




Successful sexual aging: A narrative review using the multidimensional theoretical paradigm of systems sexology to explore sexual health in midlife and older adults

Dongdong Tang^{1,2,3} · Yuyang Zhang^{1,2,3} · Xu Wu^{4,5} · Xiansheng Zhang^{4,5} · Emmanuele A. Jannini⁶ 

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Abstract

Purpose Global population aging is shifting healthcare priorities from merely extending life to enhancing quality of life, yet sexuality remains a neglected dimension of healthy aging. Prevailing approaches focus on discrete sexual dysfunctions such as erectile dysfunction, menopause-related dyspareunia, or late-onset hypogonadism, overlooking the multidimensional and dyadic nature of sexual aging. This review reframes successful sexual aging (SSA) as a biopsychosocial process evaluated in the light of the new systems sexology, integrating decline and adaptation, and introducing the paradigm of SSA grounded in acceptance, adaptation, and activation.

Methods We conducted a narrative review of literature across sexual medicine, geriatrics, endocrinology, urology, gynecology, psychiatric, psychology, sociology, and regenerative medicine. We critically examined central theoretical constructs of CouplePause and DoublePause along with validated assessment instruments and a proposed conceptual framework, the Sexual Aging Index (SAI), intended to guide future multidimensional assessment of sexual aging. Evidence synthesized from gender-specific and cross-cultural perspectives illuminated key conceptual voids, translational barriers, and novel opportunities to advance the field of sexual aging research.

Results Sexual aging is shaped by endocrine decline, neurovascular changes, psychological resilience, sociocultural norms, and relational dynamics. Men commonly experience gradual androgen and vascular decline, while women face abrupt transitions linked to menopause and genitourinary syndrome of menopause (GSM), yet both trajectories are strongly moderated by adaptation and couple dynamics. Current assessment instruments fail to adequately capture aging-specific, dyadic dimensions, highlighting the need for multidimensional tools like the SAI. Interventions extend beyond pharmacology to include translational Chinese medicine (TCM), functional nutrition, low intensity extracorporeal shock wave therapy (Li-ESWT), platelet-rich plasma (PRP), stem cell therapies, and vaginal energy-based devices, though evidence remains heterogeneous. The SSA framework reframes it as a positive, process-oriented phenomenon linked to quality of life and relational health, while challenging sexual ageism at individual, clinical, and policy levels.

Conclusions Sexual aging represents an emerging frontier in sexual medicine, demanding a shift from deficit-based models to an integrative, couple-centered, and culturally inclusive paradigm. Advancing this field will require international consensus on definitions and frameworks, the development of validated multidimensional assessment tools, the implementation of rigorous multimodal clinical trials, and societal initiatives to dismantle sexual ageism. Embedding sexual health into healthy aging policies, healthcare delivery, and medical education will be critical to ensure that intimacy, dignity, and sexual vitality remain integral to longevity in the twenty-first century.

Keywords Sexual aging · CouplePause · DoublePause · Successful sexual aging · Biopsychosocial model · Systems Sexology

Dongdong Tang, Yuyang Zhang and Xu Wu have contributed equally to this work as co-first authors.

Extended author information available on the last page of the article

Introduction

Population aging is one of the most significant demographic shifts of the twenty-first century. According to World Health Organization (WHO) statistics, by 2030, one in six people globally will be aged 60 or above, rising to around one in four to five by 2050. As human lifespan continues to lengthen, medicine must shift beyond disease counts to address determinants of healthy aging that meaningfully influence quality of life, among which sexual health remains underrecognized [1–3]. Aging is not merely chronological accrual but a multidimensional process encompassing biological decline, psychological adaptation, social role transitions, and dyadic relationship changes that jointly shape sexual trajectories in midlife and later life [4–6].

Sexual activity and behavior show age-associated decline, albeit heterogeneously. Large cohort studies indicate that ~70% of adults in their 50 s remain sexually active, falling to ~40–50% in their 70 s and <30% after 80; among those who remain active, intercourse frequency typically decreases from several times per month in midlife to a few times per year in late life [7–9]. Crucially, lower frequency does not inherently imply diminished satisfaction; many older adults report fulfilling sexual lives despite infrequent activity. Still, persistently low sexual frequency or inactivity correlates in some studies with reduced relational intimacy, higher depressive symptoms, functional decline, and adverse health trajectories, underscoring that sexuality is both a barometer and a contributor to overall well-being in aging populations [10, 11].

Historically, the age-related sexual changes have been managed through fragmented, disease-centered lenses: menopause and genitourinary syndrome of menopause (GSM) in women; late-onset hypogonadism (LOH) and erectile dysfunction (ED) in men; or isolated complaints such as dyspareunia, anorgasmia, and low desire [12–16]. While clinically important, these vertical silos miss the biopsychosocial (BPS) integration that defines sexual aging: endocrine and neurovascular alterations intersect with mood, cognition, body image, sexual communication, partner health, sociocultural forces (e.g., sexual ageism, stigma, care-setting constraints) [17, 18].

However, sexuality in later life is also inherently dyadic: one partner's symptoms and adaptations reverberate within the couple, often asynchronously. We therefore foreground a couple-centered perspective, encapsulated by the concepts of CouplePause (the shared, interactive experience of sexual aging) and DoublePause (concurrent menopausal/hypogonadal transitions) [19, 20].

In this review we advance sexual aging as a multidimensional theoretical paradigm for midlife and older adults: non-normative (sexual activity is not required),

process-oriented (emphasizing acceptance and adaptation), and dyadic (locating sexuality within relationships). Our goals are to: i) define sexual aging and align it with contemporary theories of successful aging; ii) delineate gender-specific and couple-level manifestations, including the paradox of stable satisfaction amid declining frequency; iii) synthesize mechanisms across endocrine, neurovascular, psychological, sociocultural, and relational domains; iv) critically appraise current assessment tools and articulate requirements for age-calibrated, dyadic measures; v) evaluate pharmacologic, behavioral, traditional, nutritional, physical, and regenerative interventions within integrated care pathways; and vi) propose a forward agenda for consensus, measurement, clinical trials, and policy that combats sexual ageism and embeds sexual health within healthy longevity.

Literature search and review approach

This narrative review aimed to provide an integrative and conceptual synthesis of sexual aging across biological, psychological, relational, and sociocultural domains. A comprehensive literature search was conducted in PubMed, Scopus, and Web of Science, including studies published up to March 2025. Search terms included combinations of “sexual aging,” “sexual health,” “aging,” “menopause,” “genitourinary syndrome of menopause,” “late-onset hypogonadism,” “erectile dysfunction,” “couple dynamics,” “sexual satisfaction,” “sexual ageism,” “systems sexology,” and related terms. We included original studies, systematic reviews, meta-analyses, and authoritative narrative reviews published in English and focusing on sexual health in midlife and older adults. Studies limited to younger populations, non-translational animal studies, or single-case reports were excluded. Approximately 600 records were screened at the title and abstract level, and about 120 articles were reviewed in full text and integrated into the present narrative synthesis. Given the narrative and theory-oriented aims of this review, no formal quality scoring or systematic review procedures were applied. Conceptual models and therapeutic approaches were included based on their relevance to a BPS-dyadic framework of sexual aging, their recurrence in the clinical and translational literature, and their ability to illustrate current gaps and emerging directions in the field.

Definition and theoretical foundations of sexual aging

Defining sexual aging

Sexual aging can be defined as a multidimensional, systemic, and dyadic process encompassing age-related changes in

sexual function, desire, satisfaction, intimacy, and relational dynamics [21, 22]. Unlike discrete sexual dysfunctions, which denote pathological conditions, sexual aging reflects a life-course trajectory that integrates both decline and adaptation [5, 6, 23, 24]. It includes biological alterations such as hormonal reduced production and peripheral activity; endothelial and neurovascular aging; psychological influences such as shifting self-image; resilience, or depressive symptoms; relational determinants including partner health and communication; and sociocultural factors such as sexual ageism, gender norms, and stigma [25–29]. Thus, sexual aging is not merely an accumulation of impairments but a dynamic interplay between losses, adaptations, and opportunities for continued sexual expression and fulfillment.

Distinction from related constructs

It is critical to delineate sexual aging from narrower constructs that dominate current debate: i) Menopause and LOH: These biological milestones exert profound influence on sexual health but capture only endocrine dimensions. They do not encompass psychological, relational, or cultural determinants [30–32]; ii) Sexual dysfunctions: Conditions such as ED, GSM, hypoactive sexual desire disorder (HSDD), or orgasmic dysfunction are important clinical entities, yet they represent discrete impairments rather than the overarching, integrative process of sexual aging [33–35]; iii) Climacteric or aging symptom scales: Instruments like the Aging Males' Symptoms (AMS) scale or Menopause Rating Scale (MRS) provide partial symptom profiles but neglect relational and cultural contexts [36–40]. By contrast, sexual aging should be understood as an umbrella paradigm that integrates these phenomena into a broader continuum. This distinction is pivotal for advancing assessment and intervention strategies that move beyond deficit-focused, disease-centered models.

Toward a biopsychosocial-systems sexology model

To capture the full complexity of sexual aging, we recommend a BPS-dyadic model comprising four interacting domains: i) Biological: Endocrine decline (testosterone, estrogen, and the endogenous steroid hormone precursor dehydroepiandrosterone), vascular and neurological aging, multimorbidity, polypharmacy; ii) Psychological: Mood, cognitive capacity, body image, resilience, coping strategies; iii) Relational: Partner's sexual health, desire synchrony/mismatch, intimacy, communication, the shared phenomenon of CouplePause; iv) Sociocultural: Sexual ageism, gendered expectations, cultural/religious norms, healthcare system attitudes. This model acknowledges that outcomes in sexual aging are rarely dictated by single variables but

instead reflect the convergence and interaction of multiple domains [41]. Systems Sexology (SS) can be viewed as an extension of the traditional BPS model, aiming to integrate systems-level determinants such as chronic inflammation, lifestyle factors, environmental exposures, and socio-political contexts [42, 43]. SS represents an emerging conceptual framework rather than a fully operationalized empirical model, providing a heuristic structure to guide future interdisciplinary research.

Although by definition grounded on three dimensions, the BPS approach has frequently focused on the body/mind dichotomy, with little empirical and scientific interest in the social aspects of sexual health [44–48]. For this reason, it has been recently amplified with the more extensive paradigm of the SS [49]. This evolved model borrows from the popular Systems Medicine the capacity to identify in genes and age the unmodifiable risk factors and in lifestyles the modifiable risk factors of both the sexual dysfunction and, at the same time, of the Non-communicable Chronic Diseases (NCDs) [43]. Typically, SS recognizes a shared pathogenetic mechanism in a number of general, sexual, and reproductive diseases and symptoms—i.e., the overt or subclinical chronic inflammation [50]. SS recognizes four systems producing sexual or general health of disease: the systems of the mind, that of the experience, that of the society, and that of the body. Finally, like systems medicine, SS emphasizes the role of environmental, political and economic choices (age of retirement, economic supports, amount of the pension benefits, green economy, pollution, etc.). Interestingly, its truly holistic approach makes SS particularly close to the perspective of the traditional Chinese medicine (TCM) [51, 52].

Successful sexual aging: from pathology to adaptation

Within the SS paradigm, SSA should be conceptualized not as an inevitable pathological decline but as a modifiable, adaptive process influenced by biological integrity, behavioral patterns, and sociocultural context. Menopause and the so-called andropause represent natural physiological transitions rather than-necessarily-diseases. Indeed, not all postmenopausal women experience vulvovaginal atrophy, and nearly 50% of diabetic men remain eugonadal, underscoring that sexual aging is not synonymous with sexual illness [53]. These data highlight the potential for successful sexual aging, a state in which age-related changes coexist with preserved desire, intimacy, and sexual satisfaction (Fig. 1).

Across the life course, unhealthy behaviors such as smoking, physical inactivity, unhealthy nutrition, excessive alcohol consumption, sleep disturbances, and chronic psychosocial stress accumulate to produce low-grade systemic

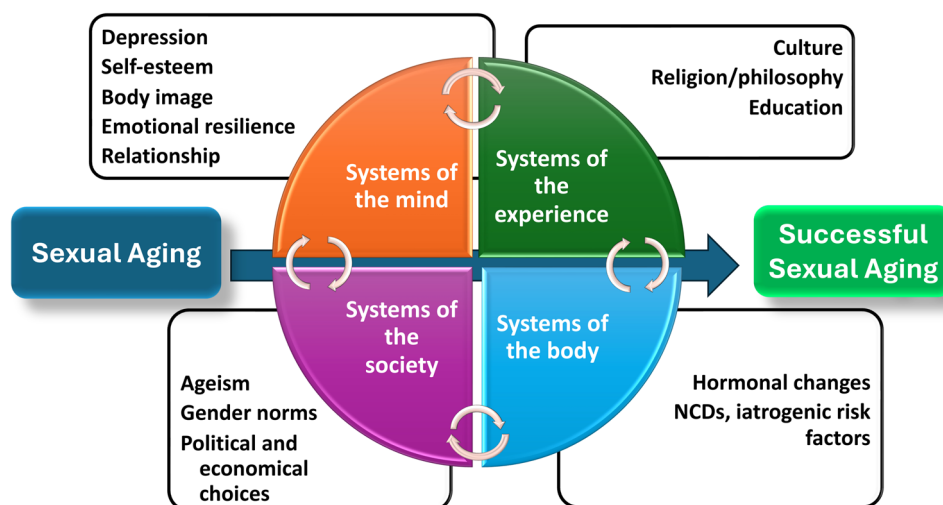


Fig. 1 Multidimensional framework of sexual aging within the Systems Sexology (SS) paradigm. This figure conceptualizes sexual aging as an emergent, system-level process grounded in Systems Sexology, an extension of the biopsychosocial model inspired by Systems Medicine. Four interrelated systems—biological, psychological, experiential/relational, and sociocultural/environmental—interact dynamically across the life course to promote either sexual health or dysfunction.

inflammation, metabolic dysregulation, and NCDs. These processes, collectively referred to as “inflammation”, contribute to the development of “sick menopause” and “sick andropause,” and when mirrored between partners, may culminate in the CouplePause. Conversely, maintaining metabolic health, emotional resilience, and relational harmony can foster adaptive trajectories of sexual aging rather than degenerative ones. The concept of Successful Sexual Aging (SSA) thus bridges sexual medicine and gerontology, aligning with the broader WHO vision of healthy aging. SSA integrates biological homeostasis, psychological adaptability, relational reciprocity, and social engagement as protective factors against inflammaging and sexual decline. Recognizing sexual aging as a potentially successful and health-promoting process shifts the paradigm from disease-centered management to prevention, resilience, and lifelong sexual well-being.

For clarity, the key concepts and frameworks discussed in this review—including established models and original heuristic proposals—are summarized in Table 1, which delineates their hierarchical relationships, empirical status, and intended roles within the SSA paradigm.

Aging-related changes, lifestyle factors, and environmental exposures converge through shared mechanisms such as chronic low-grade inflammation and non-communicable chronic diseases (NCDs). The figure highlights the shift from a disease-centered view of sexual dysfunction toward a systems-based understanding of sexual aging as a modifiable and adaptive process

Gender-specific manifestations of sexual aging

Female sexual aging

In women, sexual aging has been historically underrecognized and underprioritized, despite its profound impact on quality of life. Postmenopausal estrogen decline drives a constellation of changes termed GSM, encompassing vulvovaginal atrophy, dryness, burning, itching, dyspareunia, and urinary symptoms [54]. Nearly 50% of postmenopausal women are affected, yet many remain untreated due to stigma, normalization of symptoms, or lack of physician inquiry [55–57]. Female sexual function is further influenced by androgen decline (testosterone and DHEA), which reduces libido and central and peripheral sexual responsiveness. Beyond hormones, neurovascular alterations impair genital engorgement and lubrication, contributing to decreased arousal [58, 59]. However, the psychosocial dimension is equally salient: body image concerns, reduced self-esteem, caregiver stress, widowhood, or lack of partner availability all modulate sexual expression in later life [60, 61]. International surveys highlight a striking paradox: while physiological function and intercourse frequency decline with age, many women maintain or even enhance subjective satisfaction and intimacy, reflecting resilience, acceptance, and adaptation [62]. Sexual aging in women therefore embodies the dual trajectory of biological decline and psychological/relational adaptation. Importantly, female sexual dysfunction (FSD) is often overlooked in clinical care compared

Table 1 Conceptual frameworks related to sexual aging: hierarchical position, empirical status, and role within the Successful Sexual Aging paradigm. Operationalization is defined as the process of strictly defining abstract concepts into measurable, observable, and concrete terms, enabling empirical research

Concept (year)	Status	Level of empirical support	Conceptual role within SSA	Operationalization status
Biopsychosocial (BPS) model (late 1970s) [17, 18]	Established theoretical framework	Conceptual and partially supported by empirical data	Foundational framework integrating biological, psychological, and social determinants of sexual health	Largely used, frequently in a body/mind dichotomy, and partially operationalized in specific contexts and conditions with ad-hoc questionnaires [44–46] or a set of validated questionnaire [47, 48]
Sexual aging (2006) [22]	Established clinical concept	Empirically supported	Descriptive life-course process encompassing age-related changes in sexual function, desire, satisfaction, and intimacy	Widely operationalized through biofunctional, psychological, and quality-of-life measures [24]
CouplePause (2019) [54]	Original heuristic construct	Conceptual	Dyadic manifestation of sexual aging reflecting interacting or shared partner trajectories over the life course	To be empirically validated. Some aspects evaluated by the Gynogram [54]
DoublePause (2024) [20]	Original heuristic construct	Conceptual	Specific dyadic condition within CouplePause involving concurrent menopausal and/or androgen transitions in partners of different or same sex	To be empirically validated
Systems Sexology (SS) (2025) [42]	Extended theoretical framework	Conceptual, emerging	Based on the model of Systems Medicine [52], it is an integrative extension of the BPS model incorporating systems-level determinants (e.g., chronic inflammation, lifestyle, environment, socio-political context) [43]	Grounded on the empirical data produced for the BPS model, it is under formal operationalization
Successful Sexual Aging (SSA) (2026) [23]	Original conceptual proposal	Conceptual framework	Overarching paradigm emphasizing acceptance, adaptation, and activation as core processes of sexual aging	Partially operationalized through proposed indices and conceptual measures (Sexual Aging Index, 2026)

with male ED, being highly prevalent and strongly correlated with depressive symptoms, lower quality of life, and relational dissatisfaction [63–65]. This underlines a pressing global need for increased recognition, routine screening, and culturally sensitive interventions.

Male sexual aging

In men, sexual aging reflects a life-course trajectory that integrates both biological decline and adaptive strategies [66]. The hallmark biological substrate is androgen decline. Total testosterone decreases by ~1% annually after midlife, with sharper reductions in bioavailable testosterone due to rising sex hormone-binding globulin (SHBG) [67–69]. For the potential reversibility, and to distinguish it from the irreversible “organic hypogonadism”, the LOH has also named “functional hypogonadism” as occurring in middle aged or older men (>40–50 years), associated to comorbid illnesses (e.g. poor general health, obesity, diabetes), and with not dramatically low T concentrations [70, 71]. This hormonal shift could contribute to reduced libido, diminished morning erections, delayed ejaculation, lower orgasmic intensity, and impaired erectile rigidity [72, 73]. LOH is associated with broader systemic consequences including fatigue, sarcopenia, and mood disturbances, which indirectly influence sexual vitality [72, 74, 75]. From a vascular standpoint,

aging impairs endothelial function and nitric oxide (NO) bioavailability, compromising penile hemodynamics [76]. ED, often regarded as a sentinel marker of vascular aging, becomes more prevalent with advancing age and correlates strongly with cardiovascular risk [77–81]. Neuroendocrine alterations-including dopaminergic and oxytocinergic signaling changes-further impair sexual desire and bonding. Yet sexual aging in men is not solely decline. Adaptation is equally central [82]. Many men adjust expectations, shift toward broader forms of intimacy, or utilize medical aids such as type 5 phosphodiesterase inhibitors (PDE5i) [6, 83–85]. Satisfaction often persists even as frequency declines, underscoring that sexual aging is not synonymous with dysfunction but with redefinition of capacity and fulfillment across the lifespan [86].

CouplePause: the dyadic perspective

Sexual aging rarely occurs in isolation. Within long-term relationships, partners experience age-related sexual changes concurrently or asynchronously, creating dynamic patterns of adaptation. The concept of CouplePause reframes sexual aging as a shared dyadic process in which each partner’s biological changes, psychological adaptations, and sociocultural contexts directly affect the other [19, 87]. Clinical realities highlight several common patterns: (i)

Asynchronous decline: men may experience ED earlier, while women may develop GSM later, or vice-versa, producing mismatched trajectories [88]; (ii) Reciprocal impact: vaginal dryness and dyspareunia can exacerbate male performance anxiety, while male erectile failure may reduce female arousal [89]; (iii) Dyadic adaptation: couples who communicate openly, explore non-penetrative intimacy, and mutually redefine satisfaction demonstrate greater resilience and sexual well-being.

CouplePause also expands the concept of the DoublePause, describing couples in which both partners undergo menopause/LOH simultaneously [20]. While challenging, this context provides opportunities for synchronized adaptation and joint interventions, such as combined hormone therapy, couple-based counseling, and lifestyle modification. At this stage, CouplePause and DoublePause should be regarded as heuristic, theory-generating constructs rather than empirically validated entities, intended to facilitate a dyadic interpretation of sexual aging and to stimulate future longitudinal and couple-based research.

Homosexual couples: enriching the dyadic paradigm

While the concept of CouplePause was initially formulated within the context of heterosexual relationships, its application to homosexual couples offers important insights into the diversity of sexual aging. In same-sex relationships, both partners may experience similar endocrine and psychosocial transitions, i.e., “menopause \times 2” in female couples and “andropause \times 2” in male couples, creating unique relational dynamics of synchronization or amplification rather than contrast [20]. Unlike heterosexual couples, where sexual aging often unfolds asymmetrically due to gendered hormonal trajectories, homosexual couples may encounter parallel biological and emotional processes that challenge and reshape intimacy, desire, and sexual expression [90, 91].

Research on sexual aging among homosexual couples remains scarce, but available evidence suggests that shared experiences of identity affirmation, social stigma, and community resilience can buffer the impact of aging-related sexual changes. Emotional intimacy and mutual empathy often compensate for physiological decline, while social support within lesbian, gay, bisexual, transgender (LGBT+) networks plays a protective role for sexual satisfaction and relationship quality in later life. Integrating this dimension within the SS and SSA frameworks underscores the need for inclusive models that address diversity in sexual orientation and relational structure. Future studies should prioritize dyadic and longitudinal designs to explore how biological synchrony, psychosocial adaptation, and minority stress interact to shape the trajectories of sexual aging in

homosexual couples. Moreover, the validation in the aging context of a new powerful and holistic psychometric tool, named XYGO, which explores the three components of the sexual identity (genes-hormones-bodies, gender identity, and sexual orientation) will give the clinician new perspectives to manage the aging homosexual couple [92]. XYGO is cited here as an example of an existing psychometric instrument addressing the tri-dimensional nature (biology/gender/orientation) of sexual identity, rather than as a core component of the SSA theoretical framework. While the inclusion of homosexual couples provides important insights into dyadic sexual aging beyond heterosexual paradigms, it is important to acknowledge that empirical evidence in LGBT+ populations remains limited and uneven. Most available studies are cross-sectional, geographically restricted, and underpowered to fully capture the diversity of sexual aging trajectories across sexual orientations and gender identities. Moreover, minority stress, social stigma, and differential access to healthcare may uniquely shape sexual aging experiences in LGBT+ individuals and couples. Future research grounded on the SS paradigm should explicitly adopt inclusive, intersectional, and longitudinal approaches to better understand sexual aging in diverse populations and to ensure that emerging frameworks of SSA are applicable across different sexual identities and relational structures.

The frequency-satisfaction paradox in later life

Epidemiological studies consistently show a decline in sexual frequency with age, yet sexual satisfaction may remain, in some couples, more stable [93]. This paradox underscores that sexual aging integrates both decline and adaptation. Many older adults redefine sexuality beyond intercourse, emphasizing intimacy, affection, and emotional closeness [94]. For women in particular, emotional bonding and partner communication predict satisfaction more strongly than biological function [95]. This adaptive reframing challenges deficit-based models and validates a new SSA paradigm, where fulfillment arises from acceptance and flexibility rather than youthful performance standards. The concept of SSA is particularly precious to avoid stigmatizing aging as the asexual period of life. As discussed above, many senior individuals are satisfied with their sexual life. Thus, the paradigm of SSA help also to realize that the CouplePause is a marker of several diseases, typical of aging. In other words, SSA is the contrary of the “sick” menopause and of the “sick” andropause. Clinicians must recognize that while dysfunctions are common, many individuals and couples achieve satisfying sexual lives through adaptation, resilience, and relational support [65]. A comprehensive clinical approach should therefore: (i) Actively inquire about female

sexual health, addressing the historical under-recognition of female and male sexual dysfunctions; (ii) Incorporate partner perspectives and dyadic dynamics into assessment; (iii) Support adaptive reframing of sexual expectations while offering evidence-based treatments; (iv) Consider sexual failures as symptoms of undelaying diseases, typical of aging; (v) Aim to healthy elderly, i.e. SAA. These insights set the stage for exploring the mechanistic underpinnings of sexual aging across endocrine, neurovascular, psychological, sociocultural, and relational domains of the SS.

Mechanisms and determinants of sexual aging

Sexual aging reflects a life-course trajectory that integrates diseases, normal age-dependent changes, and adaptation to them, shaped by the interplay of biological, psychological, sociocultural, and relational domains. While women and men exhibit distinct mechanisms, there are also converging pathways that affect couples synchronously and asynchronously.

Hormonal mechanisms

The dimorphic expression of the hypothalamic-pituitary-gonadal (HPG) axis has, obviously, different impacts on elderly: in women, menopause marks a sharp endocrine transition, characterized by ovarian follicular depletion and abrupt reductions in estrogen and progesterone [96–98]. These changes drive GSM, manifesting as vulvovaginal atrophy, dryness, and dyspareunia [99, 100]. Declines in circulating androgens (testosterone and DHEA) reduce sexual desire and arousal responsiveness. Hormonal alterations also interact with neuroendocrine pathways: decreased estrogen impairs serotonin and dopamine modulation, contributing to both mood disturbance and sexual dysfunction [101, 102].

In men, the age-related dysregulation of the HPG axis is central to male sexual aging [103]. Testosterone declines progressively with age, both total and bioavailable, due to decreased Leydig cell capacity and increased SHBG. The pathogenesis of the LOH is not completely understood but it involves a decline in activity and crosstalk of the HPG axis but also a primary testicular failure, both exacerbated by NCDs, through mechanisms such as inflammation, insulin resistance, and high SHBG levels, which further suppress the amount of bioavailable testosterone [104]. This hormonal decline underlies reduced libido, weaker erections, and diminished orgasmic intensity [105]. Secondary contributors include increased aromatization, particularly in obese patients, of testosterone to estradiol in adipose tissue,

elevated prolactin in some men, and reduced growth hormone/IGF-1 activity, thyroid, further affecting vitality and sexual drive [74, 106–110].

Neurovascular and tissue mechanisms

Because of the above-described gender-specific changes, peripheral tissues are also modified by elderly in different ways. In women, lack of hormones and neurovascular aging specifically affect sexual arousal. Testosterone-dependent reduced clitoral trophism and engorgement, and estrogen-dependent impaired vaginal lubrication contribute with the reduced genital blood flow to arousal dysfunction, and dyspareunia [111]. Histological studies show collagen thinning and reduced elastic fibers in the vaginal wall after menopause. Peripheral nerve sensitivity may also decline, altering tactile responsiveness. These vascular and tissue-level changes underpin GSM and reinforce the dyspareunia-avoidance cycle that threatens intimacy.

Considering that erection is fundamentally a neurovascular event, the endothelial dysfunction typical of aging reduces NO bioavailability, impairs cyclic GMP signaling, and attenuates smooth muscle relaxation and the consequent engorgement of the corpora cavernosa [112, 113]. Structural remodeling of penile tissue-fibrosis, smooth muscle apoptosis, and reduced cavernosal compliance-further compromises erectile capacity [114]. Neurogenic decline, including reduced autonomic innervation and diminished dopaminergic drive, compounds the problem [115].

Psychological and cognitive determinants

Cognitive and psychological aspects may have impacts on gender-dependent ways. In women, intrapsychic, relational, and cognitive dimensions often outweigh biological impairment in predicting sexual satisfaction. Depression, anxiety, and negative body image strongly reduce desire and willingness to engage [116, 117]. Cognitive load from caregiving roles or bereavement may further suppress sexual expression [118]. Importantly, women who reframe sexuality toward intimacy, emotional closeness, and non-penetrative practices often sustain higher satisfaction despite functional decline-again highlighting adaptation as a core determinant.

Sexual function in aging men is heavily modulated by intrapsychic and relational factors. Performance anxiety, loss of sexual confidence, depression, and stress amplify erectile or ejaculatory dysfunction [119–121]. Cognitive decline may impair arousal processing, reduce flexibility in adapting to partner changes and needs, and contribute to withdrawal from intimacy [122, 123]. Conversely, positive coping strategies and acceptance buffer these effects.

Sociocultural and environmental influences

According to the SS paradigm, the environment is considered a major player of health and diseases. Sexual aging unfolds within cultural narratives. Sexual ageism, the belief that older adults are asexual, perpetuates stigma and discourages help-seeking [91]. Healthcare systems often neglect sexual inquiry in geriatric care. Gendered expectations exacerbate disparities: older men may be socially permitted, even encouraged, to maintain sexual activity, whereas older women's sexuality is marginalized or rendered invisible.

The role of the environmental context could be dramatic in shaping the sexual aging: access to healthcare, socioeconomic status, and living environments (e.g., long-term care facilities with limited privacy) strongly influence opportunities for sexual expression [118]. On this respect, political and economic choices could produce different effects on sexual well-being of elderly. Another variable is the cultural milieu. In some traditional cultural contexts, available evidence suggests that sexual activity in later life may be more constrained by conservative social norms and gender expectations, compared with more liberal settings [88, 124–126].

Relational and dyadic determinants

Sexual aging is not solely individual but dyadic, embedded within relationships. In women, dyspareunia or hypoactive desire can lead to withdrawal, which partners may misinterpret as rejection; similarly in men, or ED or decreased libido may evoke guilt or avoidance, influencing partner intimacy. These mechanisms may impact through communication, in the dyadic resilience, intimacy, and adaptation-mitigates decline and fosters satisfaction even in the presence of dysfunction. These changes are reciprocal producing changes in the dyadic interplay-male dysfunction exacerbates female arousal problems, while female GSM intensifies male performance anxiety [127]. As mentioned above, this framework conceptualizes sexual aging as a shared, interdependent experience as in the paradigm of the CouplePause [20, 128].

For both women and men, sexual aging reflects converging biological decline and adaptive psychological and relational processes. In women, estrogen deficiency and GSM are central; in men, testosterone declines and vascular aging dominates. Yet in both, outcomes are mediated by psychological resilience, partner dynamics, and cultural context. Recognizing this integrative trajectory is essential for clinicians: effective management must move beyond endocrine or vascular repair to incorporate dyadic counseling, cultural sensitivity, and adaptation strategies.

The inflammatory and anti-inflammatory couple: a dyadic biopsychosocial mechanism

Recent theoretical developments have reframed the couple not merely as the context of sexual aging but as an active biological and psychosocial system influencing its trajectory. The SS paradigm emphasizes that chronic inflammation represents a common pathogenic substrate linking sexual dysfunction, metabolic disease, and psychological distress. Extending this concept to the dyadic level, couples can be broadly conceptualized as either inflammatory or anti-inflammatory systems according to their emotional, behavioral, and physiological synchrony.

In an anti-inflammatory couple, emotional attunement, empathy, and constructive communication generate psychophysiological coherence, characterized by lower cortisol reactivity, improved endothelial function, and balanced immune-endocrine responses. Such relationships foster positive effects, adaptive coping, and relational intimacy that collectively buffer systemic inflammation and slow biological aging. This protective milieu aligns with the concept of SSA, wherein sexual desire, satisfaction, and intimacy are maintained despite age-related physiological changes. Conversely, inflammatory couples are characterized by chronic relational strain, emotional withdrawal, or unresolved conflict, which amplify stress reactivity and promote immune dysregulation. Over time, these dyadic inflammatory loops converge with lifestyle and metabolic risk factors to precipitate the CouplePause, a shared decline in sexual vitality and relational harmony.

Importantly, these mechanisms apply across relationship types, such as in the above-mentioned homosexual couples, where both partners may experience parallel endocrine and psychosocial transitions, the double menopause in female couples or the double andropause in male couples, creating distinctive patterns of hormonal synchrony and emotional interdependence. The presence or absence of anti-inflammatory relational dynamics may thus be even more influential in modulating sexual and emotional well-being within same-sex partnerships, where shared vulnerabilities can either buffer or amplify the effects of aging. Recognizing such dyadic bio-behavioral processes expands the framework of sexual aging beyond individual-level pathology, underscoring the couple as both a potential source of chronic inflammation and a target for preventive, resilience-based interventions.

Evaluation tools and methodological innovations in sexual aging

Current instruments: scope and limitations

Assessment of sexual health in midlife and older adults has traditionally relied on dysfunction-specific instruments, rather than age-sensitive or multidimensional tools. For men, the International Index of Erectile Function (IIEF) is the most widely used, validated across multiple languages and cultures, primarily to assess erectile rigidity, orgasmic function, desire, intercourse satisfaction, and overall satisfaction [129–132]. The ANDROTEST questionnaire is applied for screening late-onset hypogonadism, focusing on androgen deficiency related symptoms such as reduced libido, fatigue, and mood [24, 71]. While both instruments are clinically valuable, they are narrowly anchored in functional impairment and endocrine deficiency, without fully capturing psychological adaptation, relational intimacy, or cultural influences relevant to sexual aging. For women, the Female Sexual Function Index (FSFI) remains the gold standard, encompassing domains of desire, arousal, lubrication, orgasm, satisfaction, and pain [133–136]. It has been validated and translated in several languages also in its abridged form, used as a screener [137]. The MRS assesses climacteric symptoms including somatic, psychological, and urogenital changes [138, 139]. Yet neither fully reflects the broader trajectory of sexual aging. FSFI, while robust in reproductive and early postmenopausal cohorts, may not adequately address late postmenopausal women, widowed or single individuals, or those who adapt their sexual expression beyond penetrative intercourse. Similarly, MRS foregrounds vasomotor and urogenital symptoms but neglects intimacy, partner perspective, or sexual agency. Core limitations of current tools include: i) Lack of aging dimension: instruments focus on dysfunction but not on adaptive or resilient processes of later-life sexuality; ii) Low acceptability among older adults: many perceive questionnaires as invasive, lengthy, or disconnected from lived experiences; iii) Absence of partner/dyadic perspective: sexuality is often shared, yet current tools capture only the individual's symptoms, overlooking synchrony, mismatch, and relational adaptation; iv) Cultural blind spots: most measures were validated in Western midlife cohorts, with limited cross-cultural sensitivity or validation in diverse aging populations. Finally, a new powerful psychometric tool has been recently validated to investigate coital pain and to quantify its impact on sexual and global well-being in menopause called Gynogram, which could be used to ameliorate diagnosis, and possibly compliance/adherence and treatment outcomes in patients with GSM [54].

Toward a sexual aging index (SAI): conceptual framework

To address these conceptual and methodological gaps, we here propose the conceptual development of a Sexual Aging Index (SAI): a multidimensional, age-calibrated framework designed to capture not only dysfunction but also adaptation and resilience across the sexual aging continuum. This proposal does not represent a validated instrument, but rather a conceptual roadmap for future psychometric research aimed at operationalizing the principles of SSA. The SAI framework integrates five key domains: i) Functional: physiological parameters such as erection, lubrication, orgasm, desire, dyspareunia, or ejaculatory control, with sex-specific modules; ii) Self-perception: subjective satisfaction, body image, self-confidence, and acceptance of age-related changes; iii) Emotional adaptation: coping, resilience, and psychological well-being; iv) Partner feedback: relational intimacy, communication, and perceived synchrony of desire (dyadic concordance indices); v) Opportunities for sexual expression: availability of partner(s), privacy, sociocultural facilitators/barriers, and perceived agency to maintain sexual life. The SAI is envisioned as a flexible structure for future validation, potentially encompassing: i) an individual baseline module for assessing one's sexual aging trajectory, ii) a dyadic component enabling partner-reported outcomes (PROs), and iii) a brief clinical version (~10 items) for practical implementation. Future research will be required to refine and psychometrically validate this framework in diverse populations before clinical application. Importantly, the SAI should be understood as a conceptual framework rather than as a measurement instrument, being pilot data or empirical validation not currently available, and having all validation efforts explicitly future-oriented.

Pathways for validation and implementation

The development of SAI requires rigorous methodological [140]: (i) Content validity-Delphi consensus panels of international experts across sexual medicine, endocrinology, gynecology, andrology, gerontology, psychology, sociology, and patient advocates [141]; (ii) Structural validity-factor analysis and item response theory (IRT) to confirm multidimensionality and optimize scoring. Reliability: internal consistency (Cronbach's α , McDonald's ω) and test-retest stability (intraclass correlation coefficients) [142]; (iii) Construct validity-correlations with IIEF, FSFI, MRS, and mental health/quality of life scales; known-groups validity across pre- and postmenopausal women, eugonadal vs hypogonadal men [143]; (iv) Cross-cultural validity-translation and linguistic validation across languages; measurement invariance testing across sex, age bands, cultures, and

relationship types [144]; (v) Responsiveness-sensitivity to change after pharmacological (e.g., systemic or vaginal estrogen and androgens, ospemifene, PDE5i, ecc), psychosexual, and regenerative interventions. The SAI would not replace existing tools but provide a comprehensive complement, integrating decline and adaptation into a single framework. Its development would enable: (i) Clinical stratification of patients into distinct trajectories of sexual aging; (ii) Identification of individuals/couples at risk for maladaptive outcomes; (iii) Standardized outcome measures for future clinical trials of sexual anti-aging interventions.

Current assessment tools capture fragments of sexual health but fail to reflect the life-course trajectory of sexual aging that integrates decline with adaptation. A SAI, anchored in functional, psychological, relational, and socio-cultural domains, and validated across cultures, represents a necessary innovation. By incorporating both individual and dyadic perspectives, the SAI has the potential to transform clinical assessment, inform personalized interventions, and establish new research standards for sexual medicine in aging populations.

Traditional chinese medicine and functional nutrition: cross-cultural resources for sexual anti-aging

Traditional chinese medicine (TCM): conceptualization and interventions

The ancient Chinese corpus of sexual knowledge, known as *Fangzhongshu* (ancient Chinese sexual techniques), encompasses, as an expression of the TCM, various aspects of sexuality at all ages, sexual techniques, and management of several female and, with more traditional attention, sexual dysfunctions [145]. Within the framework of TCM, sexual aging is understood primarily through the doctrines of kidney *qi* deficiency and depletion of *jing* (essence), both regarded as central to vitality, fertility, and sexual performance [146]. In this paradigm, diminished kidney *yang* is linked to erectile difficulties, cold extremities, and fatigue in men, whereas kidney *yin* deficiency manifests as hot flashes, vaginal dryness, and dyspareunia in women [147–150]. This conceptual system parallels biomedical observations of androgen and estrogen decline but frames them holistically within systemic energy balance. Commonly prescribed herbal agents include: (i) Epimedium (*Yin Yang Huo*): rich in icariin, which demonstrates PDE5 inhibitory and NO enhancing properties in preclinical studies, with modest evidence of efficacy in erectile dysfunction; (ii) Panax ginseng: improves libido, erectile rigidity, and fatigue, with meta-analyses of randomized controlled trials

(RCTs) suggesting moderate benefit [151]; (iii) Morinda officinalis (*Ba Ji Tian*) and Gecko (*Ge Jie*): used to tonify kidney yang, with traditional use in male infertility and sexual decline, though clinical evidence remains limited [152–154]. Beyond herbal medicine, acupuncture, decoctions, and tonic prescriptions (*gao fang*) are employed to alleviate climacteric symptoms and sexual dysfunction [155]. Meta-analyses suggest acupuncture may reduce vasomotor and GSM symptoms, though robust evidence for direct sexual outcomes is lacking [156–158]. Overall, TCM provides culturally embedded, multimodal strategies for sexual anti-aging, yet requires high-quality trials to establish standardized protocols and confirm efficacy.

Functional nutrition strategies

Functional nutrition represents a complementary pathway to support sexual health and longevity by targeting endothelial function, hormone balance, and inflammation. Between the amino acids and precursors, L-arginine, as a NO donor, has been shown to improve penile hemodynamics, particularly when combined with antioxidants such as pycnogenol [159–161]. DHEA improves libido and vaginal atrophy in postmenopausal women, though results are heterogeneous and long-term safety is uncertain [162, 163]. The micronutrients could play a role in the aging sexual health: zinc is essential for testosterone synthesis and spermatogenesis [164, 165]; vitamin E and omega-3 fatty acids exert antioxidant and anti-inflammatory effects. Similarly, phytoestrogen such as: isoflavones and lignans from soy and flaxseed provide weak estrogenic effects, alleviating vasomotor and GSM symptoms while supporting vaginal health [166]. Dietary patterns also play a critical role. Mediterranean diet adherence has been consistently associated with improved erectile function, better endothelial health, and reduced cardiovascular risk [167–169]. Anti-inflammatory diets may modulate systemic inflammation, indirectly benefiting sexual function [170, 171]. Lifestyle factors, quitting smoke, reducing alcohol, physical activity, weight management, and sleep quality, synergize with dietary strategies to sustain sexual vitality.

Prospects for cross-cultural integration

The convergence of Eastern and Western paradigms highlights opportunities for cross-cultural integrative models in sexual anti-aging. TCM emphasizes holistic harmony, individualized constitution, and the preservation of *jing*, while Western nutrition emphasizes molecular pathways-NO bio-availability, hormonal modulation, oxidative stress reduction [172]. Together, these perspectives can be harnessed to create synergistic frameworks that combine herbal tonics,

functional supplements, and evidence-based dietary patterns [172, 173]. For example, in the spirit of the SS, an older male with ED, if living in an ageism-free environment, could benefit from PDE5i supported by Epimedium extract and L-arginine supplementation within a Mediterranean-style dietary framework; a postmenopausal woman supported by health care providers well-educated in the field of sexual health, might combine vaginal estrogen with phytoestrogens and acupuncture for GSM. However, when considering the integration with TCM, challenges include variability in herbal composition, potential herb–drug interactions, limited regulatory oversight, and heterogeneous clinical trial quality. Future directions should include: (i) Rigorous multicenter RCTs validating TCM and nutritional interventions using standardized extracts and dosing; (ii) Pharmacovigilance studies addressing long-term safety and drug–herb interactions; (iii) Development of integrative care pathways that respect cultural preferences while aligning with biomedical standards.

TCM and functional nutrition provide cross-cultural, complementary resources for sexual anti-aging. By addressing endocrine decline, vascular aging, and psychological adaptation in culturally resonant ways, these strategies hold promise for integrative sexual medicine, as claimed in the paradigm of SS. Yet their clinical application requires stronger evidence, standardized protocols, and cross-cultural validation before they can be fully embedded into global practice.

Physical and regenerative therapies: modern pathways for sexual anti-aging

Before discussing emerging physical and regenerative interventions, it is important to emphasize that many of the approaches described in this section, particularly platelet-rich plasma (PRP), stem cell-based therapies, and energy-based vaginal devices, remain investigational. Current evidence is heterogeneous, largely derived from small pilot studies, uncontrolled cohorts, or preclinical models, and long-term safety and efficacy data are limited. Accordingly, these interventions should not be considered as established clinical treatments until not confirmed by large controlled clinical trials, registries, or rigorously monitored research settings. However, the management of elderly to obtain SSA in the path of SS requires not only integration of traditional, classic and contemporary approaches, but also the search of new avenues of treatments.

Low-intensity extracorporeal shockwave therapy (Li-ESWT)

Low-intensity extracorporeal shockwave therapy (Li-ESWT) has emerged as one of the most extensively investigated non-pharmacological approaches to sexual aging, particularly in men with vasculogenic ED [174–176]. The underlying mechanism involves mechano-transduction, which stimulates angiogenesis, endothelial repair, nerve regeneration, and recruitment of progenitor cells [177–179]. Clinical trials and meta-analyses consistently report significant improvements in IIEF scores among men with mild-to-moderate ED, with durability of benefit up to 12 months in selected cohorts. However, response is attenuated in men with advanced diabetes, severe cardiovascular disease, or anatomical injury. Emerging studies suggest potential applications for female sexual arousal disorder and GSM through improved genital blood flow and tissue elasticity, though evidence remains preliminary [180].

Platelet-rich plasma (PRP) and stem cell therapies

PRP therapy involves the autologous injection of platelet concentrates rich in growth factors into genital tissues (penile shaft, clito-urethro-vaginal complex, or vaginal mucosa) [181]. The rationale is to promote collagen remodeling, neovascularization, and neuro-regeneration, aiming to restore sexual function at the tissue level [182]. Pilot studies, including the popularized “P-shot” and “O-shot,” have reported improvements in erectile rigidity, orgasmic intensity, and GSM-related dryness. Nevertheless, these claims stem from small, uncontrolled cohorts, and robust RCT evidence is lacking. Stem cell-based therapies, including mesenchymal stem cells (MSCs) and adipose-derived stem cells (ADSCs), may represent a frontier in regenerative sexual medicine [183]. In animal models, stem cell therapy has restored erectile response, preserved smooth muscle integrity, and increased vaginal epithelial thickness [184, 185]. Early-phase human studies confirm feasibility and short-term safety, but challenges persist regarding oncogenic potential, immune modulation, standardization of cell preparations, and regulatory oversight. At present, these therapies remain investigational and should be restricted to clinical trials.

Vaginal laser, radiofrequency, and sexual rejuvenation technologies

Energy-based devices, often marketed under the contested term “vaginal or sexual rejuvenation,” including fractional CO₂ laser, Er:YAG laser, and radiofrequency technologies, have been proposed for the management of GSM and sexual

symptoms [186–189]. Mechanistically, these devices deliver controlled thermal energy that induces collagen neogenesis, angiogenesis, and mucosal remodeling, with the aim of improving lubrication, elasticity, and comfort [188, 190]. Observational studies and short-term clinical trials report reductions in vaginal dryness and dyspareunia, as well as improved FSFI scores. Regulatory agencies, including the U.S. Food and Drug Administration (FDA), have issued warnings regarding the use of such devices for unapproved indications, highlighting the lack of high-quality evidence and the potential for adverse events [191, 192]. While RF appears to have a more favorable safety profile, large-scale RCTs with long-term follow-up are urgently required before these therapies can be considered standard of care.

Combined modalities and future directions

Although changes in the lifestyles and hormonal replacement in selected patients remain the gold therapeutic standard in CouplePause/DoublePause, non-hormonal therapies, such as the Selective Estrogen Receptor Modulator (SERM) ospemifene, PDE5i, and physical and regenerative therapies represent a modern frontier in sexual anti-aging medicine, shifting the paradigm from symptomatic relief to potential tissue-level rejuvenation [193]. While Li-ESWT, PRP, stem cells, and energy-based devices show promise, evidence remains heterogeneous and limited by small samples, short follow-up, and methodological variability. Future progress depends on standardized protocols, rigorous safety monitoring, and dyadic outcome integration. These innovations, if responsibly developed, may complement pharmacological

and psychosocial interventions to deliver truly multidimensional strategies for successful sexual aging.

Given the multifactorial nature of sexual dysfunctions in the elderly, multimodal strategies are likely to achieve the greatest clinical impact. Examples include: (i) PRP combined with Li-ESWT, leveraging angiogenic and regenerative pathways synergistically; (ii) Pharmacologic–device combinations, such as PDE5i with Li-ESWT or vaginal estrogen with RF/laser therapy; (iii) Behavioral integration, where psychosexual therapy is layered onto regenerative or physical interventions to sustain intimacy and satisfaction. Future priorities include: (i) Standardization of treatment protocols—clear parameters for energy settings, dosing, treatment frequency, and patient selection; (ii) Rigorous clinical trials—multicenter RCTs with validated endpoints (IIEF, FSFI, GSM symptom scales, partner-reported outcomes) and long-term safety data; (iii) Ethical and regulatory frameworks—addressing risks of over-commercialization, ensuring informed consent, and establishing registries for regenerative interventions; (iv) Couple-centered integration—embedding physical and regenerative therapies within the CouplePause framework to emphasize dyadic outcomes, communication, and mutual satisfaction; (v) use of the SS paradigm to integrate comprehension of the consequences of erroneous lifestyles in producing the “sick” CouplePause; and (vi), last but not least public intervention of political and economic nature on the education of the society to respect the sexuality in the elderly, to take care of the related sexual needs, and to consider sexual health as a unique biomarker of general health to be carefully preserved (Fig. 2).

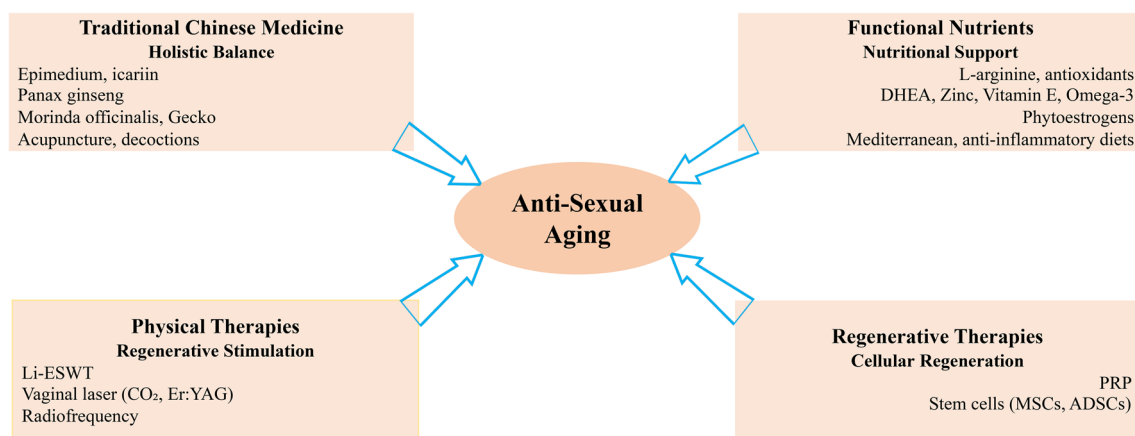


Fig. 2 Multimodal interventions targeting sexual aging across biological, psychological, and relational domains. This figure illustrates the range of established, adjunctive, and investigational strategies proposed to counteract maladaptive sexual aging trajectories within the Systems Sexology framework. Interventions span pharmacological, nutritional, physical, regenerative, and psychosocial approaches, emphasizing their potential synergistic roles rather than isolated effi-

cacy. The figure visually underscores that sexual anti-aging strategies should be integrated, individualized, and embedded within broader lifestyle and relational contexts, rather than interpreted as stand-alone or universally applicable treatments. Abbreviations: ADSCs, adipose-derived stem cells; DHEA, dehydroepiandrosterone; Li-ESWT, low-intensity extracorporeal shockwave therapy; MSCs, mesenchymal stem cells; PRP, platelet-rich plasma

From sexual aging to successful sexual aging

A number of evidence above reviewed demonstrates that aging modifies, but not necessarily abolish, the sexual dialogue within the couple and that a SSA is an aim which should be met potentially at all ages. With this in mind, some further considerations are needed.

Conceptual evolution and theoretical framework

In many cultures, and in particular in the contemporary Western societies, sexual aging was and is viewed predominantly through a decline-oriented lens, where diminished frequency of intercourse, erectile difficulties, or postmenopausal dyspareunia were equated with “sexual failure.” This reductionist framing neglected the heterogeneity of aging trajectories and overlooked adaptive capacity. Drawing inspiration from Rowe and Kahn’s model of Successful Aging [194], contemporary sexual medicine scholars have articulated the paradigm of SSA, a model that recognizes sexual health as a dynamic and multidimensional construct, where fulfillment can persist despite biological decline. Conceptually, SSA builds upon established models of successful aging, such as that proposed by Rowe and Kahn, by translating their core principles into the domain of sexual health. Rather than replacing these models, SSA represents a domain-specific extension that emphasizes sexuality as a determinant of quality of life and relational well-being in later life. The SSA framework highlights three interdependent processes: i) Acceptance-acknowledging physiological and psychosocial changes without internalized stigma, thereby normalizing aging as part of sexual [22], ii) diversifying intimacy practices, using medical or psychosocial support, and reorienting expectations to preserve satisfaction; iii) Activation-actively seeking contexts for intimacy, emotional bonding, and pleasure, even in environments constrained by illness, widowhood, or institutional living. Unlike dysfunction-focused models, SSA is non-normative (sexual activity is not required for validation), process-oriented (emphasizing trajectories rather than static states), and dyadic (acknowledging the shared nature of sexuality within couples).

Links with quality of life, mental health, and relational well-being

Empirical evidence underscores that SSA is strongly correlated with life satisfaction, psychological resilience, and relational stability. Longitudinal studies suggest that older adults who accept and adapt to sexual changes report lower depression and anxiety, greater social engagement, and stronger couple intimacy, even when sexual frequency

declines [21, 195, 196]. For men, intimacy maintained despite erectile limitations is associated with higher self-esteem, better adherence to cardiovascular risk management, and improved global health outcomes [197]. For women, reframing sexuality beyond penetrative intercourse mitigates the psychosocial burden of GSM, supports positive body image, and enhances autonomy. For couples, dyadic adaptation-mutual acceptance of asynchronous changes and joint exploration of new intimacy repertoires-correlates with greater emotional closeness and lower relational conflict [60, 198, 199]. Thus, SSA contributes not only to sexual well-being but also to broader dimensions of healthy aging, including emotional vitality, physical health, and social connectedness.

Gendered and cultural dimensions of SSA

Sexual aging is neither uniform across genders nor culturally neutral. Gender differences: Women often experience more abrupt transitions due to menopause and GSM, compounded by societal invisibility of female sexual desire in older age [200, 201]. Men’s trajectories are more gradual, dominated by vascular and androgen decline, yet male sexual difficulties are more readily medicalized and treated [69]. These disparities highlight the need for gender-sensitive assessment and interventions within the SSA framework. But there are cultural differences to be considered: European societies and some North American contexts generally display greater acceptance of later-life sexuality, while cultural norms in certain Asian and Mediterranean contexts may impose more restrictive expectations on later-life sexuality, particularly for women [202]. Cross-cultural validation of SSA instruments is essential to ensure global applicability of the paradigm.

Clinical and public health implications

As mentioned here many times, according to the SS paradigm, society, economy and politics may dramatically impact on sexual health of elderly. For example, creations of dedicated social spaces for senior citizen to meet each other may dramatically help to overcome the widower effect. At the same time, specific education in sexual medicine of HCPs engaged in general health of elderly may contribute to enhance both the patients’ quality of life and the duration of the life itself. Hence, translating SSA into clinical practice requires clinicians to: i) Proactively inquire about sexual concerns in older patients, recognizing that many avoid disclosure due to embarrassment or perceived irrelevance; ii) Frame sexuality positively, encouraging patients to accept and adapt rather than internalize dysfunction; iii) Incorporate dyadic assessments, acknowledging that

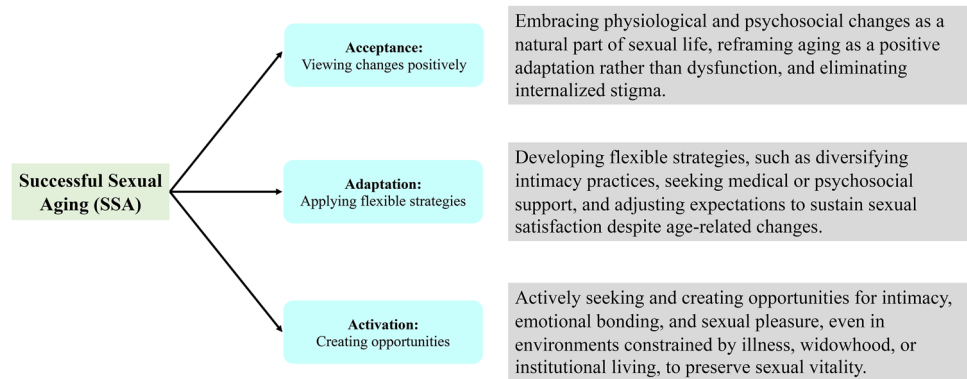


Fig. 3 Conceptual model of Successful Sexual Aging (SSA): the “Triple-A” process. This figure depicts Successful Sexual Aging (SSA) as a dynamic, process-oriented paradigm structured around three interdependent dimensions: Acceptance (acknowledging age-related biological and psychosocial changes without internalized stigma), Adaptation (flexibly redefining sexual expression, intimacy, and expectations),

successful sexual aging often depends on mutual adaptation within couples (CouplePause framework); iv) Address multimorbidity and polypharmacy, integrating sexual health into chronic disease management. v) Consider sick menopause and andropause not just as natural manifestation of elderly but as a consequence of wrong lifestyles and that the consequent inflammations lead to both sexual dysfunctions and NCDs. At the public health level, SSA provides a framework for incorporating sexual health indicators into aging and well-being policies, expanding beyond longevity to encompass quality of life and relational health.

Challenging sexual ageism: toward inclusive sexuality in aging

A critical barrier to SSA is sexual ageism, the persistent stereotype that older adults are inherently asexual or uninterested in intimacy [91, 203, 204]. This bias manifests in underreporting, lack of provider training, and exclusion of sexual health from geriatric guidelines. Moreover, gendered ageism disproportionately silences women’s sexuality, rendering their needs invisible in both clinical and societal discourse [205, 206]. Overcoming sexual ageism requires a multipronged strategy: (i) Narrative shift -public campaigns that normalize diverse expressions of later-life sexuality; (ii) Empowerment of older adults-fostering confidence, agency, and dignity in sexual self-expression; (iii) Clinician training-embedding sexual health in geriatric, andrologic, endocrinologic, urologic, gynecologic, and primary care curricula; (iv) Policy reform -integrating sexual well-being into healthy aging indices, long-term care standards, and WHO aging agendas. By situating SSA as a human right-based construct, society can dismantle structural barriers

and Activation (actively maintaining opportunities for intimacy, connection, and pleasure). Rather than defining success by sexual performance or frequency, the model emphasizes resilience, relational reciprocity, and subjective well-being across the aging trajectory. The figure visually integrates individual and dyadic dimensions, reinforcing SSA as a non-normative and couple-centered framework

and restore sexuality as an integral aspect of aging with dignity.

The evolution from sexual aging to successful sexual aging represents a paradigm shift in sexual medicine and gerontology: from deficit to resilience, from pathology to process, from silence to dignity. Anchored in acceptance, adaptation, and activation, SSA validates the heterogeneity of sexual experiences in midlife and later life, while challenging cultural taboos and medical blind spots. It provides clinicians, researchers, and policymakers with a framework to reimagine sexuality as a determinant of healthy longevity, deserving equal recognition alongside physical, cognitive, and social domains of aging (Fig. 3).

Future research agenda and concluding remarks

The new perspective of the enrichment of the BPS model in the SS, modifying the Manichean perspective of psychosocial aspects in one side and organic factors in the other, may dictate a future agenda based on a truly holistic habit of the researchers, of the HCPs, and of the general population. To obtain this ambitious goal, some final messages may help.

Conceptual deepening and consensus building

The field of sexual aging is still in its conceptual infancy, and advancing it requires systematic, collaborative effort. A dedicated Sexual Aging Research Alliance—drawing from sexual medicine, geriatrics, endocrinology, urology, andrology, gynecology, psychology, sociology, and public health—should be established to articulate consensus definitions, diagnostic frameworks, and theoretical models.

Such a consortium could also coordinate global epidemiological studies and cross-cultural validations, ensuring that the concept of sexual aging transcends geographic, cultural, and gender boundaries. Consensus statements akin to those developed in cardiovascular or oncologic medicine are urgently needed to provide clinicians and researchers with a unified lexicon and methodological roadmap.

Development and validation of assessment tools

Progress in sexual aging research will be constrained until standardized, multidimensional instruments are developed. Future tools, such as the proposed SAI should capture not only functional status but also self-perceptions, emotional adaptation, partner perspectives, and sociocultural facilitators or barriers to intimacy. Complementarily, validated measures of SSA—operationalizing acceptance, adaptation, and opportunity—should be refined and tested across diverse populations [23]. Future validation must meet rigorous psychometric standards: structural validity through factor analysis, reliability across time, and measurement invariance across languages, cultural groups, and gender identities. These tools will serve as essential endpoints for clinical trials, public health surveillance, and policy benchmarking. Future research should focus on the empirical development and psychometric validation of the proposed SAI, which at present remains a theoretical framework.

Integrated interventions and multicenter clinical research

Sexual aging is inherently multidimensional, and interventions must therefore be integrative and interdisciplinary. Future trials should evaluate combined models that merge biomedical therapies (hormone replacement, PDE5i, regenerative modalities), traditional practices (e.g., TCM and herbal supplements), psychosexual and couple-based interventions and social education. The CouplePause paradigm should guide trial design, with dyadic outcomes—desire synchrony, relational satisfaction, partner-reported distress—measured alongside functional endpoints. Large-scale, multicenter RCTs are needed to test multimodal strategies across different cultural, gender, and relational contexts. Adaptive trial designs and international registries could accelerate knowledge accumulation, improve safety surveillance, and build a comparative evidence base that informs both precision medicine and global guidelines.

Societal and educational strategies

To translate scientific advances into meaningful population impact, sexual aging must be operationalized within

healthy aging frameworks through policy implementation and intersectoral collaboration. National and international health agendas should integrate sexual well-being alongside cognition, mobility, and mental health as pillars of successful aging. Targeted public health initiatives—such as community-based awareness programs, intergenerational dialogues, and digital education platforms—can effectively combat sexual ageism and normalize diverse sexual expressions in later life.

Equally crucial is transforming medical education to include sexual aging as a formal curricular and clinical competency domain. Training for HCPs should emphasize cultural sensitivity, couple-centered approaches, and integrative treatment planning. Embedding these competencies in continuing professional development will bridge the translational gap between theoretical advances and real-world clinical care. Ultimately, promoting sexual health across the lifespan reinforces a broader vision of aging with intimacy, dignity, and agency—hallmarks of SSA in the twenty-first century.

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Data availability Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

Declarations

Ethical approval Not applicable.

Competing interests E.A.J. is or has been a consultant and/or paid speaker for Bayer, FQM, Ibsa, Kanna, Lundbeck, Menarini, Merck, Mia, Otsuka, Pfizer, Recordati, Shionogi, and Viatrix. The other authors declare no competing interests.

Informed consent Not applicable.

Consent to participate Not applicable.

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Authors and Affiliations

Dongdong Tang^{1,2,3} · Yuyang Zhang^{1,2,3} · Xu Wu^{4,5} · Xiansheng Zhang^{4,5} · Emmanuele A. Jannini⁶ 

✉ Xiansheng Zhang
zhangxiansheng@ahmu.edu.cn

✉ Emmanuele A. Jannini
ejannini@gmail.com

Dongdong Tang
tangdongdong@ahmu.edu.cn

Yuyang Zhang
zhangyuyang@fy.ahmu.edu.cn

Xu Wu
2045011217@stu.ahmu.edu.cn

¹ Department of Obstetrics and Gynecology, Reproductive Medicine Center, The First Affiliated Hospital of Anhui Medical University, Hefei, China

² NHC Key Laboratory of Study On Abnormal Gametes and Reproductive Tract, Anhui Medical University, Hefei, China

³ Key Laboratory of Population Health Across Life Cycle, Ministry of Education of the People's Republic of China, Anhui Medical University, Hefei, China

⁴ Department of Urology, The First Affiliated Hospital of Anhui Medical University, Hefei, China

⁵ Institute of Urology & Anhui Province Key Laboratory of Genitourinary Diseases, Anhui Medical University, Hefei, China

⁶ Chair of Endocrinology and Medical Sexology (ENDOSEX), Department of Biomedicine and Prevention, University of Rome Tor Vergata, Rome, Italy