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A psychosocial approach to female genital pain

Marieke Dewitte¹, Charmaine Borg² and Lior Lowenstein³

Abstract | Genital pain is a prevalent, complex, and disabling health concern in women. Efforts to study this chronic pain condition have been complicated by the fact that genital pain is heterogeneous and exists at the intersection of different biopsychosocial disciplines. Thus, organization of theoretical ideas and empirical findings across research areas is required to improve our understanding of how biopsychosocial factors affect the development and maintenance of the pain, the reporting of symptoms, and the choice of treatment. In the past, the study of physical markers has received the most research attention; an assimilation of the psychosocial variables underlying genital pain is, therefore, particularly needed to inform the field about the rapidly growing literature and stimulate interdisciplinary work. Current research lacks specificity, fails to capture the unique features of different pain conditions, and yields conflicting evidence, which makes it difficult to draw uniform conclusions. Although considerable advances have been made, confusion remains at the nosological, aetiological, theoretical, methodological, and treatment levels. This lack of consensus has important theoretical and clinical implications because inconsistent criteria and empirical disagreement can lead to misdiagnoses and interfere with the development of sound theoretical models and effective treatments to manage female genital pain and its physical and psychological sequelae.

Sexual pain, genital pain, pelvic pain, dyspareunia, vaginismus, (provoked) vulvodynia, vulvar dysaesthesia, focal vulvitis, vulvar adenitis, vulvar vestibulitis — these terms are just some of many labels and classification terms used to refer to pain in the genitopelvic area in women. With estimates of lifetime prevalence ranging from 10% to 28%, this pain condition is highly prevalent among women, causing substantial distress in both sexual and nonsexual areas of daily life^{1,2}. Whereas different terminology points towards confusion about diagnosis, it also indicates the heterogeneity of genital pain, suggesting the existence of different pain syndromes. This diversity has been acknowledged in recent revisions of classification systems in which a diagnosis can be made based on different criteria in order to account for the multifactorial nature of female genital pain. Whereas the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM5) describes genital pain along complementary criteria³ (BOX 1), the most recent nomenclature suggested in 2015 by the International Society for the Study of Vulvovaginal Disease (ISSVD), International Society for the Study of Women's Sexual Health (ISSWSH), and International Pelvic Pain Society (IPPS) distinguishes between vulvar pain caused by other disorders and

vulvodynia, which is defined as having no clear identifiable cause⁴. Both classification systems take into account pain location, onset, temporal pattern, and situations that elicit pain, suggesting that genital pain is not a uniform clinical diagnosis but involves various pathophysiological and psychosocial processes. Trying to cover a broad spectrum of pain disorders and aligning with the new DSM5 diagnosis, we will use the term genital pain throughout this article, although the majority of research findings we will discuss pertain to provoked vulvodynia, which is the most common cause of female genital pain^{5,6}. The large variety of pain disorders complicates reviewing the literature because no uniform conclusions can be drawn on the prevalence, aetiology, coping strategies, and treatment success of genital pain as one entity. The literature encompasses a wide range of disciplines, including gynaecological, urological, urogynaecological, and brain imaging research, as well as more specific sexological models and general psychological views, and even includes studies addressing the societal effect and economic costs of genitopelvic pain. As the field of sexual medicine has moved away from a dualistic approach, the biopsychosocial model is now commonly accepted to have the most heuristic value to assess, understand, and treat genital pain^{7–9}.

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Key points

- Genital pain is heterogeneous and multifactorial, including different pain syndromes that involve a dynamic interplay between biological, psychological, and sociorelational variables
- Research and clinical practice lack standardized diagnostic methods and are complicated by nosological, methodological, aetiological, and treatment confusion, which precludes uniform conclusions, causes diagnostic delay, and interferes with treatment selection
- Although the focus of research has been on biological factors, psychosocial approaches are becoming more popular, particularly when trying to understand how genital pain is maintained and exacerbated
- A comprehensive assessment protocol and methodologically sound research to evaluate the efficacy and effectiveness of various interventions (across treatment modalities) are lacking
- Research and clinical efforts should be directed at developing and evaluating multimodal treatments that target biopsychosocial aspects of genital pain; this approach requires multidisciplinary teams and collaboration across disciplines

The position of genital pain at the intersection of different biopsychosocial disciplines has made it an increasingly popular research topic; as a result, many scientific advances in the field are now beginning to reach clinical practice, and information on the origins and consequences of genitopelvic pain has been summarized^{6–8,10–12}. However, most of these papers focus on either the biomedical or the psychosocial mechanisms associated with genital pain. Reviews that address all three dimensions of the biopsychosocial model typically devote more attention to describing the biological underpinnings of genital pain and provide only a short summary of possible psychosocial contributors, possibly because research on genital pain has a long tradition of studying physical markers rather than considering psychosocial variables that maintain and exacerbate the pain⁸. In the past decade, research into the psychosexual aspects of genital pain has accelerated, revealing important insights into its sexual and emotional consequences. These consequences create distress, which turns the pain into a disabling experience and tends to make women seek help^{7,11}. Thus, any researcher or clinician working in the field of genital pain must understand the psychological, social, relational, and sexual characteristics of this chronic pain condition. Regrettably, most of the data regarding psychosocial factors in genital pain have been published in journals that primarily reach mental health professionals; thus, information on the psychosocial field of genital pain research might have been overlooked by clinicians and biologists in the field.

This Review will correct this concern by providing a comprehensive discussion on the psychosocial dynamics of genital pain in order to stimulate interdisciplinary collaboration. In addition, the diversity of genital pain and its ensuing implications will be considered, and theoretical and methodological gaps in research will be identified. By evaluating the scientific progress thus far, we hope to encourage researchers to develop specific models and formulate concrete hypotheses. We also hope to stimulate the development of effective treatments to manage genital pain and associated disorders

by highlighting some of the nosological, methodological, aetiological, and treatment issues that complicate genital pain research and clinical practice.

Nosological confusion

The most common classification systems of genital pain — the DSM5³ and the 2015 ISSVD–ISSWSH–IPPS consensus⁴ — have provided an evidence-based terminology based on expert input, which can be applied across various disciplines in both clinical and research settings. However, some diagnostic issues are still subject to critical debate. As the body of clinical and research literature has expanded, the fact that genital pain is not a uniform diagnosis but involves different types of pain has become increasingly apparent. To better account for this diversity and the lack of clear separation between syndromes, the DSM5 now describes only one diagnostic category that involves dimensional criteria and specifiers³ (BOX 1). Although such a dimensional approach should enable more differentiation than the previously categorical classification of dyspareunia and vaginismus, the validity of genitopelvic pain and/or penetration disorder as a diagnosis has been widely criticized. Whether vaginismus should be diagnostically differentiated from dyspareunia is the subject of long-standing debate¹³. Despite many research findings suggesting substantial overlap between the disorders in terms of fear, general negative appraisals of sexual stimuli, and pelvic floor muscle hypertonicity^{14,15}, marked differences exist in aetiology, clinical presentation, expression of symptoms, coping strategies, treatment approaches, and rate of treatment success¹⁶. The most important differentiator between dyspareunia and vaginismus is probably the way in which women cope with fear and pain. Whereas vaginismus always denotes a phobic avoidance response, many women with dyspareunia continue to engage in penetrative sex, with only some of them starting to avoid sexual activity altogether^{1,17}. Thus, although the DSM5 diagnostic category emphasizes the multidimensional aspect of genital pain and enables an integrative classification and treatment approach in multidisciplinary teams, it lacks specificity and thereby fails to capture the differences between many subtypes of genital pain. Among these subtypes, the case of lifelong vaginismus — in which women have never been able to allow penetration — is difficult to reconcile with the definitional criterion of ‘difficulties with penetration’ when in fact it should be defined as ‘inability to allow penetration’ (REF. 13). Another implication of this compound diagnosis is that certain subtypes of genital pain are merged or neglected because researchers fail to study their unique features. Aside from occasional reports^{18,19}, little research has been conducted into whether acquired (secondary) genital pain can be differentiated from lifelong (primary) pain and if so, which criteria can be used for this differentiation; research is also lacking in how provoked pain differs from unprovoked pain, probably because we lack reliable knowledge on the aetiology and pathophysiology of these different pain subtypes. Research on genital pain disorders has most often focused on lifelong vaginismus and provoked dyspareunia, thereby excluding secondary

Box 1 | Criteria and specifiers of the DSM5 genitopelvic pain penetration disorder**Criteria**

- Tightening of the vaginal muscle resulting in the inability to penetrate
- Tension, pain, or a burning sensation felt when penetration is attempted
- A decrease in or no desire to have intercourse
- Voluntary avoidance of sexual activity
- An intense phobia or fear of pain

Specifiers

Generalized (affecting the entire vulva)

- Localized (affecting only one area of the vulva)
- Provoked (direct pressure on the vulva causes pain)
- Unprovoked (the pain appears spontaneously and can be unrelenting)
- Primary (the pain has always been present)
- Secondary (the pain has developed after a period of time without pain)
- Situational
- Mild, moderate, or severe

genital pain conditions without clear scientific reasons. An umbrella diagnosis might, in fact, be clinically less useful and constrain research because it risks drawing general conclusions on the aetiology and treatment of genital pain on the basis of evidence that applies to only one or two specific subcategories. Accordingly, more attention should be given to using specifiers when making a pain diagnosis in order to separate and differentiate between pain conditions^{3,20}. The possibility that different pain syndromes can be identified using different predictors and yield different outcomes has important implications for building aetiological and pathophysiological models that could assist in tailoring treatments.

Another long-standing debate concerns whether genitopelvic pain should be classified as a sexual dysfunction or a pain disorder^{20,21}. Given that genital pain can be induced by nonsexual situations (for example, inserting a tampon, cycling, or wearing tight clothes), is not associated with a specific disruption of the sexual response cycle (as is the case with other sexual dysfunctions), is closely related to several pelvic floor or urinary dysfunctions, and shows somatosensory and psychosocial mechanisms similar to those of other chronic pain conditions²², Binik²⁰ proposed that dyspareunia and vaginismus should be considered types of chronic pelvic pain rather than a sexual dysfunction. Classifying and treating genital pain as a general chronic pain condition has important implications for research and clinical practice. The genital pain field could benefit from inclusion in the mainstream pain literature, which has a long history of multi-disciplinary research and treatments⁹. Conversely, whether distinct pain conditions are mechanistically similar or dissimilar, even when sharing psychopathological characteristics, is unclear. Accordingly, studying and treating female genital pain as if it were the same as any other pain condition could produce biased results. Thus, perhaps chronic pain research should act as a source of inspiration rather than leading us to disregard the unique features of pain in the genital area.

One of the most influential consequences of the lack of uniform diagnosis is the fact that the divergence in

definitions and weak boundaries between conditions result in genital pain being underreported or misdiagnosed^{1,12}. Health care providers are faced with nosological confusion and conflicting literature. As a result, they feel uncomfortable with the diagnosis and management of genital pain and lack accurate knowledge, which can lead to this disabling pain problem being overlooked and undiagnosed^{11,23,24}. Increasing awareness about the indicators of genital pain is, nevertheless, of the utmost importance, as research has shown that >30% of women who seek treatment for genital pain did not receive a diagnosis and generally consulted >2 clinicians¹. Notably, 30–48% of women choose not to seek help at all and do not convey the presence of genital pain to their health care provider even when seeking treatment for other medical problems²⁵. Women with genital pain seemingly feel stigmatized, a situation that is further complicated by the fact that health care professionals and pain experts are uncomfortable dealing with pain located in the genital area^{26,27}. Thus, clinicians have an important role to proactively ask and initiate discussion about genital pain so that women can disclose their pain problem and thereby receive effective treatment²⁵. The diagnostic debate around genital pain is not only problematic for clinicians who are discouraged from diagnosing and treating this condition but also leaves women unsure of whom to speak with and where to seek help or relief²³. Furthermore, inconsistent criteria can create a challenge to making a differential diagnosis because genital pain is often comorbid with other chronic vulvar conditions, such as lichen sclerosis²⁸, but must still be differentiated from these conditions. The consequences of nosological confusion and diagnostic delay can be considerable, as persistent, long-term tissue inflammation might increase the pain experience, alter how the woman and her partner react to the pain, and even regulate how social institutions address the pain problem (that is, treating it as a sexual problem or as a chronic pain problem)²⁹.

Methodological confusion

Nosological confusion also has important implications for interpreting research findings and is exacerbated by the methodological limitations of pelvic pain research. The focus on different subtypes of pain and the lack of standardized diagnostic methods precludes a direct comparison across studies.

As the most prevalent pain condition, provoked vestibulodynia has attracted the most research attention^{5,6}. Accordingly, most of what we know regarding the prevalence, aetiology, and underlying mechanisms of genital pain is based solely on research on this condition. Conclusions are often generalized to the entire group of genital pain syndromes without considering whether this one sample is representative of the diversity of genital pain conditions.

Measuring pain

Researchers use a variety of different instruments to induce or measure pain that focus on particular aspects of the pain sensation. Use of a genital sensory analyser, vulvogesimeter, modified von Frey filaments, vaginal

probes, vaginal vibrators, vaginal pressure inducers, or different types of tactile stimulation or induction of punctate or gradual pressure has yielded a variety of outcome measures, such as genital pain sensitivity, vaginal sensitivity, touch sensitivity, pain threshold, touch threshold, and pain tolerance^{30–34}. Given that genital pain involves various pain sensations recruited by various types of nociceptors (A δ -nociceptors for immediate pain and C-nociceptors to sustain long-term burning sensation), different types of tests are needed to stimulate different nerve fibres and to disentangle the unique physiological mechanisms that mediate tactile detection, sensitivity, and pain threshold. Quantitative sensory testing (QST) is extremely valuable to assist in early detection, therapy selection, and monitoring of progression and recovery³⁵. However, the scientific use of these measurement tools entails the risk of misinterpretations of the outcome. Although the processes involved in QST are clinically relevant and apply to different aspects of the pain sensation, they are frequently treated as redundant constructs, leading to generalized conclusions that disregard the diversity of genital pain. Furthermore, QST is not yet recommended for clinical use and treatment decision making. Accordingly, studies using QST in patients with genital pain show discrepancies in terms of definition, diagnostic methods, recruited patients, research focus, and pain outcome measures, which still lead to conflicting conclusions regarding the diagnosis and underlying mechanisms of genital pain.

Self-reported data

The almost exclusive reliance of studies of genital pain on self-reported correlational data are methodological issues that substantially impair the unambiguous interpretation of research findings. These limitations are especially relevant when examining the psychosocial determinants of genital pain. More longitudinal and prospective studies are needed in order to unravel temporal associations and causal relationships. Although genital pain does not always implicate an identifiable initiating agent, understanding how a single genital pain event can transform into a chronic pain sensation and whether a specific source or turning point can explain this transition is extremely relevant. The ultimate way to reveal this transformation is to study a cohort of young women throughout their lives to improve the understanding of potential risk factors, such as pathophysiological mechanisms, psychological vulnerabilities, and environmental and/or relational stressors that contribute to the development of chronic genital pain¹⁰. Such a study design would also be useful to determine whether comorbidities such as catastrophizing, hypervigilance, negative sexual appraisals, neuroticism, and even pelvic floor hypertonicity function as risk factors of, cause, correlate with, or result in the prolonged experience of pain⁷.

Missing the dual-process view

Another limitation of studies that use self-reported outcomes is that they do not align with the dual-process view of sexual response as including both automatic and controlled processes, which are assumed to have

different effects on sexual outcome variables^{36–38}. That is, when a stimulus is automatically construed as sexual, attention is drawn to this stimulus, which precipitates more elaborate conscious cognitive processing. The initial, unconscious appraisal of the stimulus automatically elicits a genital response, but whether this will result in a complete genital response and subjective feeling of arousal depends on whether the stimulus is consciously appraised as positive and rewarding and, therefore, not painful. Automatic and controlled processes can operate in parallel, synchronously, or in conflict, which might explain the commonly observed discordance between subjective and genital arousal responses, especially in women³⁹. In the context of genital pain, differences in variables such as appraisal of erotic stimuli and subjective versus genital arousal between women with and without genital pain are manifested mainly at the subjective, explicit level and not at the automatic, implicit level^{40,41}. This discrepancy reflects the fact that people are not always aware of their sexual responses or might be motivated to distort their conscious thoughts, feelings, and behaviour in the service of self-regulation, self-presentation, or self-protection⁴². Although pain perception is primarily a conscious act, the cognitive and physical experience of pain might still unconsciously bias the processing of sexual stimuli (for example, by prioritizing the processing of pain stimuli over sexual stimuli), the appraisal of sexual experiences (for example, by ascribing a negative and threatening meaning to sex), and the construction of plans for dealing with sexual distress and pain (for example, by avoidance of sexual intimacy). Without necessarily minimizing the role of conscious factors, we need to acknowledge that the study of conscious processes is over-represented in sex research and might even limit our understanding of genital pain, as it reveals only partial information on how pain influences the processing of sexual stimuli. Sex research has, therefore, begun to focus more on implicit reaction time measures, such as the implicit association task and attentional orientation tasks, that can better reflect and represent automatic processes^{40–45}.

The laboratory setting

Research into genital pain often takes place in a formal, individual laboratory environment⁴⁶. Thus, although the standardized, controlled research environment is an advantage, it comes at the cost of reducing ecological validity, and the laboratory design itself could actually interfere with the results via participant reactivity to the laboratory context. This confounder might be particularly relevant in genital pain research because the individual laboratory situation is not an accurate reflection of real-life pain response, which often occurs during intercourse and is, therefore, predicated upon the relational setting. Accordingly, the observed lack of differences in sexual arousal response between women with genital pain and women without genital pain might be attributed, at least in part, to the laboratory context not being salient or threatening enough to women with pain, particularly for those women who experience pain only during a sexual encounter and

Quantitative sensory testing (QST).

A noninvasive, painless technique that essentially determines the sensation and pain thresholds for cold and warm temperatures and the vibration sensation threshold by stimulating the skin and comparing the results to normative values.

not during masturbation or other occasions, such as while cycling⁴⁷. Given that the salience of pain depends on the context in which it is experienced⁴⁸ and that the individual laboratory design shares no features with the natural pain setting, women might experience less fear and anticipation anxiety when watching a sexual movie on their own in a study setting. Thus, the possibility of simulating the threat of vaginal insertion in the laboratory and embedding the sexual stimulus in a relational setting with the partner being present must be explored in order to make the women more attentive to sexual stimulation and emotionally immersed in the sexual pain experience. This approach would certainly enable more valid conclusions regarding the associations between fear, sexual arousal, and pain. In addition, reactivity to the laboratory context itself, which provides an artificial setting to elicit sexual arousal, might bias the results. In this context, dyadic diary methods might be better suited to capture detailed experiences in the natural environment near the time of occurrence. Another advantage of using diary methods is that they enable examination of temporal relationships between variables in daily life, which can help to reveal which variables predict pain and coping behaviours^{49,50}.

Static models

Genital pain research relies heavily on static models and measurement procedures, focusing mainly on symptoms and exploring the effect of a single pain event on relevant outcome measures. However, mainstream pain research has begun to focus on understanding the pathophysiological mechanisms underlying the pain experience. In particular, the dynamics of the pain processing system are thought to be important, particularly pain facilitation and inhibition^{51,52}. Temporal and spatial summation responses provide valuable information about facilitatory mechanisms underlying nociceptive processing. Evidence has shown that inducing repetitive mechanical pressure and thermal pain stimuli can discriminate between levels of genital pain, with lower pain thresholds and higher suprathreshold estimations being reported by patients with more severe pain⁵³. Conversely, conditioned pain modulation provides information on the endogenous inhibitory capacity of the nociceptive system and has also started to gain research attention in the context of genital pain⁵⁴. Preliminary evidence from studies using a cold pressor test and thermal pain stimuli indicates that women with provoked vulvodynia have intact inhibitory control, suggesting that provocation and maintenance of the pain experience are caused not by deficient inhibition but by descending facilitation^{55,56}. Further research is needed to understand the involvement of complex peripheral and central nervous mechanisms in the aetiology of genital pain, and unidimensional research approaches that focus on pain thresholds must be coupled with complex, dynamic measures of endogenous modulatory function. This focus on dynamic pain mechanisms instead of static end points is also highly relevant for clinical practice because treatments exert their clinical benefits mainly by targeting the mechanisms underlying the pain.

Allodynia

An increased pain response after normal, nonpainful stimulation.

Hyperalgesia

Increased sensitivity to painful stimulation.

Aetiological and theoretical confusion

The lack of a uniform diagnosis has made researchers increasingly aware of the multifactorial origins of genital pain. Thus, a uniform explanatory model is unlikely to account for the diversity of genital pain conditions. A variety of aetiological factors have been identified, but no systematic efforts have been made to develop specific models for each genital pain condition and to ascribe specific features to specific types of pain. Acknowledging diversity does not imply that the common operating mechanisms and pathways underlying chronic genital pain are overlooked; instead, several theoretical models have been developed, both in mainstream chronic pain literature and specifically in genital pain research, to explain the mechanisms by which people get trapped into a vicious circle of pain. In the past decade, several reviews have provided a comprehensive overview of the models and indicators of genital pain that have been supported by evidence so far^{6-8,10-12}. However, most of these papers give an extensive overview of the biological factors involved in genital pain and devote considerably less attention to its underlying psychosocial mechanisms. This omission is probably because early accounts of genital pain promoted a simplistic and dualistic approach in which the pain was characterized either as a sexual dysfunction of psychogenic origin requiring psychological treatment or as a purely biomedical problem that needed to be treated by a urogynaecologist⁵⁷. Given that pain signals physical injury, researchers, clinicians, and patients tend to prioritize somatic factors and medical treatments, which goes some way to explain the preponderance of biomedical approaches to pain⁵⁸. Fortunately, biopsychosocial perspectives are becoming more mainstream, promoting the idea that both physical and psychosocial factors affect the development and maintenance of the problem, the reporting of symptoms, and the response to treatment. Thus, the study of psychosocial factors is one of the most rapidly growing domains in genital pain research.

Biological and psychological interaction

In the past, the main focus of research on genital pain has been on physical markers. Different genital, anatomical, sensory, and physiological mechanisms have been proposed as potential causes of chronic genital pain. Although the evidence is not yet confirmatory, several studies suggest the role of local injury and inflammation⁵⁹; infections^{60,61}; vaginal cytokines^{62,63}; urogenital, pelvic, and central sensitization^{64,65}; nociceptor proliferation⁶⁶; and increased nerve fibre density⁶⁷. These processes, often in combination, can result in mechanical allodynia and hyperalgesia. Hormonal triggers of genital pain, including contraceptives and menopause^{12,68,69}, have also been identified, as have genetic influences^{70,71} and increased vulvovaginal innervation that varies as a function of gonadal hormonal status^{63,67}. Augmented neural activity and functional changes in the brain that alter the top-down influence on nociception have also been shown in response to painful vestibular stimulation in areas of the brain involved in pain modulation⁷². However, the causal or maintenance role of such pain markers is

still hypothetical and requires further theoretical and empirical work^{6,10–12}. Most researchers do agree on the importance of the pelvic floor. Increasing evidence shows that genital pain is characterized by lower pelvic muscle pressure pain thresholds and tolerance, superimposed pelvic floor hypertonicity, increased resting muscle tone, impaired voluntary relaxation (levator muscle hypertonicity, also known as myofascial pelvic pain), decreased voluntary muscle contractile ability, and reduced pelvic floor muscle flexibility, resulting in introital narrowing and muscle pain^{73–77}. However, the lack of longitudinal studies means that it is unclear whether pre-existing pelvic floor hypertonicity acts as a risk factor for developing genital pain or whether increased pelvic floor muscle tension results from chronic pain or prolonged fear of pain as part of a general defensive reaction⁷⁷.

Biological processes are unlikely to exert their influence in isolation, as psychological variables will interact with physiological mechanisms, influencing pain processing via multiple pathways⁷⁸. A clear and well-established example of such dynamic interaction is the finding that the pelvic floor reacts to emotional states and that the anticipation of pain or harm associated with vaginal penetration can elicit defensive pelvic floor reactions in affected women⁷⁹. In the context of dyspareunia, and especially vaginismus, autonomic genitopelvic reflexes are activated in response to emotional stimuli such as disgust, anxiety, fear, and sexual arousal⁷⁷. To better understand the dynamic interplay between psychological and physiological processes, specific models of genital pain have been developed. The gate control theory of pain, proposed by Melzack and Wall⁸⁰, was the first general pain model to integrate physical and psychological factors and describes how noxious sensory input is transferred via a dynamic interplay between neuronal and cognitive–emotional responses, leading to central and peripheral sensitization. Spano and Lamont⁸¹ emphasized the role of subjective experiences when describing how pain during penetration leads to fearful reactions that inhibit genital arousal, resulting in vaginal dryness and pelvic floor hypertonicity, which in turn lead to a smaller genital hiatus. These physiological reactions, together with low sexual readiness, might then cause mechanical friction and increase pain during sexual intercourse. On the basis of Spano and Lamont's seminal work⁸¹, several models of genital pain have ascribed a particularly important role to low sexual arousal. Given that a certain level of sexual arousal during penetration is important to prevent and overcome pain during intercourse, lack of lubrication during sexual activity has been proposed as a central cause of genital pain^{82,83}. However, no convincing evidence exists to suggest that genital arousal is impaired in women with genital pain compared with women without sexual complaints, although women with genital pain consistently report lower levels of subjective sexual arousal in response to diverse sexual stimuli^{82,84}. Information processing models suggest that subjective and genital arousal are determined by different processes; thus, pain — or the fear of pain — interferes with the processing of sexual stimuli, thereby inhibiting the sexual arousal response and the motivation to engage in sexual activity⁸⁶. Repeated experiences of

painful intercourse mean that sexual stimuli can become associated with negative meaning and elicit a conditioned fear response⁴⁰. As a result, attention is shifted away from sexually arousing stimuli towards nonerotic stimuli and anxious thoughts⁸⁵. Furthermore, as no sexual content is processed, genital and subjective sexual arousal responses will not develop, creating insufficient lubrication and contributing to painful intercourse. Thus, when intercourse is attempted and pain occurs, these anxious and fearful thoughts are reinforced, which can eventually lead to behavioural and even cognitive avoidance of sexual encounters^{86,87}.

Psychological factors

Whereas the search for physical and physiological markers of genital pain focuses on causality, research into psychological variables is much more concerned with understanding how pain is maintained and exacerbated. A variety of psychological constructs have been studied in relation to genital pain, ranging from cognitive–motivational processes and emotional states to personality traits. Thus far, the literature regarding genital pain has revealed only inconclusive and conflicting evidence to support a role of psychological factors in genital pain pathology. Furthermore, whether these factors preceded pain or developed after the pain began remains unclear^{78,88}.

Women with genital pain report a higher incidence of sexual abuse or an intense fear of any abuse in childhood than those without pain⁸⁹. Furthermore, studies investigating the personality profile of women with genital pain suggest that those with genital pain report greater levels of neuroticism, pessimism, trait anxiety, perfectionism, harm avoidance, disgust propensity (mainly in cases of vaginismus and to a certain extent in dyspareunia), and fear of negative evaluations as well as lower levels of self-esteem, optimism, extraversion, and self-efficacy⁴ than women without genital pain^{90–95}. However, the research on personality traits contains methodological weaknesses and should be interpreted with caution. Reduced self-efficacy has an important role in generating sexual impairment and distress. An individual's lack of belief in her own capacity to manage the pain and thereby lack of a sense of control is likely to increase anticipated pain intensity and unpleasantness, worsening both the pain and the associated sexual dysfunction⁹⁶. Studying the sexual self-concept is, therefore, relevant in order to improve our understanding of the sexual impairments associated with genital pain. Several studies have shown that women with genital pain have reduced self-esteem and less positive sexual self-schemas and report feeling less sexually desirable, less confident about their sexuality, and less feminine than before their pain began^{97,98}. These women also report more distress about their body image and a more negative genital image than they did before their pain arose, both of which contribute to increased levels of sexual distress⁹⁹. Evidence suggests that women regulate their pain and pain behaviour on the basis of how they currently perceive themselves as a sexual partner and how they ideally wish to be¹⁰⁰. Striving towards perfection, women with genital pain tend to set

Self-efficacy

The confidence in one's ability to successfully accomplish a task, achieve intended results, and exert influence over events that affect one's life.

extremely high sexual standards, overly strive to become the ideal sexual partner, and feel pressure to perform sexually^{97,101}. Their ideal self is, therefore, likely to dissociate from their current self-view, which is maladaptive in terms of sexual distress, increased pain intensity, and dysfunctional coping behaviour.

In addition to self-efficacy and self-discrepancies, lack of sexual autonomy has also been identified as an important precursor and maintaining factor in genital pain^{93,96}. Reports from both research and clinical settings suggest that women with genital pain know less about their own preconditions to experience pleasurable sex than women without pain and have difficulties communicating their wishes, expectations, and boundaries to their partner^{102–104}. They feel that once intimacy has started or once their partner has an erection, they cannot refuse penetration, even when their body is not yet prepared to engage in penetrative sex, making them vulnerable to experiencing pain and continuing penetration despite the pain^{105,106}. Notably, women with genital pain often also avoid intimate, nonpenetrative sexual acts because of fear that these will result in painful intercourse¹⁷. Given that the pain often occurs during sexual activity and, therefore, coincides with arousal, touch, penetration, and orgasm, women suffering from genital pain show greater rates of sexual dysfunction than pain-free women⁹⁰, as sex–pain association becomes stronger than sex–pleasure. The anticipation of pain can evoke cognitive and emotional processes such as self-monitoring and fear that suppress the entire sexual response^{85,107}. Accordingly, women with genital pain report increased difficulties with sexual arousal, lubrication, and reaching orgasm; negative feelings towards sexual activity^{84,108}; negative emotions — such as guilt, shame, embarrassment, and failure — during and after intercourse; reduced sexual pleasure; negative penetration cognitions; aversion to engaging in sex; negative sexual attitudes; and increased levels of erotophobia^{90,22}. However, studies have failed to find significant differences in sexual arousal, lubrication, and pain between women with and without genital pain during masturbation (although women with genital pain do masturbate less in general)¹⁰⁹. This discrepancy suggests that affected women are capable of a normal sexual response when the context does not signal a threat of pain or aversion, for example, during masturbation or in the laboratory.

The shift from studying pain as a strictly biological phenomenon to integrating psychological variables into models on genital pain has been associated with a parallel shift in research, from studying only sexual function (the biomedical approach) to studying sexual experience and satisfaction (the psychological approach). Sexual function and satisfaction are distinct outcomes that do not reliably correlate. Contrary to clinical wisdom, women with genital pain do not necessarily report impaired levels of sexual satisfaction, although the pain does limit their sexual life¹¹⁰. Optimal levels of sexual satisfaction seem to be independent of intercourse behaviour in women with genital pain. Furthermore, amelioration of sexual symptoms does not always translate into improved sexual satisfaction⁷.

The longest and most solid research tradition in the field of psychology is driven mainly by cognitive–behavioural therapy (CBT) models, which can be used to identify cognitive–emotional risk factors for developing and continuing pain. Most studies confirm that women with genital pain report higher levels of depression and trait anxiety than pain-free women, although cause and effect cannot easily be disentangled^{111,112}. A bidirectional relationship is likely to exist between anxiety, depression, and genital pain. For example, research has shown that women with antecedent mood or anxiety disorders are at increased risk of developing genital pain, just as women with genital pain are at increased risk of developing an anxiety or mood disorder or experiencing a recurrence of an existing disorder¹¹³. In terms of cognitive processes, attention and appraisal have received the most research attention to date. Both the information processing model of sexual arousal³⁶ (FIG. 1) and the fear–avoidance model^{114,115} (FIG. 2) have improved our understanding of how fear of pain interferes with attentional and evaluative processing of sexual stimuli, ultimately causing women to avoid any type of sexual activity^{34,40,87,116}. Drawing on the information processing model, (fear of) pain would interfere with different processes involved in sexual arousal responding, resulting in increased attention to pain and, therefore, less attention to sexual stimuli, more negative appraisal of sexual stimuli, decreased motivational tendencies, and lower subjective and genital sexual arousal. Although some studies failed to demonstrate hypervigilance towards pain-related stimuli and automatic threat appraisals of sexual stimuli in women with genital pain^{40,41,45}, emerging evidence suggests that women with genital pain do selectively attend to pain stimuli, report more negative appraisals of sexual penetration stimuli, and have more catastrophic thoughts than those without pain^{86,88,116}. The detrimental effect of negative pain attributions has been documented in a few studies. Overall, interpreting the pain as stable (unchangeable) and global (affecting their entire life) predicts increased distress and sexual impairment in affected women¹¹⁷. In addition, attributing the sexual dysfunction to a relational problem can cause greater distress and invalidating reactions than attributing the dysfunction to a physical or other external cause¹¹⁸. The role of attributions needs further exploration because the cognitive attributions women assign to the cause and controllability of the pain might enable health care providers to improve understanding of the patient's feelings of distress, pain, and coping behaviour.

In contrast to the variety of studies on cognitive–emotional variables, little research has been conducted on the behavioural sequelae of genital pain. According to the fear–avoidance model, fear of pain would cause women to avoid sexual activity^{114,115}. Whereas many women prefer to avoid sexual activity to prevent the experience of pain, a large portion of women regularly engage in penetrative sex despite it^{1,97,118–120}. Hence, although fear–avoidance mechanisms such as pain-related fear, pain catastrophizing, and hypervigilance have proven to be valid for predicting pain reports of women with genital pain, current CBT models cannot

Figure 1 | An information processing model of sexual arousal. Sexual arousal is triggered by a stimulus that preattentively captures attention and is automatically appraised as sexually meaningful and rewarding. Such automatic appraisal evokes genital arousal responses, which motivate people to maintain their attention to the sexual stimulus and cognitively elaborate on (consciously appraise) it. When this results in a positive evaluation, a subjective sense of sexual desire and arousal is experienced, which further increases physical and subjective arousal. These ongoing sexual responses might then trigger the motivation to actually engage in sexual activities.

explain why the experience of pain does not always lead to avoidance of sexual activity. To understand this paradox, the role of motives must be considered and the focus expanded from intraindividual to interindividual variables^{7,8}. Although empirical data are limited, studying the motivational determinants of genital pain has proven useful for understanding differences in behavioural responses to pain¹⁷. Motives for engaging in sex, despite pain, are driven by the wish to pleasure one's partner or to avoid anger, to keep the ideal image of being a 'normal' woman, and feelings of guilt and fear of losing the relationship¹⁰¹. This model suggests that women with genital pain are chronically preoccupied with averting negative outcomes, thereby missing positive opportunities and causing damage to emotional and relational well-being⁸. Early evidence has confirmed that women who pursue more sexual avoidance goals (that is, having sex to avoid a negative outcome) report lower sexual and relationship satisfaction and higher levels of depressive symptoms, whereas the active pursuit of sexual approach goals (having sex to attain a positive outcome) is associated with higher sexual and relationship satisfaction¹²¹. Framing the fear–avoidance model in motivational terms also draws attention to goal processes and self-regulatory dynamics in attempting to understand how women cope with their pain in the daily pursuit of valued activities¹²². Pain-related fear and avoidance occur in a context of multiple and often competing personal and interpersonal goals. For example, avoiding pain by refraining from sex might interfere with and at the same time facilitate important relationship goals, creating an approach–avoidance conflict. Furthermore, experiencing a discrepancy between the current situation (in which important goals are blocked by pain) and their desired end state (reflecting unrealistically high

standards) leads to goal frustration and goal failure, increases the perceived value of the blocked goals, and prevents women from disengaging from unattainable goals (for example, pain-free, spontaneous, passionate sex) and re-engaging in pain management goals. This tenacious search for pain relief narrows their attention towards the problem to be solved at the cost of pursuing other valuable intimacy goals, often leading to frustration and thereby exacerbating distress¹²².

Another limitation of current cognitive–behavioural models is their almost exclusive focus on vulnerability and risk factors. During the past decade, positive psychology approaches have become increasingly popular in psychopathology research. Such approaches focus not so much on distress and disability, but on increasing sexual pleasure, studying sexual excitation instead of only inhibition, and identifying protective and resilience factors. In the context of genital pain, re-orientating the focus towards studying the predictive value of self-efficacy, perceived control, sexual autonomy, and optimism could be useful when trying to understand pain intensity, coping behaviours, and emotional and sexual well-being. In fact, longitudinal evidence has confirmed that decreased pain intensity is associated not with the reduction of cognitive–behavioural vulnerabilities (such as catastrophic thoughts, fear, and avoidance) but mainly with the increase in pain self-efficacy⁹⁶. This paradigm shift, in which an increasingly important role is ascribed to pain resilience, is further supported by studies showing that dispositional optimism influences the perception of genital pain symptoms and determines treatment choices¹²³. More research is needed to examine how risk and protective factors relate to one another and to explore the possibility that women with genital pain do not display increased cognitive–behavioural risks, but actually lack sufficient positive resources, such as self-efficacy and optimism. Furthermore, the study of resilience might help to inform and advance clinical practice by providing valuable insights on how to prevent acute pain from developing into a chronic pain condition.

Social factors

The experience, expression, persistence, and behavioural response to pain are not solely driven by intrapersonal factors but also originate from and serve interpersonal dynamics. Although the study of social factors has progressed substantially, relationship variables have long been neglected in the study of genital pain, which is particularly surprising as the pain often occurs when having sex with a partner and is, therefore, predicated upon the relational context. Research into genital pain — and sexual response in general — typically relies on individual explanatory models that are tested in individual laboratory designs, which reduces the ecological validity of genital pain research^{8,46}. To improve the validity of genital pain models and the alignment of scientific research with the complex reality of having sex in a relationship, relational and contextual variables, which can act as risk and protective factors for developing, maintaining, and exacerbating genital pain, must be taken into account.

Figure 2 | The fear-avoidance model of chronic pain. The fear-avoidance model of Vlaeyen & Linton emphasizes the role of negative thoughts in promoting disabling fear and avoidance. Catastrophic thoughts about pain lead to pain-related fear and associated safety-seeking behaviours, such as avoidance, which result in disuse and disability. This in turn leads to exaggerated pain perceptions and overestimations of future pain, thereby lowering the threshold at which the person will experience pain. If the pain is interpreted as nonthreatening, people will accept the pain and resume activities, which ultimately leads to accelerated recovery because the individual can test and correct his or her pain expectations in light of actual experiences. Figure adapted from Vlaeyen, J. W. S. & Linton, S. J. Fear avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain* 8(3), 317–332 (2000).

Partner responses

Within the social perspective on genital pain, most research attention so far has been devoted to the study of partner responses. Sexual pain research is somewhat hindered by a heterosexual bias — the majority of studies on the interpersonal dynamics of genital pain have been conducted on heterosexual couples in which the woman experiences pain. No evidence exists to suggest that partner responses and relational dynamics operate the same way in nonheterosexual couples, but similarly, there is no reason to assume any difference. Given that the partner is typically present during the pain and both triggers and witnesses the pain of the woman, partner responses are likely to serve important functions in eliciting distress and/or maintaining and exacerbating genital pain problems. That is, the partner's degree of empathy and pain appraisals might lead to effective or ineffective helping behaviour. Through these behavioural and communicative responses, the partner might unknowingly reinforce or perpetuate the woman's dysfunctional pain behaviour, thereby contributing to increased genital pain and disability^{90,104}. Accordingly, a partner's responses to genital pain might determine whether or how much the woman will experience sexual distress. In support of this theory, research has indicated that negative and solicitous responses to pain are associated with increased pain intensity¹²⁴. By being overly supportive, partners might actually encourage avoidance of sexual activity and reinforce their partner's anxiety and negative pain appraisals. Although clinical guidance should

not suggest that women continue with painful sexual intercourse, avoidance of penetration often generalizes to nonpenetrative activities, leading to relationship difficulties, reduced intimacy, and communication breakdown. Conversely, decreased negative and increased solicitous responses were also found to predict increased sexual satisfaction, probably because women feel better understood when their partner reacts in a compassionate way^{110,124}. Facilitative responses — in which the partner supports but also challenges the woman to approach sexual situations — have been suggested as most adaptive because they are associated with both reduced pain ratings and increased sexual satisfaction. Responding in a facilitative way generates positive appraisals and encourages women to engage in and enjoy nonpainful sexual activities, thereby contributing to shared emotion regulation, intimacy, and closeness with their partner¹²⁴.

These studies suggest a bidirectional link between patient and partner responses, although such a link has not yet been directly studied. Drawing on pain communication models, women might express genital pain to maximize proximity or solicit assistance and empathic responses from their partner¹²⁵. Whether or not the partner will notice and react to these requests for support depends partly on characteristics of the partner and the relationship context. The presence of catastrophic thoughts and negative attributional style in the partner are associated with negative and solicitous behavioural responses to pain, which in turn influence the woman's pain and depressive symptoms¹²⁶. Notably, the valence and nature of the partner's cognitions is not a stable, individual feature but is likely to vary as a function of relational dynamics. That is, when partners are anxious or suspicious about the relationship, signals of pain and sexual distress might raise doubts about their ability to sexually satisfy their partner, induce feelings of incompetence, or raise questions about commitment and fidelity. A partner's beliefs about the genital pain problem might also influence the patient's expressions of sexual distress. When a partner tends to underestimate the pain, the patient might express even more pain and distress to prove that the problem is real¹²⁷. In relation to this effect, early evidence has shown that partners of women with genital pain are able to track daily changes in the woman's pain but at the same time tend to underestimate it. Poorer pain estimation might impair partners' ability to adjust their emotional and behavioural responses to women's pain, with negative consequences for relationship satisfaction in coping with genital pain for the couple¹²⁸.

A dyadic approach

Although studying the modulatory effect of partner responses on pain symptoms and sexual outcomes in women has definitely advanced our knowledge of the social features of genital pain, most studies adopt a unidirectional view and fail to carry out a detailed investigation of the dynamic interplay between partners. As a first step towards understanding dyadic pain interactions, the focus must be not only on the woman as

target of study but also on partner outcomes, examining how the pain affects the partner's sexual and emotional responses^{46,126}. Drawing on studies with heterosexual couples, evidence suggests that partners of women with genital pain also report psychological distress and sexual problems, mainly erectile dysfunction and sexual dissatisfaction, although disentangling cause and effect is difficult^{10,129,130}. Furthermore, a 2015 diary study revealed that not only women's but also men's sexual function and satisfaction depend on his level of solicitous and negative responses to her pain¹²⁸. In this context, a move beyond cognitive-behavioural models — in which partner responses are approached mainly as positive or negative reinforcers of individual pain outcomes — has been proposed to study the effect of female pelvic pain on intimacy and emotion regulation in couples^{7,131}. As a second step towards understanding the dyadic aspects of genital pain response, we need to model the psychosexual interdependence between partners and examine how they tune their physical and emotional responses to each other¹³². This so-called co-regulation is critical to a nuanced understanding of genital pain responding and shifts our focus towards developing dyadic, rather than individual, theoretical models and measurements that include the responses of both sexual partners⁴⁶. The latter creates a challenge to the field because it requires the development of new methods of measurement, complex experimental designs, and advanced statistical techniques.

In addition to studying how pain affects the patient, the partner and their dyadic interaction, exploring the effect and meaning of pain for the couple's relationship is equally informative. Currently, little data exist on relationship factors in the context of genital pain. Most research has focused on global constructs such as relationship satisfaction, which has been treated as an outcome as well as a moderator of the association between partner responses, pain, and depressive symptoms. Overall, no differences have been found in self-reported dyadic adjustment between women with and without genital pain and their partners¹³³. To fully understand the lack of association between genital pain and relationship satisfaction, the processes that underlie and determine relationship satisfaction and relationship quality must be studied. Studies of the interpersonal dynamics of genital pain have identified key relational variables, such as attachment orientation, support (perceived or received), and sexual and non-sexual communication^{134,135}. In particular, attachment theory (BOX 2) might provide a useful framework for understanding how women with pain experience sex and why they consent to painful sexual intercourse. Driven by a fear of disappointing and losing their partner, women with an anxious attachment orientation could be less open to communication about their sexual wishes and more likely to sacrifice their own needs, defer to their partner's sexual preferences, and pursue sex in a dependent way as a means to regulate their attachment insecurity. Conversely, avoidantly attached women might lack communication skills and avert intimate actions, such as touching and cuddling, which

increase the risk of experiencing pain. As intercourse represents the kind of intimacy they fear, avoidant women are more likely to dismiss their own and their partner's sexual needs and inhibit their sexual desire¹³⁶. The dynamic interaction between the attachment orientations of both partners also needs investigation to understand their influence on pain responses. Early evidence has confirmed that compared with securely attached individuals, insecurely attached women with genital pain lack the ability to openly communicate about sex and to assert their sexual limits, leading to less sexual satisfaction and poorer sexual function¹³⁴. These results suggest that attachment theory is a good model to understand sexual responses in the presence of genital pain and emphasize the need for further research in this area.

A focus on pleasure

Given the importance of sexual communication as a means of increasing a couple's well-being, communicating their sexual likes and dislikes might help couples to change their sexual script by focusing more on sexual pleasure than on painful activities. At the same time, open communication can enhance perceptions of intimacy, thereby contributing to more effective regulation of emotions, pain coping, and sexual satisfaction^{104,137}. Women with genital pain report lower levels of dyadic sexual communication with their partners than unaffected couples, with improved dyadic sexual communication being associated with increased levels of sexual function and dyadic adjustment and reduced levels of sexual distress in women with genital pain^{133,135}. Survey and observational studies examining constructs related to communication have shown that both partners' increased empathic responses and self-disclosure, increased intimacy exchanges, increased sexual assertiveness, and reduced ambivalence over emotional expression (that is, being comfortable with the way one expresses emotions) are related to increased levels of sexual function and satisfaction and reduced levels of distress^{138–140}.

When studying relationships, the focus on pain reduction alone as an outcome variable must be expanded to include intimacy and other relevant emotions. Relationship research has shown that relational variables — such as communication, intimacy, and affection — are better predictors of sexual satisfaction than individual variables, such as personality traits, especially in women, in whom sexuality is generally considered to be more interpersonally oriented and context-dependent than in men¹⁴¹. Research into genital pain will, therefore, benefit from theories and research methods used in relationship research and will enable an increasingly detailed analysis of the dyadic interactions in couples with genital pain⁷. Such an interpersonal perspective contributes to the promotion of sexual health and well-being because it more accurately reflects the occurrence and consequences of genital pain in the natural context of the relationship rather than considering the pain as purely a concern for the female partner.

Sexual script

The scenario each couple develops over time to guide their sexual interactions.

Box 2 | Attachment theory

According to attachment theory, past relationship experiences (starting with the primary caregivers) translate into mental schemas (ideas about oneself as worthy of love and others as available and supportive) that shape cognitive, emotional, and behavioural responses in later relationships. Negative interpersonal experiences with an inconsistent or rejecting caregiver are likely to result in insecure attachment orientations (that is, anxious and avoidant attachment), whereas positive interpersonal experiences with a supportive and consistently available caregiver will develop into secure attachment orientations. Both anxious and avoidant individuals are characterized by negative beliefs about themselves as unworthy of love and negative beliefs about others as unavailable, although they differ in how they cope with these feelings of insecurity. Whereas anxious individuals continue seeking proximity and support to their attachment figure, avoidant individuals will seek independence and autonomy¹³⁶.

Treatment confusion

The multifactorial aetiology of genital pain and the lack of a uniform diagnosis not only complicate research but also have important implications for treatment. In the past, clinical practice maintained a simplistic, dualistic view of genital pain in which the choice of treatment was driven mainly by the underlying aetiology. Nevertheless, both psychological and medical treatments seem to have similar efficacies^{142–144}. To further complicate the issue, effect sizes for medical interventions are often comparable to placebo and the effectiveness of psychological treatments is equivalent regardless of medical or psychological aetiology¹⁴⁴. These similar efficacies indicate that presumed aetiology might not be helpful in selecting treatment for women with genital pain. However, medical treatment is still the first-line option, with psychological treatments not available or offered only when medical interventions are not successful. Accordingly, patients often have a long history of unsuccessful medical treatments before seeing a psychologist, which is likely to result in tenacious medical attributions, catastrophic thoughts, further consolidation of the association between sex and pain, and a loss of confidence in treatment and in themselves. Furthermore, many women with genital pain see a variety of health care professionals before deciding on a management strategy, which makes them feel insecure, not taken seriously, and even maltreated^{25,27}. The numerous factors implicated in the development and maintenance of genital pain and its effects on so many aspects of women's health and well-being mean that a comprehensive assessment, preferably from both a medical doctor and a psychologist, is crucial to determine the most effective treatment strategy. This assessment procedure involves a thorough evaluation of the individual's and couple's psychosexual history, evaluation of the tone and function of the pelvic floor musculature, and a medical history with physical examination⁵⁸. To ease the burden of these intimate and often invasive examinations and to ensure that the patient does not feel that she is being needlessly referred, good communication about the necessity of a biopsychosocial approach is essential not only between patient and health professional but also among health professionals of different disciplines.

Medical therapy

A variety of medical therapies have been proposed, but none of them have sufficient evidence to verify their effectiveness in treating female genital pain. Antinociceptive agents, including local anaesthetics such as lidocaine, capsaicin, and botulinum toxin type A, provide relief to the patient by numbing the vulvovaginal area that causes pain during penetration. Although this treatment might be effective in terms of desensitization, one could argue that it reflects a somewhat simplified and functional approach because the main outcome of therapy is making penetration possible regardless of the woman's psychosexual makeup or state of sexual arousal. Other therapeutic options include anti-inflammatory agents (such as corticosteroids and interferon), local and systemic hormonal treatments (estrogen), antidepressants (for example, amitriptyline, desipramine, or duloxetine), and anticonvulsants (such as gabapentin and pregabalin), although no clear recommendations can be made without further study^{10,58,143,144}. The most frequently studied medical intervention is vestibulectomy for pain caused by vulvar vestibulitis. This procedure consists of the excision of the posterior hymen and of the painful mucosa of the posterior and anterior vestibule and is associated with high success rates in terms of pain reduction and improved sexual function¹⁴². However, it cannot be recommended as a first-line intervention given the invasiveness and potential risks associated with surgery¹⁴². Another widely used and accepted treatment is pelvic floor physical therapy, which aims to relax and restore the proper length of the pelvic floor muscles and decrease neural tension¹²⁹. Mobilization and stabilization techniques^{77,145}, internal and external myofascial trigger point release¹⁴⁶, manual and guided insertion techniques¹⁴⁵, biofeedback training¹⁴⁷, and surface electromyographic measurements^{77,148} have all proven successful for alleviating pelvic floor hypertonicity^{148,149}.

Although these medical treatments might have considerable positive effects on their own, they address only manifest symptomatology and disregard the underlying mechanisms that explain why women tighten their pelvic floor, lose their sexual arousal, and continue to experience pain even when the original source of pain has been eradicated. Patients might find greater benefit from treatments that manage the pain as well as its associated sexual, psychological, and relational consequences than from topical treatments that target only the physical pain itself¹⁰. Thus, psychological interventions might be better suited to address the underlying mechanisms maintaining and exacerbating the pain and to manage the disabling influence of pain on emotional, sexual, and relational well-being¹⁴¹.

Psychological treatments

Cognitive–Behavioural Therapy. Given the documented role of cognitive and emotional circuits in generating and modulating pain, CBT-based approaches have proven popular and promising¹²⁵. CBT aims to decrease pain and/or the fear of pain and re-establish satisfying sexual experiences by teaching the patient about the effect of their thoughts and emotions on their

pain by challenging dysfunctional catastrophic beliefs about pain and by targeting avoidance of intimacy using basic principles of systematic desensitization. Women are instructed to resume sexual activity only when in a state of high sexual arousal and to expand their sexual repertoire in order to make the overall sexual experience more rewarding^{7,11}. As a result, the pain will draw less attention from the patient, anticipation of pain will be replaced by anticipation of pleasure, and the patient will gain a greater sense of control over her pain^{58,142}. Several CBT-related treatment programmes have been developed, including a specific protocol to treat the pervasive fear and avoidance of penetration in women with lifelong vaginismus¹⁵⁰. In this protocol, known as 'therapy-aided exposure', the woman performs vaginal penetration exercises on herself (inserting fingers) in the presence of her partner and a female therapist who motivates her and teaches her to relax. Results are promising, with almost 90% of couples resuming intercourse within the first 2 weeks after treatment and showing clinical improvements in fear, negative penetration beliefs, pain, and sexual distress¹⁵⁰.

Mindfulness. Although traditional CBT models remain popular in clinical practice, interest in alternative treatments is rapidly growing, with mindfulness-based interventions receiving much research attention^{78,151,152}. Mindfulness is rooted in Buddhist meditation and cultivates nonjudgemental, moment-to-moment awareness by learning to decentre thoughts and feelings and instead focus attention on bodily sensations¹⁵³. Its effectiveness has been demonstrated for a range of clinical problems, including sexual dysfunction^{154,155}. In the context of genital pain, mindfulness meditation encourages women to attend to the pain with a nonreactive and nonjudgemental mindset and to uncouple the physical sensation from the cognitive and emotional experience of pain by emotionally detaching from fear and catastrophic thoughts that enter awareness⁷⁸. Mindfulness is often used as part of a larger therapy programme and can be integrated into CBT protocols. Although this multicomponent treatment seems to yield significant positive outcomes in terms of pain reduction and increased sexual function and satisfaction¹⁵⁵, the roles of specific interventions, such as *bodyscan* meditation and acceptance, are unclear. Thus, more research is needed on mindfulness-only interventions to better understand mechanisms of change and to examine whether combined therapy will prove more effective than either treatment modality alone.

Acceptance and Commitment Therapy. Acceptance and commitment therapy (ACT) is another promising treatment that promotes acceptance of thoughts, sensations, and feelings. ACT targets ineffective control strategies and experiential avoidance and focuses on the patient's ability to identify and commit to valued goals in daily life¹⁵⁶. Although ACT protocols are not yet well established in the field of genital pain, acceptance-based strategies have been increasingly incorporated into chronic pain treatments.

A meta-analysis of 22 studies has shown positive effects of acceptance-based treatments on pain intensity, depression, anxiety, and well-being¹⁵⁷. Acceptance of chronic pain includes giving up efforts to reduce and control the pain and fully engaging in the activities and relationships that are in line with personal values. A 2015 study showed that pain acceptance (as measured by the chronic pain acceptance questionnaire) in women with genital pain was associated with reduced self-reported pain during intercourse, reduced anxiety and depression, and increased sexual functioning and satisfaction. Furthermore, increased pain acceptance in partners was associated with their own lower depression scores¹⁵⁸. Mainstream pain research has shown that mindfulness and acceptance-based programmes are not superior to CBT but can be good additions or alternatives, although their effectiveness for treating genital pain needs further study¹⁵⁹. An important benefit of mindfulness and ACT (compared with regular CBT) is that the main outcome of therapy is pain management — that is, trying to cope with the pain and engage in valued activities despite the pain — instead of pain control or pain relief, which enables the patient to pursue sexual pleasure and engage in rewarding intimate acts despite her pain. By contrast, trying to reduce and control pain, particularly over a long period of time, requires a lot of effort and often results in more attention being directed towards the pain, counterproductively increasing the pain and its associated impairments¹⁵⁷.

Overall, positive psychology approaches to pain have proven beneficial to the field, offering a new perspective on the treatment of genital pain by focusing on increasing resilience and personal growth instead of simply reducing dysfunctional patterns and pathology.

Comparing psychological approaches

The variety of medical and psychological treatments, each with their own rationale and aims, is confusing for both physicians and patients. Furthermore, methodologically sound research evaluating the efficacy and effectiveness of various interventions is missing, which complicates treatment selection. Most of the randomized clinical trials that have been conducted examined the efficacy of CBT in relation to medical treatments of genital pain. The few available studies have reported statistically significant benefits after CBT for genital pain. One of the earliest systematic studies, carried out in 2008, compared the effects of CBT, vestibulectomy, and biofeedback training on pain intensity, psychosexual functioning, and sexual satisfaction¹⁴². Although vestibulectomy was initially two times more effective than the other two treatments in terms of reducing vestibular pain (during a cotton swab test), general pain ratings, and sensory pain ratings ($F = 3.02$, $P < 0.01$), the differences disappeared at the 6-month and 2.5-year follow-up points. Furthermore, all three interventions had similar positive and statistically significant effects on psychosexual outcome variables (sexual functioning, intercourse frequency, and psychological adjustment; $P < 0.05$). In another randomized trial, the effect of CBT was compared with the topical application of corticosteroid cream, showing a similar decrease

Bodyscan meditation

One of the most effective exercises to develop mindfulness. During *bodyscan* meditation attention is directed at various parts of the body, thereby focusing on the physical sensations in the present moment with an open and compassionate attitude.

in pain intensity immediately after treatment but a greater pain reduction in the CBT group at a 6-month follow-up point ($P < 0.01$). Treatment satisfaction rates and psychosexual variables (sexual function, intercourse frequency, and pain catastrophizing) were significantly higher after receiving CBT than after receiving medical treatment ($P < 0.01$)¹⁵⁹. To test whether CBT yields specific effects that go beyond the general effect of a therapeutic intervention, a standard CBT protocol was compared with supportive therapy, with the latter offering the same amount of sessions but without any active psychological intervention. CBT resulted in a significantly greater reduction of self-reported pain severity and pain during physical examination ($P < 0.01$; with 42% achieving clinical improvement), better sexual functioning ($P < 0.05$), and treatment satisfaction ($P < 0.05$)¹⁶⁰. The efficacy of mindfulness-based CBT interventions has started to gain empirical support, as shown in a study comparing a four-session integrated mindfulness-based group therapy with a wait-list control group¹⁵⁵. The group who received the therapy intervention demonstrated significant improvements in pain catastrophizing ($P < 0.001$), pain hypervigilance ($P < 0.05$), allodynia in response to a cotton swab test ($P < 0.001$), self-efficacy ($P < 0.001$), and sexual distress ($P < 0.001$) both immediately after treatment and at a 6-month follow-up point. Notably, pain during sexual intercourse did not significantly decrease after mindfulness-based treatment, probably because few women engaged in penetrative sex within the time frame examined¹⁵⁵. Data showing potential benefits of a couple-based approach to the treatment of genital pain have led to the development of a cognitive-behavioural couple therapy programme, which integrates the latest evidence on the interpersonal dynamics of genital pain. In this programme, both partners are engaged to discuss and expand their sexual narratives, reduce experiential and behavioural avoidance, practise communication skills, and receive mindfulness-based and acceptance-based interventions in addition to participating in psychoeducation and pain journaling. A first test of its feasibility and efficacy has revealed promising results, with women reporting a statistically significant decrease in pain during sexual intercourse and improved sexual function ($P < 0.05$). Both partners also reported increased levels of sexual satisfaction after treatment as well as statistically significant improvements in pain-related cognitions, relationship satisfaction, and psychological well-being ($P < 0.05$)¹⁶¹.

Given the multifactorial aetiology of genital pain, integrated multimodal treatments are highly recommended. However, systematic research on the efficacy of treatment programmes that integrate medical, psychological, and interpersonal interventions is scarce⁷. A first, uncontrolled prospective study examining the effect of an integrated protocol, including pelvic floor relaxation, pain management, CBT, and sex therapy, has shown reductions in pain intensity and increased sexual frequency and sexual functioning after treatment¹⁶². A second multidimensional treatment programme that includes psychoeducation, medical management, skills training, and pelvic floor therapy also demonstrated

promising effects, with statistically significant improvements in pain-related, sexual, and emotional outcome variables; however, the trial was not randomized¹⁶³. Furthermore, qualitative research has demonstrated that a combination of medical evaluation and treatment, physical therapy, dietary advice, and psychotherapy yields positive effects on pain and psychological well-being, as reported by women during targeted interviews after treatment¹⁶⁴.

Further randomized clinical trials that include baseline and post-treatment measurements are required to determine the range of improvement, the follow-up period required to verify whether the therapeutic benefits are maintained, validation of measurement scales, and therapy end points that go beyond only the experience of pain and cover multiple domains of functioning^{11,142,144}. Regarding the latter, research needs to focus on distress and satisfaction in addition to pain and function because the level of distress will determine treatment seeking, motivation for change, and prognosis. When evaluating a treatment, one must also take into account patients' expectations and goals and understand their motives for choosing a particular treatment — for example, restoring their identity as a woman and sexual partner (self-focus) or regaining the experience of coital intimacy (relational focus)¹⁶⁵. That the partner affects and is affected by the pain is now commonly accepted, and the partner should, therefore, be included in the therapeutic process; however, very few controlled studies have examined the value of couple therapy compared with individual pain treatments of the patient¹⁰. Thus, treatment should focus on both partners instead of targeting only the patient. Regardless, comparing therapeutic modalities and trying to determine whether psychological treatments yield better outcomes than medical interventions might prove useless when considering that pain is a biopsychosocial phenomenon in which biological, psychological, and relational factors influence each other in recursive loops⁹. Research and clinical efforts should, therefore, be directed at developing and evaluating multimodal treatments that target different aspects of genital pain. This approach will require collaboration from urogynaecologists, gynaecologists, urologists, psychologists, and sexual therapists.

An integrated approach

We recommend that an integrated approach should start with validating the women's concern that the pain is real and that it needs combined treatment^{11,163}. After exploring treatment expectations and setting treatment goals¹⁶⁵, a thorough clinical interview should discuss the patient's and/or couple's medical, psychosexual, and pain history and identify the factors that might contribute to pain and pain-related distress; a clinical examination should follow, which the woman can observe using a hand-held mirror. Psychoeducation about the vicious circle of pain and the relationship between negative thoughts and feelings and pain has also proven to be an essential component of therapy. Pelvic floor therapy should be part of any treatment protocol, as should the advice to install a pain stop (cessation of any activity that

Sensate focus

A set of sexual exercises in which both partners touch each other in hierarchical steps (starting with nongenital touching, over genital touching, towards penetration) without regard for sexual response or pleasure for oneself or one's partner.

causes genital pain) to uncouple the association between sex and pain. In addition, the suggestion that a woman needs to pursue penetration whenever her partner gets an erection must be dismissed, and emphasis must be placed on engaging in penetrative sex only when sexually aroused because lubrication and relaxed pelvic floor muscles will make penetration more comfortable. Women should also be advised to schedule sex to disrupt avoidance of intimacy and to rely on sensate focus exercises to practise touching and communicating about sex and to expand their sexual repertoire. The exact order of treatment options, including at which step psychological treatments should complement medical treatments and vice versa, is difficult to determine and depends on the pain profile and psychosexual history of each individual patient.

Genital pain in evolution

During the past decade, considerable advances have been made in the field of genital pain. Although they have limitations, the new classification systems (DSM5³ and the 2015 ISSVD–ISSWSH–IPPS consensus⁴) better account for the multidimensional nature of genital pain, encourage research into integrative classifications and treatment approaches, and stimulate communication and collaboration across relevant disciplines. In general, the long-standing fragmentation between biological and psychosocial perspectives is changing in favour of an integrated multidisciplinary approach that focuses on feedback links between different components. Future research efforts should be directed at studying interactions and pathways instead of determining the relative influence of biological and psychosocial variables in predicting pain and its consequences; in this way, such efforts can focus on satisfaction instead of function alone and broaden the scope of outcome variables by studying not only pain reduction but also other domains of functioning such as dyadic adjustment, well-being, and quality of life. This multidimensional approach demands an expansion of traditional CBT models, in which a central role has been ascribed to dysfunctional thoughts and emotions. Such an expansion should explore protective and resilience factors, encourage an increase in sexual excitement to reduce the effect of negative emotions and offer experiences to correct dysfunctional thoughts, incorporate the idea that pain-related fear and avoidance occur in a motivational context and specify the motives and motivational processes underlying genital pain behaviour, and move beyond the almost exclusive focus

on aetiology and predictors of pain towards studying maintaining factors and consequences of pain and how the pain interferes with valued life goals. In addition, the field shows a trend towards developing interpersonal instead of individual explanatory models in which the dynamic interplay between the patient, the partner, and the relational context are studied in relation to pain-related and intimacy-related outcomes. Although the social perspective on genital pain is becoming more popular, the social dimension has thus far been narrowly defined, leaving how genital pain is manifested in non-Western populations — in which sexual behaviour is regulated by traditional values and sex education is lacking — unexplored. Studies to explore whether and in what way the experience of pain is modulated by media and other societal influences, the reactions of others, and the therapeutic relationship between clinician and patient could also be useful.

Similar trends towards integration can also be noted in clinical practice. Demand for multidisciplinary treatments has increased, and the focus has moved towards inviting both members of the couple into therapy to work on their interactive relationship, concentrating on pain management rather than pain relief, and trying to boost the patient's resilience in addition to decreasing her vulnerabilities. Increasing positive aspects rather than decreasing the negative corresponds with a positive psychology approach to psychopathology that emphasizes personal growth, thus increasing happiness and achieving a satisfactory life despite pain rather than maintaining an illness-oriented focus.

Conclusions

The necessity of promoting dialogue and integration not only across disciplines but also across fields must be emphasized in order to close the gap between scientific research and clinical practice in female genital pain. Basic research relies on controlled (laboratory) settings, strives towards maximal internal validity, and intends to advance our understanding of genital pain, whereas clinical research aims at maximizing external validity and intends to change practice. Substantial advances can be made only when both research traditions are incorporated into a translational programme that will generate new ideas, methodologies, and insights with the ultimate aim of reducing suffering, increasing sexual pleasure, and motivating multidisciplinary teams to be involved in the assessment and treatment of women and couples with genital pain.

1. Arnold, L. D., Bachmann, G. L., Rosen, R. & Rhoads, G. G. Assessment of vulvodynia symptoms in a sample of US women: a prevalence survey with a nested case control study. *Am. J. Obstet. Gynecol.* **196**, 128.e1–128.e6 (2007).
2. Reed, B. D., Haefner, H. K., Sen, A. & Gorenflo, D. W. Vulvodynia incidence and remission rates among adult women: a 2-year follow-up study. *Obstet. Gynecol.* **112**, 231–237 (2008).
3. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders* 5th edn (2013).
4. Bornstein, J. *et al.* 2015 ISSVD, ISSWSH and IPPS consensus terminology and classification of persistent vulvar pain and vulvodynia. *Obstet. Gynecol.* **127**, 745–751 (2016).
5. Moyal-Barracco, M. & Labat, J. J. Vulvodynia and chronic pelvic and perineal pain. *Prog. Urol.* **20**, 1019–1026 (2010).
6. Van Lankveld, J. D. M. *et al.* Women's sexual pain disorders. *J. Sex. Med.* **7**, 615–631 (2010).
7. Bergeron, S., Rosen, N. O. & Morin, M. Genital pain in women: beyond interference with intercourse. *Pain* **152**, 1223–1225 (2011).
8. Dewitte, M., Van Lankveld, J. & Crombez, G. Understanding women suffering from sexual pain: a cognitive-motivational account. *Pain* **152**, 251–253 (2011).
9. Gatchel, R. J., Peng, Y. B., Peters, M. L., Fuchs, P. N. & Turk, D. C. The biopsychosocial approach to chronic pain: scientific advances and future directions. *Psych Bull.* **133**, 581–624 (2007).
10. Bergeron, S., Corsini-Munt, S., Aerts, L., Rancourt, K. & Rosen, N. Female sexual pain disorders: a review of the literature on etiology and treatment. *Curr. Sex. Health Rep.* **7**, 159–169 (2015).
11. Sadownik, L. A. Etiology, diagnosis, and clinical management of vulvodynia. *J. Women's Health* **6**, 437–449 (2014).
12. Pukall, C. F. *et al.* Vulvodynia: definition, prevalence, impact, and pathophysiological factors. *J. Sex. Med.* **13**, 291–304 (2016).

13. Reissing, E. D. *et al.* "Throwing the baby out with the bathwater": The demise of vaginismus in favor of Genito-Pelvic Pain/Penetration Disorder. *Arch. Sex. Behav.* **43**, 1209–1213 (2014).
14. De Kruiff, M. E., ter Kuile, M. M., Weijnenborg, P. T. & van Lankveld, J. J. Vaginismus and dyspareunia: is there a difference in clinical presentation? *J. Psychosom. Obstet. Gynaecol.* **21**, 149–155 (2000).
15. Reissing, E. D., Binik, Y. M., Khalife, S., Cohen, D. & Amsel, R. Vaginal spasm, pain, and behavior: an empirical investigation of the diagnosis of vaginismus. *Arch. Sex. Behav.* **33**, 5–17 (2004).
16. Lahaie, M. A. *et al.* Can fear, pain, and muscle tension discriminate vaginismus from dyspareunia/provoked vestibulodynia? Implications for the new DSM-5 diagnosis of Genito-Pelvic Pain/Penetration Disorder. *Arch. Sex. Behav.* **44**, 1537–1550 (2015).
17. Brauer, M., Lakeman, M., van Lunsen, R. & Laan, E. Predictors of task-persistent and fear-avoiding behaviors in women with sexual pain disorders. *J. Sex. Med.* **11**, 3051–3063 (2014).
18. Aerts, L., Bergeron, S., Corsini-Munt, S., Steben, M. & Paquet, M. Are primary and secondary provoked vestibulodynia two different entities? A comparison of pain, psychosocial and sexual characteristics. *J. Sex. Med.* **12**, 1463–1473 (2015).
19. Reissing, E. D. Consultation and treatment history and causal attributions in an online sample of women with lifelong and acquired vaginismus. *J. Sex. Med.* **9**, 251–258 (2012).
20. Binik, Y. M. Should dyspareunia be retained as a sexual dysfunction in DSM-V? A painful classification decision. *Arch. Sex. Behav.* **34**, 11–21 (2005).
21. Binik, Y. M. The DSM diagnostic criteria for dyspareunia. *Arch. Sex. Behav.* **39**, 292–303 (2010).
22. Meana, M., Binik, Y. M., Khalife, S. & Cohen, D. R. Biopsychosocial profile of women with dyspareunia. *Obstet. Gynaecol.* **90**, 583–589 (1997).
23. Glajchen, M. Chronic pain: treatment barriers and strategies for clinical practice. *J. Am. Board Fam. Pract.* **14**, 211 (2001).
24. Green, C. R. *et al.* How well is chronic pain managed? Who does it well? *Pain Med.* **3**, 56 (2002).
25. Harlow, B. L. *et al.* Prevalence of symptoms consistent with a diagnosis of vulvodynia: population-based estimates from 2 geographic regions. *Am. J. Obstet. Gynecol.* **210**, 40.e1–40.e8 (2014).
26. Buchan, A. *et al.* A qualitative study of women with vulvodynia: I. The journey into treatment. *J. Reprod. Med.* **52**, 15 (2007).
27. Nguyen, R., Turner, R., Rydell, S., MacLehose, R. & Harlow, B. L. Perceived stereotyping and seeking care for chronic vulvar pain. *Pain Med.* **14**, 1461–1467 (2013).
28. Hansen, A., Carr, K. & Jensen, J. T. Characteristics and initial diagnoses in women presenting to a referral center for vulvovaginal disorders in 1996–2000. *J. Reprod. Med.* **47**, 854–860 (2002).
29. Stewart, E. G. Developments in vulvovaginal care. *Curr. Opin. Obstet. Gynecol.* **14**, 483–488 (2002).
30. Gruenewald, I., Lowenstein, L., Gartman, I. & Vardi, Y. Physiological changes in female genital sensation during sexual stimulation. *J. Sex. Med.* **4**, 390–394 (2007).
31. Lowenstein, L., Vardi, Y., Deutsch, M. & Yarnitsky, D. Vulvar vestibulitis severity: assessment by sensory and pain testing modalities. *Pain* **107**, 47–53 (2004).
32. Melles, R., Dewitte, M., ter Kuile, M., Bonnemayer, C. & Peters, M. The Vaginal Pressure Inducer: a new device to test the (un)pleasurableness and tolerance of vaginal pressure and the influence of sexual stimuli. *J. Sex Marital Ther.* <http://dx.doi.org/10.1080/0092623X.2017.1342728> (2017). [Au:OK?]
33. Paterson, L. Q., Amsel, R. & Binik, Y. M. Pleasure and pain: the effect of (almost) having an orgasm on genital and nongenital sensitivity. *J. Sex. Med.* **10**, 1531–1544 (2013).
34. Pukall, C. F., Binik, Y. M., Khalife, S., Amsel, R. & Abbott, F. V. Vestibular tactile and pain thresholds in women with vulvar vestibulitis syndrome. *Pain* **96**, 163–175 (2002).
35. Yarnitsky, D. & Granot, M. in *Handbook of Clinical Neurology* (eds Kovacs, G. G. & Alafuzoff, I.) Vol. 145 Ch. 27 (Elsevier, 2006).
36. Janssen, E., Everaerd, W., Spiering, M. & Janssen, J. Automatic processes and the appraisal of sexual stimuli: toward an information processing model of sexual arousal. *J. Sex. Res.* **37**, 8–23 (2000).
37. Bush, S. I. Implicit and explicit memory of neutral, negative emotional, and sexual information. *Arch. Sex. Behav.* **30**, 615–631 (2001).
38. Everaerd, W., Janssen, E. & Spiering, M. Priming the sexual system: implicit versus explicit activation. *J. Sex. Res.* **30**, 134–145 (2003).
39. Chivers, M. L., Seto, M. C., Lalumière, L. M., Laan, E. & Grimbos, T. Agreement of self-reported and genital measures of sexual arousal in men and women: a meta-analysis. *Arch. Sex. Behav.* **39**, 5–56 (2010).
40. Brauer, M., ter Kuile, M. M. & Laan, E. Effects of appraisal of sexual stimulation on sexual arousal in women with and without superficial dyspareunia. *Arch. Sex. Behav.* **38**, 476–485 (2009).
41. Melles, R. J. *et al.* Automatic and deliberate affective associations with sexual stimuli in women with lifelong vaginismus before and after therapist-aided exposure treatment. *J. Sex Med.* **11**, 786–799 (2014).
42. Schroder, K. E., Carey, M. P. & Venable, P. Methodological challenges in research on sexual risk behavior: II. Accuracy of self-report. *Ann. Behav. Med.* **26**, 104–123 (2003).
43. Borg, C., de Jong, P. J. & Schultz, W. W. Vaginismus and dyspareunia: automatic versus deliberate disgust responsivity. *J. Sex. Med.* **7**, 2149–2157 (2010).
44. Dewitte, M. Gender differences in implicit processing of sexual stimuli. *Eur. J. Personal.* **30**, 107–124 (2016).
45. Huijding, J., Borg, C., Weijmar-Schultz, W. & de Jong, P. J. Automatic affective appraisal of sexual penetration stimuli in women with vaginismus or dyspareunia. *J. Sex. Med.* **8**, 806–813 (2011).
46. Dewitte, M. On the interpersonal dynamics in sexuality. *J. Sex Marital Ther.* **40**, 209–232 (2014).
47. Farmer, M. A. & Meston, C. M. Predictors of genital pain in young women. *Arch. Sex. Behav.* **36**, 831–843 (2007).
48. Legrain, V., Iannetti, G. D., Plaghki, L. & Mouraux, A. The pain matrix reloaded: a salience detection system for the body. *Prog. Neurobiol.* **93**, 111–124 (2011).
49. Bolger, N., Davis, A. & Rafaeli, E. Diary methods: capturing life as it is lived. *Annu. Rev. Psychol.* **54**, 579–516 (2003).
50. Laurenceau, J. P. & Bolger, N. Using diary methods to study marital and family processes. *J. Fam. Psychol.* **19**, 86–97 (2005).
51. Cruz-Almeida, M. S. P. H. & Fillingim, R. B. Can quantitative sensory testing move us closer to mechanism-based pain management? *Pain Med.* **5**, 61–72 (2014).
52. Lowenstein, L. *et al.* Vulvar vestibulitis severity — assessment by sensory and pain testing modalities. *Pain* **107**, 47–53 (2004).
53. Farmer, M. A. *et al.* Psychophysical properties of female genital sensation. *Pain* **154**, 2277–2286 (2013).
54. Yarnitsky, D., Arendt-Nielsen, L., Bouhassira, D. & Wilder-Smith, O. Recommendations on terminology and practice of psychophysical DNIC testing. *Eur. J. Pain* **14**, 339 (2010).
55. Johannesson, U., de Bousard, C. N., Jansen, G. B. & Bohm-Starke, N. Evidence of diffuse noxious inhibitory controls (DNIC) elicited by cold noxious stimulation in patients with provoked vestibulodynia. *Pain* **130**, 31–39 (2007).
56. Sutton, K. S., Pukall, C. F. & Chamberlain, S. Diffuse noxious inhibitory control function in women with provoked vestibulodynia. *Clin. J. Pain* **28**, 667–674 (2012).
57. Meana, M. & Binik, Y. M. Painful coitus: A review of female dyspareunia. *J. Nerv. Ment. Dis.* **182**, 264–272 (1994).
58. Goldstein, A. T. *et al.* Vulvodynia: assessment and treatment. *J. Sex. Med.* **13**, 572–590 (2016).
59. Akopians, A. L. & Rapkin, A. J. Vulvodynia: the role of inflammation in the etiology of localized provoked pain of the vulvar vestibule (vestibulodynia). *Semin. Reprod. Med.* **33**, 239–245 (2015).
60. Nguyen, R. H., Swanson, D. & Harlow, B. L. Urogenital infections in relation to the occurrence of vulvodynia. *J. Reprod. Med.* **54**, 385–392 (2009).
61. Ramirez De Kott, H. M. *et al.* Cutaneous hypersensitivity to *Candida albicans* in idiopathic vulvodynia. *Contact Derm.* **53**, 214 (2005).
62. Thomson, J. C. Chronic inflammation of the peritoneum and vagina: review of its significance, immunologic pathogenesis, investigation and rationale for treatment. *J. Reprod. Med.* **50**, 507–5012 (2005).
63. Wesselmann, U., Bonham, A. & Foster, D. Vulvodynia: current state of the biological science. *Pain* **155**, 1696–1701 (2014).
64. Woolf, C. J. Central sensitization: implications for the diagnosis and treatment of pain. *Pain* **152**, S2–S15 (2011).
65. Reed, B. D. *et al.* Urogenital symptoms and pain history as precursors of vulvodynia: a longitudinal study. *J. Womens Health* **21**, 1139–1143 (2012).
66. Tympanidis, P., Terenghi, G. & Dowd, P. Increased innervation of the vulvar vestibule in patients with vulvodynia. *Br. J. Dermatol.* **148**, 1021–1027 (2003).
67. Westrom, L. V. & Willen, R. Vestibular nerve fiber proliferation in vulvar vestibulitis syndrome. *Obstet. Gynecol.* **91**, 572–576 (1998).
68. Goldstein, A. T. *et al.* Polymorphisms of the androgen receptor gene and hormonal contraceptive induced provoked vestibulodynia. *J. Sex. Med.* **11**, 2764 (2014).
69. Bohm-Starke, N., Johannesson, U., Hilliges, M., Rylander, E. & Törebjörk, E. Decreased mechanical pain threshold in the vestibular mucosa of women using oral contraceptives: a contributing factor in vulvar vestibulitis? *J. Reprod. Med.* **49**, 888 (2004).
70. Lev-Sagie, A. *et al.* Polymorphism in a gene coding for the inflammasome component NALP3 and recurrent vulvovaginal candidiasis in women with vulvar vestibulitis syndrome. *Am. J. Obstet. Gynecol.* **200**, 303.e1–303.e6 (2009).
71. Foster, D. C., Sazenski, T. M. & Stodgell, C. Impact of genetic variants of the interleukin receptor antagonist and melanocortin-1 receptor genes on vulvar vestibulitis syndrome (vestibulodynia). *J. Reprod. Med.* **49**, 503–509 (2004).
72. Pukall, C. F. *et al.* Neural correlates of painful genital touch in women with vulvar vestibulitis syndrome. *Pain* **115**, 118–127 (2005).
73. Baker, P. K. Musculoskeletal origins of chronic pelvic pain: diagnosis and treatment. *Obstet. Gynecol. Clin. North Am.* **20**, 719 (1993).
74. Gentilcore-Saulnier, E., McLean, L., Goldfinger, C., Pukall, C. F. & Chamberlain, S. Pelvic floor muscle assessment outcomes in women with and without provoked vestibulodynia and the impact of a physical therapy program. *J. Sex. Med.* **7**, 1003–1022 (2010).
75. Gyang, A., Hartman, M. & Lamvu, G. Musculoskeletal causes of chronic pelvic pain: what a gynecologist should know. *Obstet. Gynecol.* **121**, 645–650 (2013).
76. Reissing, E. D., Brown, C., Lord, M. J., Binik, Y. M. & Khalife, S. Pelvic floor muscle functioning in women with vulvar vestibulitis syndrome. *J. Psychosom. Obstet. Gynaecol.* **26**, 107–113 (2005).
77. Thibault-Gagnon, S. & Morin, M. Active and passive components of pelvic floor muscle tone in women with provoked vestibulodynia: a perspective based on a review of the literature. *J. Sex. Med.* **12**, 2178–2189 (2015).
78. Basson, R. The recurrent pain and sexual sequelae of provoked vestibulodynia: a perpetuating cycle. *J. Sex. Med.* **8**, 2077–2092 (2012).
79. Van der Velde, J., Laan, E. & Everaerd, W. Vaginismus, a component of a general defensive reaction. An investigation of pelvic floor muscle activity during exposure to emotion-inducing film excerpts in women with and without vaginismus. *Int. Urogynaecol. J. Pelv. Floor Dysfunct.* **12**, 328–331 (2001).
80. Melzack, R. & Wall, P. D. Pain mechanisms: a new theory. *Science* **191**, 971–979 (1965).
81. Spano, L. & Lamont, J. A. Dyspareunia: a symptom of female sexual dysfunction. *Can. Nurse* **8**, 22–25 (1975).
82. Brauer, M., Laan, E. & ter Kuile, M. M. Sexual arousal in women with superficial dyspareunia. *Arch. Sex. Behav.* **35**, 191–200 (2006).
83. ter Kuile, M. M., Both, S. & van Lankveld, J. J. Cognitive behavioral therapy for sexual dysfunctions in women. *Psychiatr. Clin. North Am.* **33**, 595–610 (2010).
84. Wouda, J. C. *et al.* Vaginal plethysmography in women with dyspareunia. *J. Sex. Res.* **35**, 141–147 (1998).
85. Barlow, D. H. The causes of sexual dysfunction: the role of anxiety and cognitive interference. *J. Cons. Clin. Psychol.* **54**, 140–148 (1986).
86. Lykins, A. D., Meana, M. & Minimi, J. Visual attention to erotic images in women reporting pain with intercourse. *J. Sex. Res.* **48**, 43–52 (2011).
87. Sutherland, O. Qualitative analysis of heterosexual women's experience of sexual pain and discomfort. *J. Sex Marital Ther.* **38**, 223–244 (2012).
88. Desrochers, G., Bergeron, S., Landry, T. & Jodoin, M. Do psychosexual factors play a role in the etiology of provoked vestibulodynia? A critical review. *J. Sex Marital Ther.* **34**, 1998–1226 (2008).
89. Khandker, M., Brady, S. S., Stewart, E. G. & Harlow, B. L. Is chronic stress during childhood associated with adult-onset vulvodynia? *J. Womens Health* **23**, 649–656 (2014).

90. Bergeron, S., Likes, W. M. & Steben, M. Psychosexual aspects of vulvovaginal pain. *Best Pract. Res. Clin. Obstet. Gynaecol.* **28**, 991–999 (2014).
91. Borg, C., Peters, M. L., Schultz, W. W. & de Jong, P. J. Vaginismus: heightened harm avoidance and pain catastrophizing cognitions. *J. Sex. Med.* **9**, 558–567 (2012).
92. Brotto, L. A., Basson, R. & Gehring, D. Psychological profiles among women with vulvar vestibulitis syndrome: a chart review. *J. Psychosom. Obstet. Gynaecol.* **24**, 195–203 (2003).
93. Desrochers, G., Bergeron, S., Khalife, S., Dupuis, M. J. & Jodoin, M. Fear-avoidance and self-efficacy in relation to pain and sexual impairment in women with provoked vestibulodynia. *Clin. J. Pain* **25**, 520–527 (2009).
94. Lundqvist, E. N. & Bergdahl, J. Vestibulodynia (former vulvar vestibulitis): Personality in affected women. *J. Psychosom. Obstet. Gynaecol.* **26**, 251–256 (2005).
95. de Jong, P. J., van Overveld, M., Weijmar Schultz, W., Peters, M. L. & Buwalda, F. M. Disgust and contamination sensitivity in vaginismus and dyspareunia. *Arch. Sex. Behav.* **34**, 244–252 (2009).
96. Davis, S. N. P. *et al.* A prospective 2-year examination of cognitive and behavioral correlates of provoked vestibulodynia outcomes. *Clin. J. Pain* **31**, 333–341 (2015).
97. Ayling, K. & Ussher, J. M. “If sex hurts, am I still a woman?” The subjective experience of vulvodynia in heterosexual women. *Arch. Sex. Behav.* **37**, 294–304 (2008).
98. Pazmany, E. *et al.* Aspects of sexual self-schema in premenopausal women with dyspareunia: associations with pain, sexual function, and sexual distress. *J. Sex. Med.* **10**, 2255–2264 (2013).
99. Pazmany, E., Bergeron, S., Van Oudenhove, L., Verhaeghe, J. & Enzlin, P. Body image and genital self-image in pre-menopausal women with dyspareunia. *Arch. Sex. Behav.* **42**, 999–1010 (2013).
100. Dewitte, De Schryver, M., Heider, N. & De Houwer, J. The actual and ideal sexual self-concept in the context of genital pain using implicit and explicit measures. *J. Sex. Med.* **14**, 702–714 (2017).
101. Elmerstig, E., R. N., R. M., Wijma, B. & Bertero, R. N. T. Why do young women continue to have sexual intercourse despite pain? *J. Adolesc. Health* **43**, 357–363 (2008).
102. Boyer, S. C. & Pukall, C. F. Pelvic examination experiences in women with and without chronic pain during intercourse. *J. Sex. Med.* **11**, 3035–3050 (2014).
103. Pazmany, E., Bergeron, S., Verhaeghe, J., Van Oudenhove, L. & Enzlin, P. Dyadic sexual communication in pre-menopausal women with self-reported dyspareunia and their partners: Associations with sexual function, sexual distress and dyadic adjustment. *J. Sex. Med.* **12**, 516–528 (2015).
104. Rancourt, K. M., N. O., Rosen, Bergeron, S. & Logan, J. Talking about sex when sex is painful: dyadic sexual communication is associated with women's pain, and couples' sexual and psychological outcomes in provoked vestibulodynia. *Arch. Sex. Behav.* **45**, 1933–1944 (2016).
105. Gordon, A. S. *et al.* Characteristics of women with vulvar pain disorders: responses to a webbased survey. *J. Sex. Marital Ther.* **29**, 45–58 (2003).
106. Sheppard, C., Hallam-Jones, R. & Wylie, K. Why have you both come? Emotional, relationship, sexual and social issues raised by heterosexual couples seeking sexual therapy (in women referred to a sexual difficulties clinic with a history of vulval pain). *Sex. Rel. Ther.* **23**, 217–226 (2008).
107. Dove, N. & Wiederman, M. Cognitive distraction and women's sexual functioning. *J. Sex Marital Ther.* **26**, 67–78 (2000).
108. Nunn, D. & Mandal, D. Psychological and psychosexual aspects of vulvar vestibulitis. *Genitourinary Med.* **73**, 541–544 (1997).
109. Van Lankveld, J. J. D. M., Weijenborg, P. T. M. & ter Kuile, M. M. Psychologic profiles of and sexual function in women with vulvar vestibulitis and their partners. *Obstet. Gynecol.* **88**, 65–70 (1996).
110. Rosen, N. O., Bergeron, S., Leclerc, B., Lambert, B. & Steben, M. Woman and partner-perceived partner responses predict pain and sexual satisfaction in provoked vestibulodynia (PVD) couples. *J. Sex. Med.* **7**, 3715–3724 (2010).
111. Gates, E. A. & Galask, R. P. Psychological and sexual functioning in women with vulvar vestibulitis. *J. Psychosom. Obstet. Gynaecol.* **22**, 221–228 (2001).
112. Lundqvist, E. N. & Bergdahl, J. Vulvar vestibulitis: evidence of depression and state anxiety in patients and partners. *Acta Derm. Venereol.* **83**, 369–373 (2003).
113. Khandker, M. *et al.* The influence of depression and anxiety on risk of adult onset vulvodynia. *J. Womens Health* **20**, 1445 (2011).
114. Lethem, J., Slade, P. D., Troup, J. D. & Bentley, G. Outline of a fear-avoidance model of exaggerated pain perception. *Behav. Res. Ther.* **21**, 401–408 (1983).
115. Vlaeyen, J. W. S. & Linton, S. J. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain* **85**, 317–332 (2000).
116. Payne, K. A., Binik, Y. M., Amsel, R. & Khalife, S. When sex hurts, anxiety and fear orient attention towards pain. *Eur. J. Pain* **9**, 427–436 (2005).
117. Jodoin, M. *et al.* Male partners of women with provoked vestibulodynia: attributions for pain and their implications for dyadic adjustment, sexual satisfaction and psychological distress. *J. Sex. Med.* **5**, 2862–2870 (2008).
118. Meana, M., Binik, Y. M., Khalife, S. & Cohen, D. Psychosocial correlates of pain attributions in women with dyspareunia. *Psychosomatics* **40**, 497–502 (1999).
119. Arnold, L. D., Bachmann, G. A., Rosen, R., Kelly, S. & Rhoads, G. G. Vulvodynia: characteristics and associations with comorbidities and quality of life. *Obstet. Gynecol.* **107**, 617–624 (2006).
120. Marriott, C. & Thompson, A. R. Managing threats to femininity: personal and interpersonal experience of living with vulval pain. *Psychol. Health* **23**, 243–258 (2008).
121. Rosen, N. O., Muise, A., Bergeron, Impett, E. A. & Boudreau, G. K. Approach and avoidance sexual goals in couples with provoked vestibulodynia: associations with sexual, relational, and psychological well-being. *J. Sex. Med.* **12**, 1781–1790 (2015).
122. Crombez, G., Eccleston, C., Van Damme, S., Vlaeyen, J. W. S. & Karoly, P. Fear-avoidance model of chronic pain: the next generation. *Clin. J. Pain* **28**, 475–483 (2012).
123. Lowenstein, L. *et al.* The impact of dispositional optimism on symptoms and treatment choices in patients with pelvic floor disorders. *Int. Urogynecol. J.* **23**, 295–298 (2012).
124. Rosen, N. O., Bergeron, S., Glowacka, M., Delisle, B., Baxter, M. L. Harmful or helpful: perceived solicitous and facilitative partner responses are differentially associated with pain and sexual satisfaction in women with provoked vestibulodynia. *J. Sex. Med.* **9**, 2351–2360 (2012).
125. Hadjistavropoulos, T. *et al.* A biopsychosocial formulation of pain communication. *Psychol. Bull.* **137**, 910–939 (2011).
126. Davis, S. N., Bergeron, S., Sadikaj, G., Corsini-Munt, S. & Steben, M. Partner behavioral responses to pain mediate the relationship between partner pain cognitions and pain outcomes in women with provoked vestibulodynia. *J. Pain* **16**, 549–557 (2015).
127. Prkachin, K. M., Solomon, P. E. & Ross, J. Underestimation of pain by health-care providers: towards a model of the process of inferring pain in others. *Clin. J. Nurs. Res.* **39**, 88–109 (2007).
128. Rosen, N. O., Bergeron, S., Sadikaj, G. & Delisle, I. Daily associations among male partner responses, pain during intercourse, and anxiety in women with vulvodynia and their partners. *J. Pain* **16**, 1312–1320 (2015).
129. Nylanderlundqvist, E. & Bergdahl, J. Vulvar vestibulitis: evidence of depression and state anxiety in patients and partners. *Acta Derm. Venereol.* **83**, 369–373 (2003).
130. Smith, K. B. & Pukall, C. F. Sexual function, relationship adjustment, and the relational impact of pain in male partners of women with provoked vulvar pain. *J. Sex. Med.* **11**, 283–293 (2014).
131. Cano, A., de C. Williams, A. C. Social interaction in pain: reinforcing pain behaviors or building intimacy? *Pain* **149**, 9–11 (2010).
132. Sbarra, D. A. & Hazan, C. Coregulation, dysregulation, self-regulation: an integrative analysis and empirical agenda for understanding adult attachment, separation, loss, and recovery. *Pers. Soc. Psychol. Rev.* **12**, 141–167 (2008).
133. Smith, K. B. & Pukall, C. A. Systematic review of relationship adjustment and sexual satisfaction among women with provoked vestibulodynia. *J. Sex. Res.* **48**, 166–191 (2011).
134. Leclerc, B. *et al.* Attachment, sexual assertiveness, and sexual outcomes in women with provoked vestibulodynia and their partners: a mediation model. *Arch. Sex. Behav.* **44**, 1561–1572 (2015).
135. Pazmany, E., Bergeron, S., Verhaeghe, J., Van Oudenhove, L. & Enzlin, P. Sexual communication, dyadic adjustment, and psychosexual well-being in premenopausal women with self-reported dyspareunia and their partners: a controlled study. *J. Sex. Med.* **11**, 1786–1797 (2014).
136. Dewitte, M. Different perspectives on the sex-attachment link: towards an emotion-motivational account. *J. Sex. Res.* **49**, 105–124 (2012).
137. MacNeil, S. & Byers, E. S. Dyadic assessment of sexual self-disclosure and sexual satisfaction in heterosexual dating couples. *J. Pers. Soc. Rel.* **22**, 169–181 (2005).
138. Awada, N. *et al.* To say or not to say: dyadic ambivalence over emotional expression and its associations with pain, sexuality, and distress in couples coping with provoked vestibulodynia. *J. Sex. Med.* **11**, 127 (2014).
139. Bois, K. *et al.* Empathic response and disclosure in women with vulvodynia and their spouses in relation to his and her sexual satisfaction and distress: an observational study. *Health Psychol.* **35**, 531–540 (2016).
140. Bois, K., Bergeron, S., Rosen, N. O., McDuff, P. & Gregoire, C. Sexual and relationship intimacy among women with provoked vestibulodynia and their partners: associations with sexual satisfaction, sexual function, and pain self-efficacy. *J. Sex. Med.* **10**, 2024–2035 (2013).
141. Basson, R. The female sexual response: a different model. *J. Sex. Marital Ther.* **26**, 51–65 (2000).
142. Bergeron, S., Khalife, S., Glazer, H. I. & Binik, Y. M. Surgical and behavioral treatments for vestibulodynia: two-and-one-half year follow-up and predictors of outcome. *Obstet. Gynecol.* **111**, 159–166 (2008).
143. Landry, T., Bergeron, S., Dupuis, M. J. & Desrochers, G. The treatment of provoked vestibulodynia: a critical review. *Clin. J. Pain* **24**, 155–171 (2008).
144. Andrews, J. C. Vulvodynia interventions — systematic review and evidence grading. *Obstet. Gynecol. Surv.* **66**, 299–315 (2011).
145. Glazer, H. I., Marinoff, S. C. & Sleight, I. J. Web-enabled Glazer surface electromyographic protocol for the remote, real-time assessment and rehabilitation of pelvic floor dysfunction in vulvar vestibulitis syndrome. A case report. *J. Reprod. Med.* **47**, 728–730 (2002).
146. Travell, J. & Simons, D. *Travell & Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual: Volume 1: Upper Half of Body* (Lippincott Williams and Wilkins, 1998). [Au:OK?]
147. Danielsson, I., Torstensson, T., Brodda-Jansen, G. & Bohm-Starke, N. EMG biofeedback versus topical lidocaine gel: a randomized study for the treatment of women with vulvar vestibulitis. *Acta Obstet. Gynecol. Scand.* **85**, 1360–1367 (2006).
148. Bergeron, S., Morin, M. & Lord, M.-J. Integrating pelvic floor rehabilitation and cognitive-behavioral therapy for sexual pain: what have we learned and where do we go from here? *Sex. Relat. Ther.* **25**, 304–313 (2010).
149. FitzGerald, M. P. & Kotarinos, R. Rehabilitation of the short pelvic floor. II: treatment of the patient with the short pelvic floor. *Int. Urogynecol. J. Pelv. Floor Dysfunct.* **14**, 269–275 (2003).
150. ter Kuile, M. M. *et al.* Therapist-aided exposure for women with lifelong vaginismus: a replicated single-case design. *J. Consult. Clin. Psychol.* **77**, 149–159 (2009).
151. Brotto, L. Mindfulness applications to women's sexual dysfunction: Applications for low desire, sexual distress, and provoked vestibulodynia. *J. Sex. Med.* **8**, 94 (2011).
152. Brotto, L. A., Yong, P., Smith, K. B. & Sadownik, L. A. Impact of a multidisciplinary vulvodynia program on sexual functioning and dyspareunia. *J. Sex. Med.* **12**, 238–247 (2015).
153. Kabat-Zinn, J. *Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain and Illness* (Random House, 1990).

154. Brotto, L. A. & Basson, R. Group mindfulness-based therapy significantly improves sexual desire in women. *Behav. Res. Ther.* **57**, 43–54 (2014).
155. Brotto, L. A. *et al.* Mindfulness-based group therapy for women with provoked vestibulodynia. *Mindfulness* **6**, 417–432 (2015).
156. Hayes, S. C., Strosahl, K. & Wilson, K. G. *Acceptance and Commitment Therapy* (Guilford Press, 1999).
157. Veehof, M. M., Oskam, M. J., Schreurs, K. M. G. & Bohlmeijer, E. T. Acceptance-based interventions for the treatment of chronic pain: A systematic review and meta-analysis. *Pain* **55**, 533–542 (2011).
158. Boerner, K. E. & Rosen, N. O. Acceptance of vulvovaginal pain in women with provoked vestibulodynia and their partners: associations with pain, psychological, and sexual adjustment. *J. Sex. Med.* **12**, 1450–1462 (2015).
159. Bergeron, S., Khalife, S., Dupuis, M. J. & McDuff, P. A randomized clinical trial comparing group cognitive-behavioral therapy and a topical steroid for women with dyspareunia. *J. Consult. Clin. Psychol.* **84**, 259–268 (2016).
160. Masheb, R. M. *et al.* A randomized clinical trial for women with vulvodynia: cognitive-behavioral therapy versus supportive psychotherapy. *Pain* **14**, 131–140 (2009).
161. Corsini-Munt, S. *et al.* Feasibility and preliminary effectiveness of a novel cognitive behavioral couple therapy for provoked vestibulodynia: a pilot study. *J. Sex. Med.* **11**, 2515–2527 (2014).
162. Backman, H. *et al.* Combined physical and psychosexual therapy for provoked vestibulodynia: An evaluation of a multidisciplinary treatment model. *J. Sex. Res.* **45**, 378 (2008).
163. Sadownik, L. A., Seal, B. N. & Brotto, L. A. Provoked vestibulodynia: women's experience of participating in a multidisciplinary vulvodynia program. *J. Sex. Med.* **9**, 1086–1093 (2012).
164. Munday, P. *et al.* A qualitative study of women with vulvodynia II. Response to a multidisciplinary approach to management. *J. Reprod.* **52**, 19–22 (2007).
165. Brubaker, L. & Shull, B. EGGS for patient-centered outcomes. *Int. Urogynecol. J. Pelv. Floor Dysfunct* **16**, 171–173 (2015).

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Fig. 2: Figure adapted from Vlaeyen, J. W. S. & Linton, S. J. Fear avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain* 8(3), 317–332 (2000).

ToC blurb

000 A psychosocial approach to female genital pain

Marieke Dewitte, Charmaine Borg, and Lior Lowenstein

Despite its prevalence, sexual pain in women is poorly understood as it exists at the intersection of different biopsychosocial disciplines. In this Review, experts in the field describe how confusion remains at the nosological, aetiological, theoretical, methodological, and treatment levels and how a psychosocial approach can help to overcome this lack of consensus to improve theoretical models and effective treatments.