, and social factors that simultaneously affect the brain during and after sexual activity. Sex is not merely an instinctive response for survival and reproduction; due to its intricate interaction with the central nervous system, it has significant effects on emotion, cognition, mental health, cognitive performance, and even brain aging. At the neurochemical level, sexual activity triggers the release of a range of neurotransmitters and hormones, including dopamine, oxytocin, serotonin, norepinephrine, and endorphins, each playing a distinct role in regulating pleasure, emotional bonding, stress reduction, and life satisfaction. Dopamine acts as a key neurotransmitter in the brain's reward system, producing euphoria and enhancing motivation. During sexual activity, the mesolimbic system, including regions such as the nucleus accumbens and prefrontal cortex, becomes more active, leading to feelings of pleasure and strengthening of emotional connection between partners. Oxytocin, often referred to as the "love hormone," is another important compound released especially during orgasm. Secreted by the hypothalamus and released into circulation via the posterior pituitary, oxytocin plays a vital role in human relationships by increasing trust, reducing anxiety, and strengthening social bonds (Joel et al., 2020). Studies have shown that individuals with frequent and satisfying sexual activity have higher levels of oxytocin, which increases attachment and improves the quality of relationships between partners (Joel, 2021; Joel et al., 2020).

Serotonin is another key neurotransmitter that rises following sexual activity and is involved in mood regulation, anxiety reduction, and increased feelings of contentment. This compound induces a sense of calm and alleviates psychological tension. One reason for the feelings of happiness and relaxation after sex is the increase in serotonin levels in the brain, which improves sleep quality and reduces symptoms of depression. Beyond neurochemical changes, sexual activity also has structural effects on the brain. Studies have demonstrated that regular sexual activity can increase gray matter volume in areas such as the hippocampus, which plays a crucial role in memory and learning. This effect is likely due to increased blood flow, release of growth factors, and enhanced synaptic function in that region (Joel, 2021). Research has also shown that regular sexual activity reduces levels of stress hormones such as cortisol, which can protect against neuronal damage and cognitive decline. In older adults, regular sexual activity is associated with slower brain aging and preserved cognitive functioning. Studies on individuals over 50 have shown that those who regularly engage in sexual activity perform better on cognitive tests, including memory, problem-solving, and verbal abilities. This is likely due to the positive effects of sexual activity on brain vasculature and the increased presence of neurotrophic factors such as BDNF, which support neuron protection and synaptic strength.

Sexual activity also affects the structure of the prefrontal cortex, which is responsible for emotional processing, decision-making, and social behavior regulation. Activities related to sexual intimacy can enhance this region and subsequently improve cognitive abilities and emotional regulation. These effects are especially pronounced in individuals with strong emotional relationships (Bath et al., 2013; Neumann, 2008).

From a psychological perspective, regular and satisfying sexual activity has important effects in reducing stress, anxiety, and depression. This is not only due to neurochemical changes involving dopamine and serotonin but also due to the emotional closeness and support fostered between partners. Studies have shown that individuals in healthy and fulfilling sexual relationships report higher levels of happiness, quality of life, and relationship satisfaction. The effect of sexual activity on the immune system is also notable. Research has shown that individuals with regular sexual activity have higher levels of immunoglobulin A, one of the body’s key immune components that protects against infections (Crespi, 2016). Elevated levels of this antibody in sexually active individuals may explain reduced incidence of infectious diseases and improved overall health.

Sexual activity can also positively affect pain tolerance. Studies have shown that sexual activity increases the level of endorphins in the brain, which are natural analgesics.

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Consequently, individuals who engage in regular sexual activity tend to have lower pain sensitivity and greater tolerance to painful stimuli. Another important effect of sexual activity on the brain is improved sleep quality. The increased secretion of serotonin and oxytocin following orgasm creates a sense of relaxation that enhances sleep. Better sleep quality, in turn, positively influences cognitive performance, mood regulation, and stress reduction.

From a hormonal perspective, sexual activity increases testosterone levels in both men and women. This hormone plays an important role in maintaining muscle mass, bone density, energy levels, and libido (Bethlehem et al., 2013). In men, optimal testosterone levels are associated with increased self-confidence, improved cognitive performance, and reduced risk of depression. In women, testosterone contributes to heightened sexual desire, improved mood, and bone health maintenance.

The effects of sexual activity on the brain can also be examined within the framework of evolutionary theory. From an evolutionary standpoint, sexual behavior not only ensures species survival but also promotes social cohesion and strengthens bonds among group members—factors that increase offspring survival and group success. In human societies, sex is part of emotional and social relationships that enhance cooperation, trust, and emotional bonds (Borland & Rilling, 2019).

3.3. *The Physiological Role of Oxytocin in the Nervous and Endocrine Systems*

In the central nervous system, oxytocin acts as a synaptic modulator, interacting with its specific receptors in various brain regions such as the amygdala, hippocampus, and prefrontal cortex. These functions play roles in anxiety regulation, social bonding, and social cognition. At the endocrine level, oxytocin is crucial during childbirth and lactation—it induces uterine contractions during labor and stimulates milk ejection from mammary glands in response to infant suckling. This hormone also modulates stress responses by lowering cortisol levels and promoting relaxation. Oxytocin contributes to metabolism and energy regulation by reducing appetite, regulating fat stores, and enhancing insulin sensitivity.

Additionally, oxytocin has cardiovascular benefits, including lowering blood pressure and increasing vasodilation, thereby supporting hemodynamic homeostasis. In its interaction with the immune system, oxytocin exhibits anti-inflammatory properties by reducing pro-inflammatory cytokine production and regulating immune responses (Ahsan, 2021).

3.4. *Mechanisms of Oxytocin's Effects on Sexual Behavior*

Oxytocin exerts its influence on behavioral and physiological processes related to sexual activity through its specific receptors, which are expressed in regions such as the amygdala, hippocampus, prefrontal cortex, and hypothalamic nuclei. One of the key mechanisms of oxytocin's effect is the enhancement of dopaminergic neuron activity in the ventral tegmental area, which plays a central role in promoting sexual motivation and the reward associated with sexual activity. Moreover, oxytocin reduces the activity of GABAergic neurons in the amygdala, leading to decreased anxiety and increased willingness for social interaction, including physical contact and affectionate behaviors. It also interacts with the endogenous opioid system and inhibits corticotropin-releasing receptors, contributing to stress reduction and enhancement of sexual pleasure. Peripherally, oxytocin facilitates increased blood flow to genital organs and enhances nitric oxide secretion from endothelial cells, thereby improving erection in men and increasing sexual sensitivity in women.

In men, oxytocin interacts with its receptors in the spinal cord and the paraventricular nucleus of the hypothalamus, coordinating with the sympathetic and parasympathetic nervous systems to regulate sexual arousal and ejaculation. Together with dopamine and serotonin, oxytocin facilitates the physiological processes necessary for erection maintenance and sexual performance (Baskerville & Douglas, 2008; Caldwell, 2018). In women, oxytocin promotes sexual arousal by increasing genital sensitivity and enhancing blood flow to the clitoris and vaginal walls. Additionally, it increases the excitability of oxytocinergic neurons in the supraoptic and paraventricular nuclei, heightening the desire for physical intimacy and emotional closeness.

Oxytocin also activates the orbitofrontal cortex, amplifying positive emotional experiences associated with sexual interaction and strengthening sexual motivation. Apart from its role in desire and arousal, oxytocin participates in the regulation of orgasm. In men, oxytocin levels increase during orgasm, leading to rhythmic contractions of the perineal muscles and ejaculatory ducts. In women, oxytocin release during orgasm induces uterine contractions and intensifies sexual pleasure. Furthermore, the post-orgasmic rise in prolactin mediated by oxytocin

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contributes to feelings of satisfaction and relaxation, reinforcing emotional bonds between partners.

The effect of oxytocin on sexual desire and arousal depends on the density of oxytocin receptors and the individual's baseline hormone levels. Research shows that men with higher oxytocin levels exhibit more interest in physical and emotional intimacy. Similarly, women with elevated oxytocin levels show stronger arousal responses to sexual stimuli and greater sensitivity to physical contact. Oxytocin also enhances feelings of trust and psychological safety during sexual interactions, mitigating stress and anxiety related to sexual performance. Studies indicate that intranasal administration of oxytocin increases sexual desire and strengthens physiological responses to sexual stimulation (Magon & Kalra, 2011).

Additionally, oxytocin influences the endocrine system by decreasing cortisol secretion and increasing testosterone in men and estrogen in women, thus enhancing libido. Another mechanism is its impact on the mesolimbic reward system; by activating dopaminergic neurons in the ventral tegmental area and increasing dopamine release in the nucleus accumbens, oxytocin promotes motivation for sexual activity. Its stress-reducing effects and reinforcement of psychological safety further contribute to increasing sexual desire and reducing psychological barriers. The role of oxytocin in treating erectile dysfunction and hypoactive sexual desire has drawn interest due to its influence on both neurological and vascular systems. By promoting nitric oxide release and reducing vascular tension, oxytocin enhances genital blood flow and erectile function. It also improves the sensitivity of sexual stimuli through enhanced neural signaling, leading to improved erectile responses (Campbell, 2010).

Studies have demonstrated that oxytocin administration in men with erectile dysfunction enhances sexual performance and arousal. In women with low sexual desire, oxytocin as an adjunctive therapy increases arousal and improves relationship quality. By reducing cortisol and inhibiting the stress system, oxytocin minimizes the negative effects of anxiety on sexual function, contributing to better sexual well-being. Research has shown that individuals using oxytocin for sexual issues report significantly lower stress levels and greater satisfaction with sexual relationships. Moreover, oxytocin enhances positive feelings toward sexual partners and strengthens emotional bonds, leading to improved marital relationships and increased desire for intimacy. Overall, the mechanisms by which oxytocin affects sexual behavior include modulation of the central nervous system, hormonal interaction, enhancement of genital blood flow, stress reduction, and promotion of psychological security. Oxytocin is thus considered a crucial agent in the regulation of sexual function, particularly in addressing disorders related to desire and erectile performance (IsHak et al., 2011).

3.5. *Oxytocin's Effects on Psychological and Emotional Responses in Sexual Relationships*

Oxytocin contributes to emotional closeness and relationship enhancement by increasing sensitivity to physical contact and strengthening positive feelings toward a sexual partner. Studies have shown that individuals with higher oxytocin levels are more inclined to initiate intimate and physical relationships with their sexual partners. This hormone reinforces feelings of love, intimacy, and trust, helping to overcome psychological barriers that can negatively affect libido. Oxytocin also facilitates a supportive and emotionally safe environment for sexual engagement by reducing stress and anxiety related to performance. By lowering cortisol—the primary stress hormone—and inhibiting the stress system, oxytocin fosters positive emotions and psychological calm. This is particularly beneficial for individuals experiencing performance anxiety, as oxytocin administration can reduce these anxieties and enhance sexual relationship quality.

These psychological effects help individuals feel more relaxed during sexual interactions and increase their capacity to enjoy the experience. Moreover, oxytocin fosters emotional bonding between couples by enhancing mutual trust and support, transforming sexual activity into a rewarding emotional and psychological experience. In women, higher oxytocin levels are associated with a greater desire for emotional intimacy and stronger positive emotions during sexual encounters. In men, oxytocin facilitates the establishment of both emotional and physical connections, playing a significant role in building more stable and satisfying sexual relationships (Flanagan & Chatzittofis, 2022; Lane & Luminet, 2013).

3.6. *Potential Therapeutic Applications of Oxytocin in Treating Sexual Disorders*

Oxytocin, often referred to as the "love hormone," plays a vital role in social interactions, emotional bonding, and sexual behavior. Secreted by the hypothalamus and released into the bloodstream via the posterior pituitary, this hormone has substantial effects on various aspects of sexual function.

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Recent studies suggest that oxytocin may be effective in treating certain sexual disorders, including hypoactive sexual desire disorder (HSDD), erectile dysfunction, orgasmic disorder, and vaginismus. One of the primary mechanisms through which oxytocin influences sexual function is by increasing trust and reducing stress via suppression of the hypothalamic–pituitary–adrenal (HPA) axis. Stress is a critical factor in diminished libido and sexual dysfunction in both men and women.

Animal and human studies have shown that oxytocin administration can lower cortisol levels and increase feelings of safety, thereby enhancing libido. This effect is particularly important for individuals whose sexual desire has been reduced due to stress or anxiety. In erectile dysfunction, oxytocin promotes nitric oxide release in the penile vasculature, improving blood flow and erection quality. Studies on animal models demonstrate that oxytocin enhances erectile responses via spinal receptor activation. These findings support the use of oxytocin, whether intravenously or as a nasal spray, as an adjunct therapy for erectile dysfunction, especially when psychological factors are involved (Cera & Vargas-Cáceres, 2021; Ghorbani & Mirghafourvand, 2023; Thackare et al., 2006).

Orgasmic disorder, characterized by the inability to reach orgasm in both women and men, is another condition where oxytocin may be beneficial. The hormone enhances orgasmic intensity by increasing muscle contractions and sensory sensitivity in pleasure-associated areas. Studies show that oxytocin administration in women can elevate orgasm frequency and intensity. There is also evidence suggesting a role for oxytocin in managing delayed ejaculation in men.

Vaginismus, a common disorder among women marked by involuntary vaginal muscle contractions during intercourse, is another potential therapeutic target. Oxytocin, through its anxiety-reducing, relaxing, and pain-modulating effects, may alleviate the severity of this condition. Due to its capacity to reduce fear of intercourse, oxytocin could be integrated into behavioral and physical treatment programs.

An emerging area of oxytocin research involves its effect on enhancing intimacy and relationship quality among couples. Studies suggest that oxytocin administration fosters attachment, trust, and positive interaction within marriages. These effects may indirectly improve sexual function, as stronger emotional relationships often enhance sexual satisfaction.

Despite promising results, challenges remain in the clinical application of oxytocin. One major limitation is its short half-life, which necessitates frequent dosing. Moreover, individual sensitivity to oxytocin and its social-emotional effects must be carefully evaluated. Some studies have noted paradoxical effects in individuals with past traumatic or negative relational experiences. Therefore, further research is needed to determine optimal dosages and assess therapeutic efficacy (Liu & Yang, 2022; Tom & Assinder, 2010; Veening & De Jong, 2015).

3.7. Review of Selected Animal and Human Studies on the Effects of Oxytocin on Sexual Function

Mokhtari (2007) conducted a study titled *The Effects of Various Doses of Oxytocin Alone and in Combination with an Alpha-1 Adrenergic Agonist on Sexual Behaviors in Adult Male Rats*. In this experimental research, 56 adult male Wistar rats weighing approximately 200–220 grams were used. The animals were divided into seven groups of eight. The control group received no substances. The sham group was administered a vehicle (normal saline). Experimental groups 1, 2, and 3 received 100, 200, and 300 µg/kg of oxytocin, respectively. Experimental group 4 received 200 µg/kg of oxytocin combined with 100 µg/kg of phenylephrine (an α1-adrenergic agonist), and group 5 received 200 µg/kg of oxytocin with 100 µg of clonidine (an α1-adrenergic antagonist). The drugs were administered intraperitoneally (IP) for 20 consecutive days, and parameters of sexual behavior were evaluated. Data were analyzed using Tukey's test and t-test. The results indicated that oxytocin at 100 and 200 µg/kg, and oxytocin plus phenylephrine at 200 and 100 µg/kg, significantly improved sexual behaviors and reduced mount latency (ML), intromission latency (IL), post-ejaculatory interval (PEI), mount frequency without intromission (MF), and ejaculation latency (EL). Oxytocin also significantly increased intromission frequency (IF), the ratio of intromission to total mounts (CF), and the inter-intromission interval (ICI) compared to the control group (Mokhtari, 2007).

Ghasemneghad (2023) conducted a study titled *The Protective Effects of Oxytocin on Quantitative and Qualitative Variables of Spermatogenesis in Rats Undergoing Ischemia-Reperfusion*. The study showed that oxytocin significantly improved spermatogenesis in rats subjected to ischemia-reperfusion injury. Intraperitoneal administration of oxytocin at a dose of 0.3 µg/kg during or after ischemia significantly reduced cellular stress and improved germinal epithelium thickness, Johnsen's score, and spermatocyte count compared to control groups. While sex hormone levels did not significantly change, the

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protective effects of oxytocin on sperm quality and quantity were evident and likely independent of the hypothalamic–pituitary–gonadal axis (Ghasemneghad, 2015).

Muin and colleagues (2015) investigated the *Long-Term Intranasal Oxytocin Effects on Sexual Dysfunction in Premenopausal and Postmenopausal Women: A Randomized Study*. In this randomized, double-blind, placebo-controlled crossover study, 30 women received 32 IU of intranasal oxytocin or placebo 50 minutes before intercourse for 8 weeks. After a 2-week washout, they were crossed over. The main outcome, measured by the Female Sexual Function Index (FSFI), showed a 26% and 31% improvement in oxytocin and placebo groups, respectively. Secondary outcomes—Female Sexual Distress Scale (FSDS) and Sexual Quality of Life-Female (SQOL-F)—also improved significantly with oxytocin. FSDS scores decreased by 36% with oxytocin and 45% with placebo. However, no significant differences were observed in treatment effects, sequence, or interactions, suggesting similar impacts of oxytocin and placebo on sexual outcomes (Muin & Wolzt, 2015).

Abbasinazari and colleagues (2018), in a preliminary clinical trial titled *Plasma Oxytocin Levels and Sexual Dysfunction in Depressed Women Treated with Fluoxetine or Citalopram*, examined the relationship between oxytocin and sexual function in women using SSRIs. The study involved 39 women with major depressive disorder randomized to fluoxetine (20 mg/day) or citalopram (20 mg/day). After one month, plasma oxytocin levels and FSFI scores were assessed. Of 23 who completed the study, 12 were in the fluoxetine group and 11 in the citalopram group. No significant difference in FSFI scores was observed, but oxytocin levels were significantly lower in the fluoxetine group. A positive correlation between oxytocin level and FSFI score was found, suggesting oxytocin's role in SSRI-induced sexual dysfunction (Abbasinazari, 2018).

Abedi and colleagues (2020), in a randomized controlled trial titled *The Effects of Vaginal Oxytocin Gel on Sexual Function in Postmenopausal Women*, found that oxytocin gel improved both vaginal atrophy and sexual function. The study included 96 postmenopausal women with atrophic vaginitis and sexual dysfunction. Participants were randomly assigned to oxytocin gel or placebo. Vaginal maturation index, vaginal pH, and FSFI domains were assessed before and after 8 weeks. The oxytocin group showed significant improvements in vaginal maturation, pH, and all FSFI domains, including desire, arousal, lubrication, pain, satisfaction, and overall sexual function, making it a suitable option for women avoiding hormone therapy (Abedi, 2020).

Melis and Argiolas (2021), in their article *Oxytocin, Erectile Function, and Sexual Behavior: Recent Findings and Possible Advances*, reviewed the central and behavioral roles of oxytocin in sexual function. They noted that oxytocin's involvement in sexual behavior was first identified in the 1980s in laboratory animals. The study reviewed mechanisms through which oxytocin, along with other neurotransmitters and neuropeptides, participates in complex reproductive behaviors. Interestingly, the human studies, particularly using intranasal oxytocin, did not consistently confirm its facilitative role in sexual behavior in either men or women (Melis & Argiolas, 2021).

Burri and colleagues (2008), in the article *Acute Effects of Intranasal Oxytocin Administration on Endocrine and Sexual Function in Men*, conducted a placebo-controlled, double-blind, crossover trial with 10 healthy men. Sexual arousal and orgasm were induced via erotic films and masturbation. Hormonal (oxytocin, cortisol, prolactin, epinephrine, norepinephrine) and cardiovascular parameters were monitored. Plasma oxytocin significantly increased during the test following intranasal administration. Oxytocin also elevated epinephrine levels during sexual activity but had no significant effect on cortisol, prolactin, or heart rate. No behavioral changes in sexual desire, pleasure, or refractory period were detected via the Acute Sexual Experience Scale (ASES), though most participants correctly identified oxytocin administration, indicating its perceptual influence on sexual arousal (Burri & Heinrichs, 2008).

4. Discussion and Conclusion

The findings reviewed in this article highlight oxytocin's multifaceted influence on sexual function, encompassing neurochemical, hormonal, vascular, and emotional mechanisms. Across both animal and human studies, oxytocin demonstrated a significant role in enhancing sexual behavior, arousal, and satisfaction through its action in central and peripheral systems. Experimental research on male rats, for example, confirmed that oxytocin administration—either alone or in combination with adrenergic agents—improves parameters such as mount latency, ejaculation latency, and post-ejaculatory intervals, suggesting increased sexual motivation and performance (Mokhtari, 2007). These effects are mediated by oxytocin's facilitative impact on dopaminergic pathways in the ventral

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tegmental area and its capacity to suppress GABAergic inhibition in the amygdala, reducing anxiety and promoting social and sexual engagement (Baskerville & Douglas, 2008; Caldwell, 2018).

Peripheral mechanisms of action are equally crucial. Oxytocin facilitates genital blood flow via nitric oxide release and enhances genital sensitivity in both sexes, thereby supporting arousal and orgasmic function (Campbell, 2010). These physiological effects are closely tied to oxytocin's interaction with the autonomic nervous system, particularly through the paraventricular nucleus of the hypothalamus and spinal cord, which regulate penile erection and female genital vasodilation (Flanagan & Chatzittofis, 2022). Additionally, in ischemia-reperfusion models, oxytocin has shown protective effects on spermatogenesis, likely through its anti-inflammatory and anti-oxidative properties, even in the absence of significant hormonal fluctuations (Ghasemneghad, 2015).

In human studies, the administration of intranasal oxytocin yielded promising results, particularly in women with hypoactive sexual desire disorder (HSDD), postmenopausal dysfunction, or SSRI-induced sexual side effects. Muin et al. (2015) reported improvements in FSFI, FSDS, and SQOL-F scores, demonstrating enhanced sexual function and reduced distress. Similarly, the use of oxytocin vaginal gel improved vaginal atrophy markers and all domains of sexual functioning, positioning it as a potential alternative to hormonal therapy for postmenopausal women (Abedi, 2020). Furthermore, plasma oxytocin levels were found to correlate positively with sexual function among women treated with antidepressants, reinforcing the hypothesis that oxytocin modulates the sexual side effects of SSRIs (Abbasinazari, 2018).

Despite these benefits, the therapeutic effects of oxytocin remain inconsistent across populations. Burri et al. (2008) found that while intranasal oxytocin raised plasma levels and epinephrine during sexual stimulation, it did not significantly alter behavioral measures of desire or satisfaction. Similarly, Melis and Argiolas (2021) observed that the expected facilitative effects of oxytocin on sexual behavior were not consistently replicated in human participants, suggesting a potential discrepancy between neuroendocrine changes and subjective sexual experiences (Melis & Argiolas, 2021).

This variability may stem from several factors, including dosage, route of administration, individual hormonal baselines, receptor density, and psychological context. For instance, oxytocin's effects may be amplified under conditions of emotional intimacy or pre-existing anxiety, while its benefits may be less observable in sexually healthy individuals without psychological distress (IsHak et al., 2011; Liu & Yang, 2022). The hormone's short half-life and individual variability in blood-brain barrier permeability further complicate consistent clinical outcomes.

Moreover, while oxytocin increases trust, bonding, and intimacy, its effects can be context-dependent and even paradoxical in individuals with adverse relational histories or attachment-related trauma. This highlights the necessity of personalized therapeutic approaches and further investigation into the neurobiological and psychosocial determinants of oxytocin responsiveness (Tom & Assinder, 2010; Veening & De Jong, 2015).

Overall, the current body of evidence supports oxytocin's significant role in enhancing sexual function through neural, vascular, and affective pathways. However, its clinical application requires careful consideration of individual differences, therapeutic context, and long-term safety. Ongoing research should aim to refine dosing strategies, explore sustained-release formulations, and identify reliable biomarkers of treatment response to maximize oxytocin's therapeutic utility in sexual medicine.

In sum, Oxytocin, as a peptide hormone, plays extensive roles in physiological and behavioral processes, including childbirth, lactation, social bonding, stress reduction, and mental health improvement. By binding to its specific receptors across various tissues, oxytocin activates intracellular signaling pathways that regulate vital body functions. Behaviorally, it promotes empathy, trust, reduces anxiety, and enhances emotional relationships; its deficiency is associated with disorders such as autism, depression, and anxiety. Research has also shown oxytocin's regulatory effects on immune responses, inflammation reduction, and tissue repair, emphasizing its clinical significance.

From an evolutionary perspective, oxytocin has been conserved across species for regulating social and reproductive behaviors, underscoring its role in survival. On the other hand, sexual activity, through the release of neurotransmitters and hormones such as dopamine, oxytocin, and serotonin, profoundly impacts the brain—enhancing pleasure, reducing stress, improving mood, and reinforcing emotional bonds. These neurochemical interactions influence mental and cognitive health, interpersonal relationships, and quality of life, producing long-term effects on brain structure and function and demonstrating the vital role of sexual activity in promoting overall well-being.

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Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

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Declaration of Interest

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