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Dyspareunia in women : a painful affair : the role of fear of pain and sexual arousal

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DYSPAREUNIA IN WOMEN
A PAINFUL AFFAIR
THE ROLE OF FEAR OF PAIN AND SEXUAL AROUSAL

MARIEKE BRAUER

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DYSPAREUNIA IN WOMEN
A P A I N F U L A F F A I R
THE ROLE OF FEAR OF PAIN AND SEXUAL AROUSAL

P R O E F S C H R I F T

ter verkrijging van
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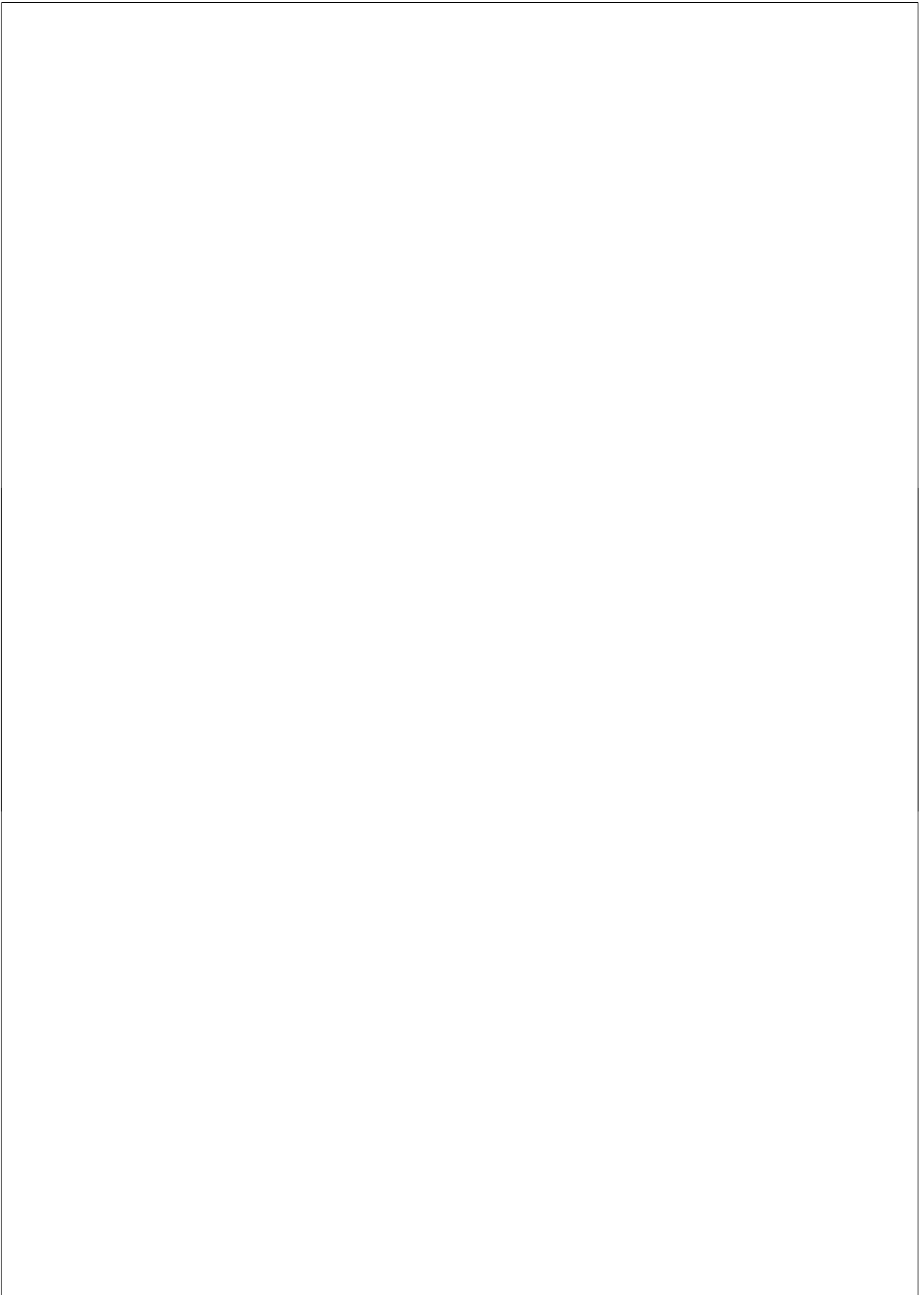
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Overig lid:	Prof. dr. J.G. van Dijk, Universiteit Leiden

voor mijn moeder



C O N T E N T S

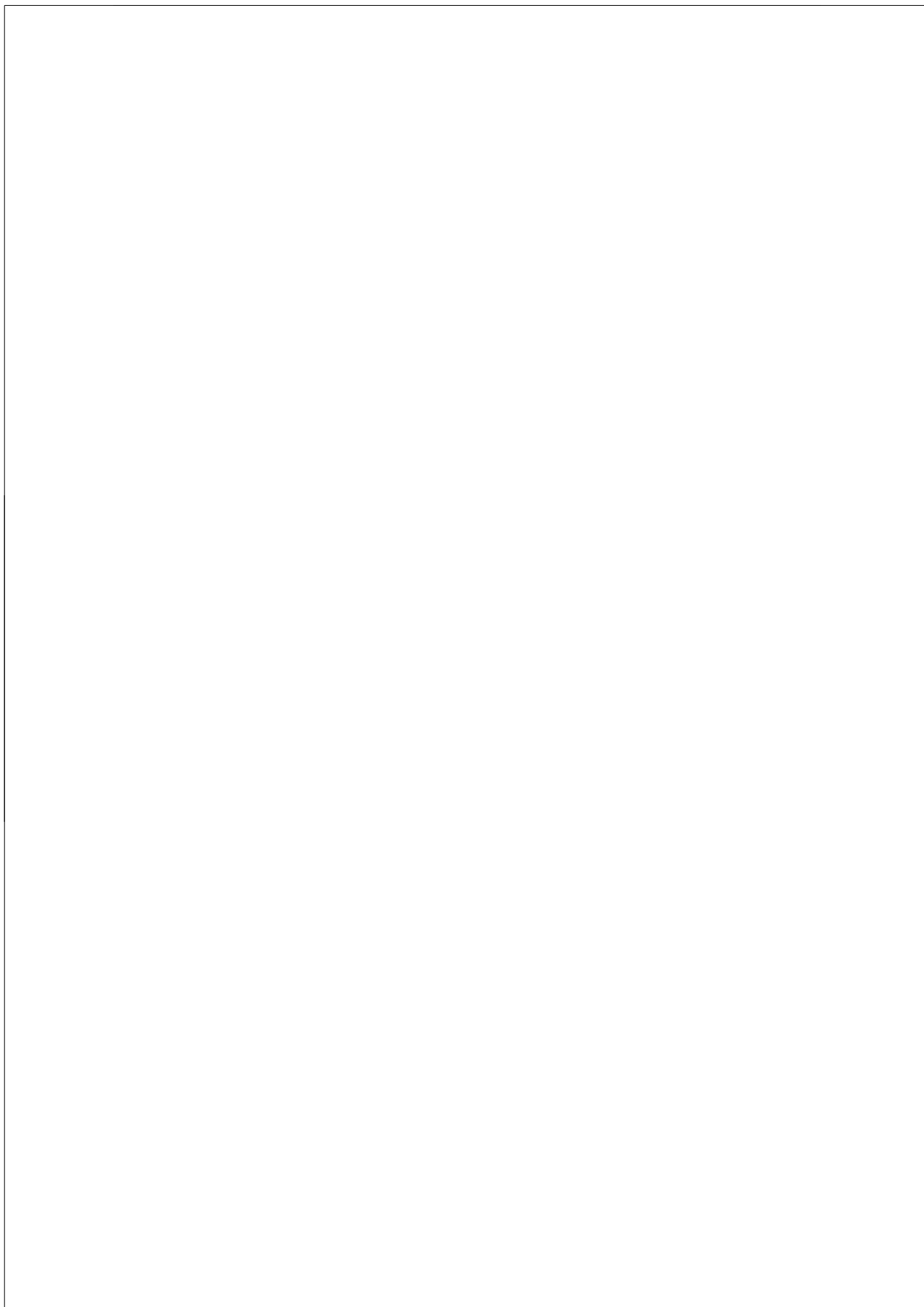
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C H A P T E R

General introduction

1



Maaïke, 23 years: *"Intercourse has always been painful to me. Every time we have intercourse, it hurts really bad. I mentioned it to the physician once, but he couldn't find anything wrong on the exam. He advised us to use some lubricant, but this didn't seem to help. After a while, I found myself avoiding to have sex with my boyfriend. A few weeks ago, we tried it again, but it was impossible to take him inside me. I feel like a failure. I know my boyfriend is very patient and never insists to have intercourse, but I don't want to disappoint him over and over again. Am I destined to be this way forever?"*

Sandra, 34 years: *"I used to enjoy sex, but about three years ago, intercourse really began to hurt. It burns and stings when we try to have intercourse. It also hurts when I insert tampons. Over time, I became more and more anxious that intercourse would hurt again and it usually did. Now it seems that my body just tightens up. The pleasure has gone, and instead, there is only the prospect of discomfort and frustration. Many nights I cry when we are done. What else can I do then gritting my teeth and bear the pain? I feel very inadequate and insecure. Our relationship is suffering, and I'm afraid this is going to tear us apart."*

The stories of Maaïke and Sandra are quite representative for women who suffer from painful intercourse. When intercourse hurts persistently and there is no apparent physical pathology explaining the pain, the term dyspareunia is used to describe this condition. Dyspareunia represents a common health problem in women. As illustrated above, for many affected women intercourse may become a troublesome, frustrating or even aversive activity. Apart from the distressing interference of pain with sexuality, dyspareunia may also have repercussions on the woman's individual and relational well-being. To date, little is known about the underlying mechanisms of dyspareunia and, therefore, treatment is challenging.

The purpose of the present thesis was to gain more insight into the factors involved in the onset and/or maintenance of this poorly understood condition. This may not only be of theoretical interest, but may also provide new clues for improving available treatment modalities.

Below, a brief overview on dyspareunia will be presented, followed by an introduction of the prevailing cognitive-behavioral model on dyspareunia. It will be presented in the light of current general models on sexual (dys)function. Finally, an outline of the present thesis is provided.

CLINICAL DESCRIPTION AND DIAGNOSIS

Dyspareunia means, literally translated from ancient Greek, bed partners not fitting together. Nowadays, dyspareunia is defined as recurrent or persistent acute pain associated with penile-vaginal intercourse (Basson et al., 2003). In the Diagnostic and Statistical Manual of Mental Disorders, fourth edition text revision (DSM-IV-TR), dyspareunia is classified as a sexual dysfunction (American Psychiatric Association, 2000). There is currently considerable controversy about whether dyspareunia should be reconceptualised as a pain disorder rather than a sexual dysfunction (e.g., Binik, 2005). Dyspareunia can afflict men and women, but is less common in men. This thesis will deal with dyspareunia in women.

Dyspareunia is a diagnosis of exclusion arrived at only when physical illness or abnormalities that cause pain on (attempted) vaginal penetration, such as vaginal infections, cystitis, atrophía, adhesions, dermatologic diseases, scar tissue, and allergic reactions to hygiene products have not been found (see for an overview, Weijmar Schultz, Basson, Binik, Eschenbach, Wessellmann, & van Lankveld, 2005).

Two types of dyspareunia are distinguished: pain felt deep inside the pelvis during penile thrusting (deep dyspareunia), and pain experienced at the vaginal introitus (i.e., superficial dyspareunia). As the vast majority of symptomatic women reports superficial dyspareunia, this form was chosen as the dyspareunia subtype to be investigated in this thesis.

Vulvar vestibulitis syndrome (VVS) is believed to be the most common form of superficial dyspareunia in premenopausal women (Meana, Binik, Khalifé, & Cohen, 1997; Harlow, Wise, & Stewart, 2001). Women with VVS experience a sharp/burning pain at the entrance of the vagina in response to contact or pressure to the vulvar vestibule. This pain can be provoked by sexual and nonsexual activities (e.g., tampon insertion, sitting, cycling or tight clothing). Its etiology is unknown and there are no generally accepted associated physical findings (Lotery, McClure,

Galask, 2004).

The diagnosis of VVS has been established according to the following criteria: 1) severe pain on vestibular touch or attempted vaginal entry; 2) tenderness in response to pressure on the vulvar vestibule, and 3) physical findings limited to vulvar erythema (i.e., redness of the skin) (Friedrich, 1987). However, as vulvar erythema is a normal finding in women with and without vulvar pain conditions (Bergeron, Binik, Khalifé, Pagidas, & Glazer, 2001a), the International Society for the Study of Vulvovaginal Diseases (ISSVD) has recently proposed to remove this criterion (Edwards, 2004; Haefner, 2007). Furthermore, the ISSVD has suggested to delete "vestibulitis" because the presence of inflammation, as implied by this term, has been debated (Lotery et al., 2004), and, instead, to rename VVS as "provoked vestibulodynia." During the period in which the present research project was conducted, the term VVS and Friedrich's diagnostic criteria were universally accepted, and therefore, they have been used consistently throughout this thesis. It should be noted that there is still considerable confusion in the literature regarding the nomenclature and classification of dyspareunia. As a consequence, studies differ in their selection criteria for symptomatic women to be included, whereas other studies do not fully specify these criteria. For this reason, it is to date impossible to meaningfully distinguish between subtypes when describing the state of the art regarding prevalence, treatment and etiology of dyspareunia.

PREVALENCE AND INCIDENCE

Estimates of the prevalence vary considerably, depending on the differences in the definitions of dyspareunia that are used, subtypes of dyspareunia included in the study, the survey methods, and the population that was studied (e.g., with or without VVS). International studies have reported prevalence rates between 3 and 18% in the general population (e.g., Simons & Carey, 2001; Harlow et al., 2001), and between 15 and 20% in gynaecological practice (Goetsch, 1991). Twenty-six percent of female patients at sexology outpatient clinics in the Netherlands receive treatment for dyspareunia, which makes it the most prevalent problem at Dutch sexology outpatient clinics (Kedde, 2007).

While women of all ages report dyspareunia, it has a peak incidence in nulliparous

women in their twenties and thirties (Simons & Carey, 2001). In the present thesis exclusively premenopausal women were investigated.

TREATMENT

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A variety of medical and non-medical treatment modalities are applied in attempts to relieve the genital pain (see for an overview, Farage & Galask, 2005; Meana & Binik, 1994; Bergeron, Binik, Khalifé, & Pagidas, 1997; Weijmar Schultz et al., 2005). Medical interventions include local use of topical anaesthetics or corticosteroid ointments, and surgery in the case of VVS (e.g., laser therapy or vestibulectomy [removal of painful vestibular tissue]). Non-medical treatments include physical therapy (e.g., electromyographic biofeedback) and cognitive-behavioral therapy (CBT). Physical therapy aims mainly at control over and relaxation of the pelvic floor. The primary foci of CBT-programs are on pain management and improvement of sexual functioning (especially enhancement of sexual arousal).

Knowledge about the effectiveness of these treatments is scarce. Most treatments claim success (Bergeron et al., 1997), although these claims are based on methodologically flawed research. Until now, there are only a handful of randomized trials (Bornstein, Livnat, Stolar, & Abramovici, 2000; Bergeron et al., 2001b; Danielsson, Torstensson, Brodda-Jansen, & Bohm-Starke, 2006; Nyirjesy, Sobel, Weitz, Leaman, Small & Gelone, 2001). Two of these studies compared the effectiveness of drug treatment (fluconazole and cromolyn cream, respectively) versus placebo and found that women who received drug treatment were not significantly more improved than women who received placebo (Bornstein et al., 2000; Nyirjesy et al., 2001). In another study, a treatment of electromyographic biofeedback was compared to topical lidocaine (Danielsson et al., 2006). No differences in outcome for both treatments were obtained, with an average of 11% of women considering themselves completely cured. In the randomised controlled study of Bergeron and colleagues (2001b) the effects of vestibulectomy, biofeedback, and CBT were compared. Success rates (in terms of partial or complete pain relief) for biofeedback, CBT, and vestibulectomy were 34.6%, 39.3% and 68.2%, respectively. Two-and-a-half year later, vestibulectomy and CBT appeared to be similarly effective in terms of self-reported pain during intercourse (Bergeron, Khalifé, Glazer, & Binik, 2008),

suggesting that women with dyspareunia/VVS can benefit from both medical and behavioural interventions. However, the above success rates also indicate that there are still many patients whose symptoms are not relieved after treatment. These moderate success rates may well be explained by the fact that the currently available treatment modalities rely on suspected, but largely unsubstantiated, etiological factors. Hence, in order to optimize health care to patients, it is of paramount importance to identify the factors involved in the onset and maintenance of dyspareunia.

ETIOLOGY

Despite the wide-ranging list of factors that has been proposed to explain the etiology of dyspareunia, the mechanisms underlying dyspareunia are still largely unknown. For a long time, research was guided by either a biomedical or psychological approach. The majority of studies has focused primarily on biomedical factors, which can be roughly divided into one of the following categories: vestibular pathology, genetic vulnerability, and central pain modulatory dysfunction (see for an overview Farage & Galask, 2005; Weijmar Schultz et al., 2005). Psychological causes that have been proposed are, for instance, negative feelings about sexuality, fear of sex, sexual traumata, relational conflicts, general psychopathology, and specific personality dimensions. Many of these biomedical and psychological factors are derived from clinical case reports, or lack a theoretical framework. Furthermore, research into the etiological candidates has been plagued by methodological flaws (e.g., lack of control groups, unvalidated instruments, lack of objective tests of physical conditions, vague inclusion criteria, or inclusion of heterogeneous samples) and was cross-sectional in nature. All these aspects may have obscured a clear understanding of the factors playing a role in the onset and maintenance of dyspareunia.

Apart from the abovementioned factors, there is almost universal consensus among theoreticians and clinicians that insufficient lubrication due to lack of sexual arousal and pelvic floor hypertonicity may be critically involved in the development of dyspareunia (e.g., Bancroft, 1989; Binik, 2005; de Jong, van Lunsen, Robertson, Stam, & Lammes, 1995; Kaplan, 1974; Meana & Binik, 1994; van Lunsen &

Ramakers, 2002; Spano & Lamont, 1975; ter Kuile & Weijnenborg, 2006; Weijmar Schultz et al., 2005). Correspondingly, physical therapy and CBT aim at reducing pelvic floor muscle tension and enhancing sexual arousal. Despite the general acceptance of these etiological candidates, there is, surprisingly, a paucity of controlled, objective assessments of (genital) sexual arousal and pelvic floor function in women with dyspareunia compared to asymptomatic women. To gain more insight into the causal and maintaining factors of dyspareunia, a good theory or model that would enable specific and testable predictions is indispensable. This brings us to the presentation of the prevailing CBT-model on dyspareunia, in which lack of sexual arousal and pelvic floor muscle tension are incorporated.

EXPLANATORY MODEL OF DYSpareunia

Already more than thirty years ago, Spano and Lamont (1975) introduced a circular model of dyspareunia in which it was assumed that pain during penetration, or memories of that pain, lead to fear of pain in new intercourse situations, which, in turn, results in decreased sexual arousal during sexual activity and therefore results in vaginal dryness and/or increased pelvic floor muscle tone (as a protective reaction to anticipated or actual pain). The combination of vaginal dryness and increased pelvic floor muscle tone, causing friction between the penis and vulvar skin, may result in pain and even tissue damage (VVS). This damage may in itself result in pain or may further increase already existing pain. According to this model, diminished sexual response and/or increased pelvic floor muscle tone can be a cause, as well as a consequence of the genital pain complaint (see Figure 1).

Spano and Lamont's model (1975) has considerably influenced the contemporary CBT-programs for dyspareunia (see e.g., ter Kuile & Weijnenborg, 2006). In conjunction with this model, CBT-programs focus on pain, fear of pain, and their hypothesized adverse impact on sexual desire, arousal and vaginal lubrication on the one hand, and pelvic floor muscle function on the other.

Empirical evidence for this model, however, is scarce. The few studies that have examined pelvic floor muscle function in women with dyspareunia/VVS point to pelvic floor pathology (Glazer, Jantos, Hartmann, & Swencionis, 1998; Reissing, Binik, Khalifé, Cohen, & Amsel, 2004; Reissing, Brown, Lord, Binik, & Khalifé, 2005;

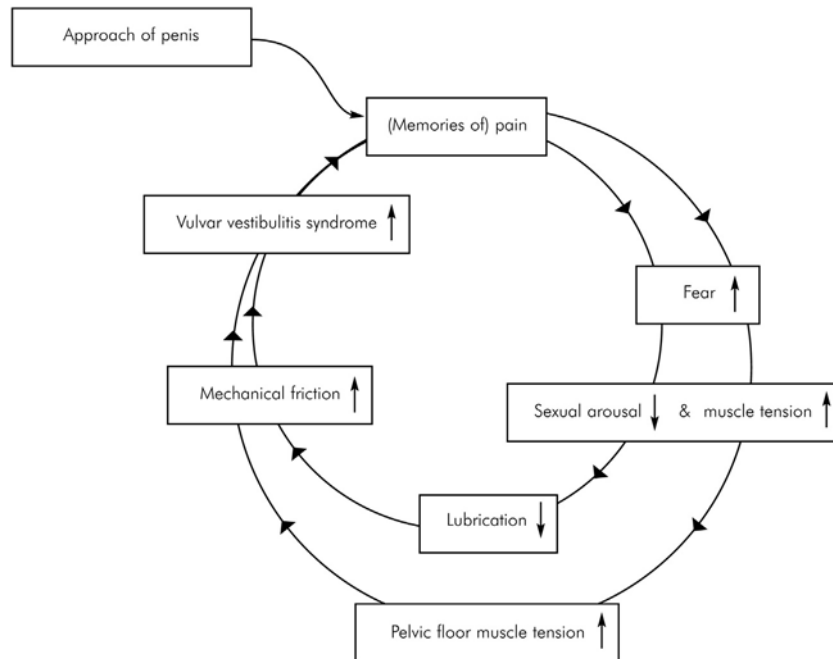


Figure 1. An adapted version of Spano & Lamonts (1975) circular model of dyspareunia (ter Kuile, Bolle, & Weijnenborg, 2004).

White, Jantos, & Glazer, 1997). Additional evidence for Spano & Lamont's hypothesis that fear leads to enhanced pelvic floor muscle activity stems from two experimental studies in which vaginal surface EMG was assessed in women with vaginismus and sexually functional women (van der Velde, & Everaerd, 2001; van der Velde, Laan, & Everaerd, 2001). These studies showed that exposure to threatening film clips (either with or without a sexual content) resulted in both groups of women in significantly increased pelvic floor muscle activity as compared to a sexual (without threat) or a neutral film clip. Thus far, it has not been investigated whether these data can be extended to women with dyspareunia.

A few observational studies investigated the relationship between dyspareunia and sexual arousal problems and showed that women with dyspareunia consistently reported lower sexual arousal (e.g., Meana and Binik, 1994; Reissing, Binik, Khalifé, Cohen, & Amsel, 2003; Wouda, Hartman, Bakker, Bakker, van de Wiel, & Weijmar

Schultz, 1998) and lubrication than controls (Nunns & Mandall, 1997; van Lankveld, Weijenborg, & ter Kuile, 1996; Masheb, Lozano-Blanco, Kohorn, Minkin, & Kerns, 2004). Moreover, an inverse relationship between genital pain and lubrication has been documented (Wiegel, Meston, & Rosen, 2005). As such, these data suggest an important role for sexual arousal problems in the etiology and/or maintenance of superficial dyspareunia. However, self-assessment of sexual arousal indices through interviews or questionnaires may be distorted by inaccurate perceptions, or, particularly in sexually dysfunctional individuals, may be overly pessimistic (e.g., Rowland, 1999). Furthermore, these studies do not allow for definitive conclusions about the causal status of these associations.

Only one study directly investigated sexual arousal in women with dyspareunia by means of an objective measure (vaginal photoplethysmography). Wouda et al. (1998) observed similar levels of genital arousal during exposure to non-coital film fragments in women with and without dyspareunia, but reduced levels of genital arousal in symptomatic women during exposure to an intercourse film fragment. The authors argued that exposure to a depiction of coitus had an inhibiting effect on genital response because intercourse had become negatively associated with pain. These findings support Spano and Lamont's hypothesis that fear of pain results in diminished genital arousal.

The specific model of dyspareunia (Spano & Lamont, 1975) bears striking resemblance with Barlow's eminent cognitive-behavioral model on sexual functioning (1986), as both models assume that fear¹ (or anxiety in terms of Barlow's model) impairs sexual arousal (Barlow, 1986; Sbrocco & Barlow, 1996). Although some other critical components of Barlow's model have received considerable empirical support, the impact of anxiety on sexual arousal in women remains unclear. Whereas some studies reported facilitative effects on genital responding (Hoon, Wincze, & Hoon, 1977; Palace & Gorzalka, 1990), but not on subjective sexual arousal (Palace & Gorzalka, 1990), other studies demonstrated a decrease in

¹The distinction between fear and anxiety is theoretically based on the focus of threat. Fear is the emotional reaction to a specific, identifiable and immediate threat, such as a dangerous animal or an injury (Rachman, 1998). Anxiety, in contrast to fear, is a future-oriented affective state and the source of threat is more elusive without a clear focus. Clinically, the distinction between fear and anxiety is less evident, and these terms are frequently used interchangeably.

genital responding and subjective sexual arousal (Beggs, Calhoun, & Wolchik, 1987; Both, Everaerd, & Laan, 2003; Laan, Everaerd, & Evers, 1995) and still other studies did not find any effect at all (Elliott & O'Donohue, 1997; Sipski, Rosen, Alexander, & Gomez-Marin, 2004).

Also, in the information processing model of sexual arousal as proposed by Janssen, Everaerd, Spiering, & Janssen (2000), fear has been hypothesized to adversely influence sexual arousal. In short, in this model it is assumed that fearful associations with sex in sexually dysfunctional individuals are already present at an automatic (unconscious) level. Hence, for these individuals the confrontation with a sexual stimulus may lead to a negative appraisal of that stimulus, which, in turn, may impede both genital and subjective sexual arousal responses. Yet, the existence of automatic fear-related associations in women with dyspareunia or other sexual dysfunctions has not been empirically tested.

In sum, there is a strong emphasis on the role of fear and diminished sexual arousal in the onset and maintenance of dyspareunia in particular (Spano & Lamont, 1975) and sexual dysfunctions in general (Barlow, 1986; Janssen et al., 2000). Offering an attractive theoretical framework, Spano & Lamont's circular model of dyspareunia (1975) functioned as the major guide for the present research project. The main research question of this thesis was: *are fear of pain and diminished sexual arousal key components in dyspareunia?* To address this question, five studies were designed. These studies and our hypotheses will be briefly presented below.

OUTLINE OF THE PRESENT THESIS

This thesis can be divided into three sections, based on the methodology used to investigate the role of fear and sexual arousal in dyspareunia. In all studies, premenopausal women with complaints of superficial dyspareunia (either with or without a concomitant diagnosis of VVS) were compared to women without sexual complaints.

Psychophysiological research

Chapter 2, 3 and 4 present experimental studies that included psychophysiological measurements of sexual arousal in response to exposure to visual sexual stimuli. To

measure genital arousal, vaginal photoplethysmography was used. The vaginal photoplethysmography, originally developed by Sintchak and Geer (1975), monitors changes in vasocongestion of the vagina, one of the earliest and most reliable correlates of genital arousal in women (Masters & Johnson, 1966). Vaginal lubrication is presumed to be the result of the passage of blood plasma in the capillaries through the vaginal epithelium, due to the increased pressure inside the capillaries during vasocongestion (Levin, 1992). This instrument has proven to provide a valid measure of genital response in women and is the most widely used physiological method for assessing female genital arousal responses. It is easy to use and has been demonstrated to be both sensitive and specific to sexual arousal (e.g., Laan, Everaerd, & Evers, 1995). Reports on genital sensations and affect in response to the sexual stimuli were obtained as indices of subjective sexual arousal, the second component of sexual arousal. Both components of sexual arousal were assessed because there is little agreement between genital arousal and reported feelings of sexual arousal in women (e.g., Chivers, Seto, Lalumière, Laan, & Grimbos, *subm.*; Laan & Everaerd, 1995; Laan & Janssen, 2007).

Chapter 2 reports on a study that was conducted analogous to the study by Wouda et al. (1998). That is, genital arousal and subjective responses to different visual sexual stimuli (noncoital and coital scenes) were compared. Exposing participants to both noncoital and coital film excerpts enabled us to explore the following questions: are women with dyspareunia characterized by a generally impaired genital responsiveness such that sexual arousal responses are lower to both kinds of sexual stimuli? Or do women with dyspareunia exhibit a conditioned fear response such that sexual arousal responses are lower only to stimuli that may induce fear of pain (i.e., coitus)? In line with Wouda et al.'s findings (1998), we hypothesized that women with dyspareunia would show equal levels of genital arousal as women without sexual complaints to the erotic stimuli depicting non-coital sex. When presented with a coitus scene, however, we expected women with dyspareunia to react with decreased genital response, whereas controls were expected to display a further increase in genital response. Women with dyspareunia were predicted to report overall less positive and more negative affect than the control women. In addition, the dyspareunia group was hypothesized to report more fear in exposure to the coitus stimulus than to the non-coital stimulus.

Chapter 3 presents a study that directly manipulated fear of pain to investigate its effects on genital arousal and subjective reports. To induce fear of pain, participants were told that they had a 60% chance of receiving painful stimuli while being exposed to one of two erotic film clips. It was hypothesized that fear of pain would adversely affect genital arousal and subjective reports in both women with and without dyspareunia. Based on research pointing to hypervigilance to pain in women with dyspareunia with VVS (Payne, Binik, Amsel, & Khalifé, 2005), we expected fear of pain to result in a more pronounced decline in genital arousal in symptomatic women. Furthermore, it was expected that the dyspareunia group would report overall less positive and more negative affect than controls. Finally, it was examined whether affected women with or without VVS differed on the dependent variables.

In Chapter 4 a study is described that investigated whether the appraisal of one and the same sexual stimulus can be successfully manipulated by providing discrepant information regarding that stimulus prior to viewing it. The information had either a focus on genital pain or sexual enjoyment. The focus on genital pain was chosen as an analogue of the expectation of experiencing pain during coitus as assumed to exist in women with dyspareunia, whereas the sexual enjoyment instruction was used as an analogue to the expectation of experiencing enjoyment during coitus in sexually functional women. A neutral instruction served as a control condition. In line with the information processing model on sexual arousal (Janssen et al., 2000), it was hypothesized that information with a focus on genital pain would result in lower levels of genital arousal and subjective reports as compared to information with a focus on sexual enjoyment.

Indirect measure

The study described in Chapter 5 tested the hypothesis that automatic (in the sense of fast, unintentional) fear-related associations with sexual stimuli are involved in superficial dyspareunia. According to the information processing model of sexual arousal (Janssen et al., 2000), automatically elicited associations are assumed to be related to genital responses (e.g., lubrication) whereas deliberate, controlled associations are linked to the experience of sexual excitement and further strategic/planned behaviour. As it has been argued that automatic fear responses may be best predicted by indirect measures (e.g., Egloff & Schmuckle, 2002), the

purpose of this experiment was to design and implement an indirect measure. Indirect measures have already been successfully used to assess disorder-relevant automatic associations in a range of psychological complaints, including pain (Vancleef, Peters, Gilissen, & de Jong, 2007) and specific fears (e.g., Teachman, Gregg, & Woody, 2001).

We preferred the Affective Simon Task (AST) (De Houwer & Eelen, 1998) above other implicit tasks because the AST does not, in contrast to other related tasks, require a contrast category relative to which the results should be interpreted. Furthermore, contrary to other tasks, the AST can be used to examine associations involving subcomponents of a concept, here "sex". This enabled us to select both noncoital and coital stimuli in order to investigate whether negative sex-related associations in women with dyspareunia would be restricted to penetration stimuli or whether they would exist for sexual stimuli in general. In addition to automatic sex-related associations, self-report ratings of the stimuli were assessed as an index of deliberate sex-related associations.

Self-report measures

In Chapter 6 an observational study is presented, which was designed to systematically collect information regarding cognitive-affective evaluations of sexual stimuli, sexual functioning, and the experience of pain by means of validated questionnaires. Furthermore, this study was conducted to determine which of the discriminating variables would best predict group membership (dyspareunia or control). Finally, this study directly compared dyspareunia subgroups with or without VVS to find out whether these different subgroups are associated with different psychological profiles.

Summary and Discussion

Chapter 7 provides a summary of the main findings followed by a discussion of the findings in relation to theory and other relevant findings in this field. After considering some methodological limitations, implications of the findings for future research and clinical practice will be presented.

C H A P T E R

2

**Sexual arousal in women
with superficial dyspareunia**

BRAUER, M., LAAN, E., & TER KUILE, M. M., (2006).
ARCHIVES OF SEXUAL BEHAVIOR, 35, 191-200.

ABSTRACT

The role of sexual arousal in the etiology and/or maintenance of superficial dyspareunia is still unclear. Lack of sexual arousal may be both the cause and the result of anticipated pain. This study compared genital and subjective sexual responses to visual sexual stimuli of women with dyspareunia and women without sexual complaints. We investigated whether women with dyspareunia were less genitally and subjectively responsive to noncoital (oral sex) as well as coital visual sexual stimuli than women without sexual problems, or whether they exhibited a conditioned anxiety response such that sexual arousal responses were lower only to stimuli that may induce fear of pain (i.e., coitus). A total of 50 women with dyspareunia and 25 women without sexual problems were shown two sexual stimuli, one depicting oral sex and the other one depicting coitus. Genital arousal was assessed as vaginal pulse amplitude using vaginal photoplethysmography. Self-reported ratings of subjective sexual arousal were collected after each erotic stimulus presentation. Women with dyspareunia had comparable levels of genital arousal to two different visual sexual stimuli as women without sexual complaints. Contrary to expectation, there was an indication that women with dyspareunia reacted with higher levels of genital arousal to the explicitly depicted coitus stimulus than controls, whereas controls had higher genital responses to the oral sex stimulus. With respect to subjective sexual arousal, it was found that women with dyspareunia reported less positive feelings in response to both erotic stimuli than controls. We conclude that, with adequate visual sexual stimulation, women with dyspareunia showed equal levels of genital sexual arousal to visual sexual stimuli as women without sexual complaints. Therefore, there was no evidence for impaired genital responsiveness associated with dyspareunia. Also, we found no evidence for a conditioned anxiety reaction in response to exposure to a coitus scene.

INTRODUCTION

Dyspareunia means, literally translated from ancient Greek, bed partners not fitting together. Although there is some controversy concerning the classification of dyspareunia (Binik, 2005), in the most recent sexual dysfunction classification proposal, dyspareunia is defined as recurrent or persistent genital pain associated with sexual intercourse (Basson et al., 2003). Dyspareunia is a common complaint in women. When asked explicitly, between 10 and 20% of women visiting a general gynecological practice complain of painful intercourse (Bachmann, Leiblum, & Grill, 1989; Goetsch, 1991; van Lankveld, Brewaeys, ter Kuile, & Weijenborg, 1995).

In the vast majority of women with dyspareunia, pain is located at the entrance of the vagina starting with penetration, which is defined as superficial dyspareunia. Vulvar vestibulitis syndrome (VVS) is thought to be the most common form of premenopausal superficial dyspareunia (Bergeron, Binik, Khalifé, & Pagidas, 1997; Harlow, Wise, & Stewart, 2001). An estimated 75% of women with dyspareunia are diagnosed with VVS (Goetsch, 1991). Its etiology is unknown and there are no generally accepted associated physical findings, with the possible exception of non-specific inflammation (Binik, Meana, Berkely, & Khalifé, 1999; Friedrich, 1987).

The high comorbidity between dyspareunia and sexual arousal disorder suggests an important role for sexual arousal problems in the etiology and/or maintenance of superficial dyspareunia (e.g., Meana & Binik, 1994; Reissing, Binik, Khalifé, Cohen, & Amsel, 2003; Segraves & Segraves, 1991). Thirty years ago, Spano and Lamont (1975) introduced a circular model of dyspareunia in which it was assumed that both pain during intercourse and fear of pain, which becomes conditioned over time, might induce decreased sexual arousal during sexual activity and therefore result in vaginal dryness and/or increased pelvic floor muscle tone. This reaction may lead to friction between the penis and vulvar skin, which may cause pain and even tissue damage (VVS). In this model, decreased sexual arousal can be either the cause or the result of dyspareunia. Kaplan (1974) and Bancroft (1989), in contrast, considered lack of sexual arousal due to insufficient vasocongestion to be the main cause of the vulvar pain. In line with this latter model, one of the main foci in sex therapy should be the enhancement of sexual arousal.

If lack of arousal plays an important role in the etiology and/or maintenance of

dyspareunia, it should be possible to observe an association between arousal problems and dyspareunia under controlled laboratory conditions, in which sexual responses to explicit visual erotic stimuli are assessed. Indeed, Wouda and colleagues found that women with dyspareunia had reduced levels of genital arousal (vaginal pulse amplitude [VPA] as measured by vaginal photoplethysmography) in response to an intercourse film clip compared to women without sexual complaints, in whom genital arousal further increased (Wouda, Hartman, Bakker, Bakker, van de Wiel, & Weijmar Schultz, 1998). Video clips depicting oral sex yielded similar genital responses in women with dyspareunia and controls. Women in both groups, however, did not differ in their self-reported subjective levels of sexual arousal, so the decrease in genital arousal went unnoticed. Although they did not measure feelings of anxiety Wouda et al. suggested that, for women with dyspareunia, intercourse has become negatively associated with pain. They argued that exposure to a depiction of coitus had an inhibiting effect on genital response, albeit unconsciously. These findings appear to support the circular model of Spano and Lamont (1975), in which it is assumed that anxiety (for pain) inhibits sexual arousal.

Nevertheless, for several reasons, the results of Wouda et al. (1998) should be interpreted with considerable caution. Firstly, all women were presented with the erotic clips in the same order: an oral sex clip was followed by a coitus clip. Therefore, the reduction in genital response in women with dyspareunia could also have been due to a time effect. That is, women with dyspareunia could have reached their maximum level of genital arousal just prior to the coitus scene, whereas women without sexual complaints may have reached their highest levels of arousal some time later, which then happened to be during the coitus scene. Alternatively, the difference between groups may have resulted from the women with dyspareunia habituating to sexual stimuli at a faster rate than controls. In other words, it remains unclear whether the reduction in genital response during the coitus clip was indeed a consequence of a specific stimulus invoking fear of pain (i.e., coitus).

Secondly, Wouda et al. only used the mean of the last min of each 10-min erotic fragment in their statistical analyses. From psychophysiological studies it is known that VPA levels fluctuate in response to variations in stimulus explicitness (e.g., Laan, Everaerd, van der Velde, & Geer, 1995). That is, with active and/or passionate scenes, such as oral sex and coitus, VPA levels increase more than in scenes with

genital fondling and kissing. Repeated measure analyses would have offered the possibility of inspecting changes in VPA associated with the various sexual activities within the clip.

Thirdly, Wouda et al. collected subjective data for both erotic clips at the end of the experiment. It is possible that women were not able to remember exactly what they had felt when exposed to the different stimuli, which might explain why subjective reports of the two groups of women were similar.

Fourth, Wouda et al. presented their subjects with a coitus stimulus in which intercourse was depicted in an implicit way. The scene was taken from Candida Royalle's (2000) *Urban Heat*, showing a couple engaging in intercourse in an elevator. In that scene, only the suggestion of coitus is shown, as inferred from the movements of the actors. A more explicit coitus scene might have yielded an even stronger reduction in genital response relative to the oral sex scene in the dyspareunia group as well as differential subjective reports.

In an attempt to obtain more clarity about the role of sexual arousal problems and fear of pain in women with dyspareunia, we conducted a study analogous to the one by Wouda et al.. Although this study is not a real test of Spano and Lamont's model of dyspareunia (1975) in the sense that it cannot inform us about any causal relationships, it could give us more insight in the association between arousal and dyspareunia. We measured genital and subjective sexual arousal during two different erotic stimuli (oral sex and coitus) in women with superficial dyspareunia and women without sexual complaints. To infer with more certainty that a decrease in genital arousal might be related to a conditioned anxiety response to coitus, we also measured the level of anxiety. Subjective reports were collected immediately following each film clip. A time effect was ruled out by counterbalancing the order in which the erotic film clips were presented. The length of baseline recording and interstimulus interval were the same as in the Wouda et al. (1998) study. Variations in VPA responses related to different sexual activities in the erotic clips were investigated using repeated measures analyses. The erotic clips were taken from films by the same director as used by Wouda et al., with a coitus scene portraying explicit intercourse lasting 3.15 min.

We hypothesized that women with dyspareunia would show equal levels of genital arousal as women without sexual complaints to the erotic stimuli depicting oral sex.

When presented with a coitus scene, however, we expected women with dyspareunia to react with decreased genital response. In contrast, presentation of a coitus scene in the sexually functional women was expected to further enhance genital response. With respect to subjective report, we expected women with dyspareunia to report overall less positive and more negative affect than the control women. In addition, we hypothesized that the dyspareunia group would respond aversively to the coitus stimulus compared to the oral sex stimulus. The control women were not expected to show anxiety responses to any of the erotic stimuli.

METHOD

Participants

Premenopausal women between 18 and 45 years, in a steady heterosexual relationship for at least 6 months, were recruited through advertisements, media attention, and professional referral. The inclusion criterion for women with dyspareunia was complaints of superficial dyspareunia in minimally 50% of intercourse attempts for at least 6 months. Exclusion criteria for women with dyspareunia were somatic causes of dyspareunia, vulvar pain not directly related to intercourse, and lifelong vaginismus. Women without sexual complaints were included if they had had no sexual complaints for at least one year, were sexually active including intercourse, had had their first coital experience more than a year ago, and had partners without severe sexual complaints that could impede intercourse. We excluded women from either experimental group if any of the following applied: pregnancy or lactation, a diagnosis of affective, psychotic or substance related disorder according to DSM-IV-TR (APA, 2000), or had undergone a hysterectomy or prolapse surgery. The initial screening on inclusion and exclusion criteria was done during a first telephone contact in which the experimental procedures were also briefly explained. Women who were eligible and interested were invited for a psychological/sexological and a medical screening. Informed consent, in which confidentiality, anonymity, and the opportunity to withdraw from the experiment without penalty were assured, was obtained from all participants prior to screening. The study protocol was approved by the Medical Ethics Committee of the Leiden University Medical Center. Participants received a compensatory fee of €60

and travelling expenses.

All potential participants underwent a sexual function interview by the first author during a first visit at the Department of Sexology. Subsequently, a structured psychiatric interview by means of the MINI International Neuropsychiatric Interview (MINI), a shortened version of the SCID-1, was conducted (First, Spitzer, Gibbon, & Williams, 1997; Lecrubier et al., 1997; Sheehan et al., 1997). The MINI is a standardized interview regarding mental disorders according to the DSM-IV-TR (APA, 2000). Subjects with a diagnosis of affective, psychotic or substance-related disorder were excluded from participation. At the end of screening, the measurement of sexual arousal in the laboratory was explained in detail.

During a second visit, a standardized physical examination for sexual pain disorders was carried out in all participants to exclude women with somatic pathology, and to verify the presence or absence of VVS in the dyspareunia group. For that purpose, erythema as well as vulvar pain were assessed. Erythema was assessed visually by rating the presence (yes/no) of redness anywhere on the vestibule, up to para-urethral. With a cotton-swab ("touch-test"), vulvar pain was assessed by scoring pain (yes/no) upon light touching of the vestibulum (de Kruiff, ter Kuile, Weijnenborg, & van Lankveld, 2000).

Of 113 women who responded to the advertisements, 84 (74%) women appeared eligible during the first telephone interview and were subsequently screened in a first visit at the department of Sexology. Of 57 screened women with dyspareunia, 4 (7%) were excluded and 3 (5%) eligible women withdrew from the study. Of the excluded women with dyspareunia, one was diagnosed with lifelong vaginismus during the physical examination and one was diagnosed with vulvodynia. The third woman experienced pain during less than 50% percent of intercourse attempts. The fourth woman was excluded because she experienced difficulties with comprehending the questions during the interview and with completing the questionnaires. Of the women with dyspareunia who withdrew, one explained that she was afraid of inserting the vaginal photoplethysmograph. The second woman got severely ill and the third one withdrew without offering a reason. Of 27 screened women without sexual complaints, 25 (93%) were eligible. One ineligible woman had had intercourse less than one year ago. The other woman was diagnosed with depressive disorder. Women who withdrew or were excluded after screening were paid €12,50.

In total, 50 women with dyspareunia and 25 women without sexual complaints participated in the study.

Table I lists demographic and complaint characteristics. The mean age of women with dyspareunia was 28.2 years ($SD = 6.5$) and of controls 26.6 years ($SD = 7.5$). Significantly more women with dyspareunia cohabitated with a partner than controls ($\chi^2(1) = 10.5, p < .005$). The average duration of dyspareunia was 6.3 years ($SD = 4.1$). Of the women with dyspareunia, 52.2% had experienced genital pain since first intercourse, and 63.3% of the women in this group were diagnosed with VVS.

Measures

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Psychophysiological assessment

Stimulus materials. Two neutral and two sexual film clips with sound were used. The neutral video clips were taken from *Die Salzmänner von Tibet*, a documentary about a nomadic tribe in Tibet. The duration of the first neutral film clip was 7 min, and the second clip lasted 9 min. Both erotic video clips were selected from *One Size Fits All*, a so-called women-friendly erotic film directed by Candida Royalle (Laan, Everaerd, Van Bellen, & Hanewald, 1994). The oral sex stimulus was taken from the fourth scene of this film and depicted non-coital sex with erotic kissing, manual, and oral sex (cunnilingus and fellatio), lasting 7.5 min. The coitus stimulus was taken from the fifth scene of the film and depicted non-coital sex as well as intercourse (9 min). Even though we had all of Candida Royalle's films at our disposal, we were unable to isolate a coitus scene that lasted 5 min, the duration of coitus in the Wouda et al.'s study (1998). The maximum length of coitus we were able to find was 2.5 min. We therefore decided to extend the coitus scene somewhat by copy-editing the video such that the number of depictions of explicit penis in vagina movements was increased. The coitus clip that was thus obtained lasted 9 min in total, and depicted non-coital sex for about 5.45 min, followed by an explicit depiction of coitus lasting 3.15 min. The two sexual stimuli were presented in counterbalanced order. Participants were randomly assigned to one of the two orders.

Genital sexual arousal. To measure genital arousal, VPA was assessed by a vaginal photoplethysmograph. The photoplethysmograph is a menstrual tampon-sized device, containing an orange-red light source and a photocell. The light source illuminates the capillary bed of the vaginal wall and the phototransistor responds to

the light backscattered by the vaginal wall and the blood circulating within it. When the signal is connected to an alternating current (AC) amplifier, VPA is measured, which reflects the phasic changes in vaginal engorgement accompanying each heart beat, with larger amplitudes reflecting higher levels of vaginal vasocongestion. For a detailed description of this measure, see Laan, Everaerd, and Evers (1995). During the experimental session, VPA was continuously recorded. VPA was sampled at 20 Hz across baseline and subsequent trials. A two-pass algorithm for automatic artefact removal (© Molenkamp Technical Support Group, University of Amsterdam) was used to analyze the VPA data. After artefact deletion, peak-to-trough amplitude was calculated for each remaining pulse. Depth of the probe and orientation of the light source were controlled by a plate attached to the cable within 5 cm of the light sensor. Subjects were instructed to insert the probe such that the plate touched their labia. The probe and plate were disinfected by means of a plasma sterilization procedure between uses.

Subjective sexual arousal. Immediately following each erotic film clip, the participant was asked to assess on a 7-point Likert scale the degree to which she was experiencing genital sensations (6 items, e.g., genital pulsing and throbbing), positive (5 items, e.g., excited and longing), and negative affect (6 items, e.g., disgust and shame). To be able to substantiate a potential anxiety response, the item anxiety of the subscale negative affect was also analyzed separately. The extremes of the 7-point scales were "not at all" and "very strong." These 17 items were taken from a questionnaire constructed by Heiman and Rowland (1983).

Other measures

Sexual function. At the end of the sexological screening, participants completed the Female Sexual Function Index (FSFI). The FSFI consists of 19 items, which assess sexual (dys)function in women (Rosen et al., 2000). There are six subscales: desire (2 items; range, 1-5), arousal (4 items; range, 0-5), lubrication (4 items; range, 0-5), orgasm (3 items; range, 0-5), satisfaction (3 items; range, 0-5) and pain (3 items; range, 0-5). The data were scored using the scoring system as described by Rosen et al. (2000). Lower scores indicate worse sexual function. The FSFI has good-to-excellent internal reliability (Cronbach's $\alpha > 0.80$ for sexually dysfunctional and nondysfunctional samples independently) and is able to differentiate well between

various clinical samples and non-dysfunctional controls (Wiegel, Meston, & Rosen, 2005).

Sexual arousal and anxiety. In addition to the FSFI, subjects completed the Sexual Arousalability Index (SAI). The SAI is an adapted and extended version of the 26-item SAI and SAI-expanded (Hoon & Chambless, 1998; Hoon, Hoon, & Wincze, 1976), consisting of 46 items. Participants were asked to rate how aroused they generally feel while being exposed to the activity or situation described in the item or how aroused they thought they would feel. Items ranged from -1 to 5, with -1 indicating that the situation or activity adversely affects arousal and would evoke anxiety or aversion, with 0 indicating not aroused at all, and with 5 indicating extremely sexually aroused. Two scores are obtained: The Arousalability score, which is the sum of the 0 to 5 arousalability ratings (total range, 0-230), and the Anxiety score, which is the total number of times -1 was scored (total range, 0-46). The original SAI has high internal consistency (Cronbach's $\alpha > 0.91$) and discriminant validity has been demonstrated between normal and sexually dysfunctional women (Hoon & Chambless, 1998), and between women with congenital adrenal hyperplasia (CAH) and their unaffected sisters/female cousins (Zucker, Bradley, Oliver, Blake, Fleming, & Hood, 2004).

Procedure

Prior to the psychophysiological assessment, each participant was informed about the experimental procedures in detail. After that, the participant inserted the photoplethysmograph in private. She was then presented with a 7-min neutral film excerpt of which the last 5 min were used for baseline measurement. Subsequently, the participant was exposed to the two erotic stimuli (oral sex and coitus), with a return-to-baseline interval (RTB) of 9 min between stimuli, during which the second neutral film clip was shown. If after 6 min participants' VPA-level was still more than 30% higher than the first baseline, she was distracted from possible sexual thoughts by means of a concentration task (counting aloud backwards) followed by another 1-min excerpt from the second neutral film. Otherwise, women continued to watch the 9-min neutral film clip. In each case, the last min of the neutral film was used as a second baseline measurement. Self-report ratings of sexual arousal, positive sexual, and negative affect were collected immediately following each erotic

stimulus. At the end of the experiment, a short exit interview took place, in which the participant was asked to evaluate the presented film clips and the experiment. All women were individually tested by the first author.

Data analysis

After VPA artefact deletion, peak-to-through amplitude was calculated for each remaining pulse and averaged over 30-sec epochs. For each baseline recording, a mean baseline score per participant was calculated. For both erotic stimuli, a mean VPA score was obtained, by averaging all epochs of each stimulus minus the mean preceding baseline.

A 2 (Group) x 2 (Stimulus) x 2 (Order) ANOVA was conducted on mean VPA, with α set at .05. In addition, we wanted to inspect the time course for genital responses during both erotic stimuli. Therefore, the 30-sec VPA epochs minus each participant's mean baseline were evaluated in a 2 (Group) x 2 (Stimulus) x 2 (Order) x 15 (Epoch) repeated measures ANOVA. Because the coitus stimulus lasted longer, 18 epochs were obtained compared to 15 in the oral sex stimulus. A mean score was calculated over four epochs (4, 5, 6, and 7) of the coitus scene to obtain the same number of epochs. VPA of the four epochs that were averaged into one data point were virtually identical. No explicit coitus was shown in any of these epochs. The Greenhouse-Geisser epsilon (ϵ) procedure was applied to the repeated measures ANOVA to correct for the violation of the sphericity assumption in repeated measures designs. To investigate differences in subjective reports of sexual feelings and affect, subjective variables were evaluated in a 2 (Group) x 2 (Stimulus) x 2 (Order) MANOVA, with α set at .05. To inspect differences in patient characteristics, one-way ANOVA's and chi-square tests were used.

Based on Wouda et al's results (1998), we expected a large effect size ($d > 0.8$; Cohen, 1988). Together with an α -value of .05, and a power of .80, 20 subjects per group is needed. Taken into account a failure rate of 25%, we decided to include 25 subjects per group. The number of women with dyspareunia was doubled for testing another hypothesis, which will not be described in the current study.

With respect to the analysis of VPA, data of one participant with dyspareunia and one woman in the control group could not be used; the participant with dyspareunia was excluded from the analyses because the initial doubt of both the experimenter

and the gynecologist about the diagnosis was further supported by inconsistencies in her answers to the questions about sexual dysfunction. The data of the other participant were excluded because of too many artifacts. VPA data of 49 women with dyspareunia and 24 women without sexual complaints were analyzed. With respect to the analysis of subjective report, data of one woman with dyspareunia were lost due to a technical failure; the analysis of subjective report therefore included data of 48 women with dyspareunia and 24 women without sexual complaints.

RESULTS

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Sexual function

To examine whether there were any differences in sexual function between the two groups of women, participants completed the FSFI and SAI. Because the FSFI and SAI subscale scores were not normally distributed, the Mann-Whitney U test was used. As can be seen in Table I, women with dyspareunia reported significantly less desire ($z = -4.78, p < .0001$), arousal ($z = -5.23, p < .0001$), lubrication ($z = -5.74, p < .0001$), satisfaction ($z = -6.36, p < .0001$), fewer orgasms ($z = -3.52, p < .0001$), and more pain ($z = -6.61, p < .0001$) than controls. As reported on the SAI, women with dyspareunia experienced less arousal ($z = -3.99, p < .0001$) and experienced more frequently anxiety ($z = -2.56, p < .05$) in different sexual situations and activities than women without sexual complaints.

Genital sexual arousal

Baseline VPA levels prior to the oral sex scene and the coitus scene were not significantly different.

Mean genital arousal. Table II shows the mean VPA responses for both groups. A 2 (Group) $\times$ 2 (Stimulus) $\times$ 2 (Order) multivariate analysis of variance (MANOVA) yielded significant multivariate main effects for Stimulus, $F(1, 69) = 7.91, p < .01$, and Order, $F(1, 69) = 9.57, p < .05$. Contrary to our expectations, no significant effect for Group ($p > 0.90$) was found; however, a trend of a Group $\times$ Stimulus interaction was observed, $F(1, 69) = 3.63, p = 0.061$, indicating that the dyspareunia group had higher levels of genital arousal to the coitus stimulus than the control group, whereas the control group had higher genital arousal to the oral sex stimulus.

Table I. Demographic and sexual function characteristics

<i>Characteristics</i>	Dyspareunia (<i>n</i> = 49)		Controls (<i>n</i> = 24)	
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Age (in years)	28.2	6.5	26.6	7.5
Duration relationship (in years)	6.4	4.7	4.9	7.3
Married/co-habiting, N (%)	39 (79.6)*		10 (41.7)*	
Children, N (%)	5 (10.2)		4 (16.7)	
Onset dyspareunia ^a				
Lifelong, N (%)	24 (52.2)			
Diagnosis of VVS, N (%)	31 (63.3)			
Duration dyspareunia (in years)	6.3	4.1		
FSFI subscales				
<i>Desire</i>	2.62**	1.07	4.10**	0.93
<i>Arousal</i>	3.12**	1.67	5.13**	1.23
<i>Lubrication</i>	3.46**	1.76	5.63**	1.23
<i>Orgasm</i>	3.45**	1.93	4.93**	1.56
<i>Satisfaction</i>	3.36**	1.25	5.57**	0.54
<i>Pain</i>	1.20**	1.29	5.65**	1.25
SAI				
<i>SAI Arousalability</i>	102.73**	33.88	131.33**	22.51
<i>SAI Anxiety</i>	1.84*	1.79	0.92*	1.47

Note: Range for FSFI subscales: *Desire* (1-5), *Arousal* (0-5), *Lubrication* (0-5), *Orgasm* (0-5), *Satisfaction* (0-5) and *Pain* (0-5). Lower scores indicate worse sexual function. Range for SAI *Arousalability*, 0-230; higher scores indicate stronger sexual arousal. Range for SAI *Anxiety* 0-46; higher scores indicate more sexual anxiety/ aversion. SAI = Sexual Arousalability Index; FSFI = Female Sexual Function Index; VVS = Vulvar Vestibulitis Syndrome.

^aData of 3 participants were missing for this variable.

* $p < .05$. ** $p < .0001$.

Repeated measures analysis of genital arousal. A 2 (Group) x 2 (Stimulus) x 2 (Order) x 15 (Epoch) repeated measures analysis yielded a main effect for Epoch, $F(15, 1035) = 50.72$, $p < .005$, $\epsilon = 0.26$, and a Group x Stimulus x Epoch interaction, $F(15, 1035) = 2.93$, $p < .05$, $\epsilon = 0.34$. The three-way interaction indicated that, contrary to expectation, women with dyspareunia showed significantly

higher genital responses to the explicit coitus scene compared to controls, but that their responses to the oral sex stimulus were significantly lower. Fig. 1 shows that VPA patterns of the two groups started to diverge just prior to the onset of coitus (which started as off epoch 9), with the women with dyspareunia reaching higher levels of genital arousal than the controls. In an exploratory analysis, we conducted 15 univariate follow-up analyses, which signified that the Group x Stimulus interactions became significant from epoch 8 until the end of stimulus exposure ($.015 < p < .049$).

Table II. Mean Vaginal Pulse Amplitude (VPA) responses (in millivolts [mV]) for the oral sex stimulus and the coitus stimulus

	Dyspareunia (<i>n</i> = 49)	Controls (<i>n</i> = 24)
<i>Stimulus</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>
Oral sex	1.65 (1.21)	1.92 (1.79)
Coitus	2.61 (1.49)	2.03 (1.65)

Note: Mean VPA scores were calculated over both stimulus orders. Mean VPA scores separately for each stimulus order are available on request.

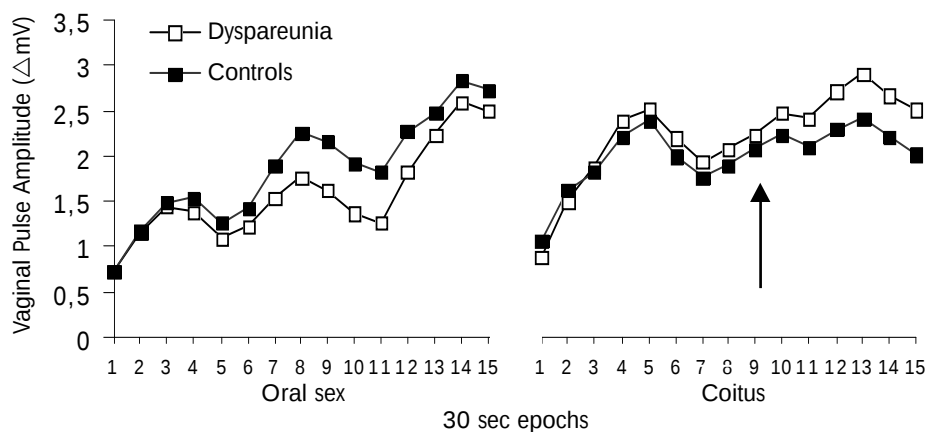


Figure 1. Variations in vaginal pulse amplitude (in millivolts [mV]) relative to preceding baseline during the oral sex stimulus and the coitus stimulus in women with dyspareunia and controls. Data are averaged over 30-second epochs and are calculated over both stimulus orders. The arrow indicates the start of the explicit coitus scene.

Subjective sexual arousal: genital sensations and positive and negative affect

Table III shows the ratings of genital sensations and positive and negative affect for both groups. A 2 (Group) x 2 (Stimulus) x 2 (Order) MANOVA for the three subjective arousal variables yielded significant multivariate main effects for Group, $F(3, 66) = 3.16, p < .05$, and for Stimulus, $F(3, 66) = 3.41, p < .05$, and a significant Stimulus x Order interaction, $F(3, 66) = 3.19, p < .05$. Follow-up univariate tests showed that the Group main effect was only significant for positive affect, $F(1, 68) = 4.21, p < .05$, indicating that the dyspareunia group reported overall less positive affect than the control group. Univariate tests showed that the main effect of Stimulus was significant for genital sensations, $F(1, 68) = 8.41, p < .005$, indicating that women in both groups reported stronger genital sensations during the coitus clip. Finally, univariate tests showed a significant interaction of Stimulus x Order for positive affect, $F(1, 68) = 9.69, p < .005$, implying that in both order groups, irrespective of stimulus content (oral sex or coitus), the sexual stimulus that was presented first was rated less positive than the stimulus that was presented last.

Subjective rating of anxiety

Contrary to expectation, the 2 (Group) x 2 (Stimulus) x 2 (Order) ANOVA for anxiety revealed no significant effects.

Table III. Mean ratings on the subscales genital sensations, positive affect and negative affect and anxiety for the oral sex stimulus and coitus stimulus

	Dyspareunia ($n = 48$)		Controls ($n = 24$)	
	Oral sex	Coitus	Oral sex	Coitus
<i>Subjective reports</i>	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Genital sensations	4.01 (1.37)	4.43 (1.43)	4.19 (1.35)	4.42 (1.39)
Positive affect	3.44 (1.02)	3.73 (1.23)	4.05 (1.30)	4.22 (1.28)
Negative affect	1.34 (0.58)	1.41 (0.68)	1.25 (0.40)	1.22 (0.35)
Anxiety	1.15 (0.46)	1.27 (0.79)	1.13 (0.61)	1.04 (0.20)

Note: Mean ratings were calculated over both stimulus orders. Mean ratings separately for each stimulus order are available on request.

DISCUSSION

Contrary to expectation, our study showed that a somatically healthy group of women with superficial dyspareunia reacted with equal levels of genital arousal to two different visual sexual stimuli as women without sexual complaints. In line with our hypothesis, the dyspareunia group reported less positive affect in response to both erotic stimuli than the control group. Unexpectedly, the dyspareunia group did not report more negative affect than the control group. They also did not differ from controls in ratings of genital sensations. Contrary to our assumption, the dyspareunia group was not more anxious than the control group when exposed to the coitus scene. As expected, the oral scene did not evoke anxiety in either group.

With respect to the oral sex stimulus, our study confirmed the findings of Wouda et al. (1998) in that women with and without dyspareunia reacted with equal levels of genital arousal. However, contrary to Wouda et al., we did not find a reduction in genital arousal in response to a coitus scene in the dyspareunia group compared to the control group. Instead, inspection of the changes in VPA associated with the various sexual activities within the two erotic clips revealed that the dyspareunia group exhibited significantly higher genital responses to the explicitly depicted coitus scene compared to the control group, but their responses to the oral sex stimulus were significantly lower.

The present study demonstrated that, in both groups of women, the coitus clip generated stronger subjective genital sensations than the oral sex clip. This finding is also in contrast with Wouda et al.'s study, in which no significant differences in subjective genital sensations for both erotic stimuli were found. Finally, we found that positive affect was significantly higher in the control group, irrespective of stimulus content. Wouda et al. did not measure either positive or negative affect in their sample. We conclude, also given the low anxiety scores to the erotic clips, that our study did not provide evidence for a conditioned anxiety reaction in response to exposure to a coitus scene in the dyspareunia group. Hence, in this study we found no support for the circular model of dyspareunia (Spano & Lamont, 1975).

Our results suggest that, with adequate visual sexual stimulation, women with dyspareunia show equal levels of genital sexual arousal as women without sexual

complaints. This finding corresponds with previous laboratory studies conducted in women with sexual arousal dysfunction (Laan, van Driel, & van Lunsen, 2003; Meston & Gorzalka, 1996; Morokoff & Heiman, 1980). We conclude that there were no indications for impaired genital responsiveness associated with dyspareunia.

An explanation for the surprising finding that the dyspareunia group had significantly higher genital arousal to the explicit coitus depiction might be that the laboratory situation for the dyspareunia group was less threatening or aversive than their home situation, whereas for controls, the laboratory setting was less sexually arousing than their home situation. Alternatively, women with dyspareunia may have been exposed to coitus stimuli less often than controls, resulting in higher genital responses. Studies by Laan and Everaerd (1995) showed that women who had never been exposed to erotic film stimuli had higher genital responses than women who had been exposed to visual erotica prior to participation in a psychophysiological study. Unfortunately, we have no data available about participants' past exposure to erotic stimuli.

What might be reasons for our failure to find a reduction in genital response to a coitus clip in the dyspareunia group? On the one hand, it might be that genital arousal problems are not a key factor in the onset and maintenance of superficial dyspareunia. If so, other factors than genital responsiveness might be involved in distinguishing women with dyspareunia from women without sexual complaints. On the other hand, the finding that genital responses of both groups did not differ might have been due to methodological limitations in the present study, of which the first one might be insufficient statistical power. However, it is unlikely that the failure to find a reduction in the dyspareunia group to the coitus clip was due to lack of power, given the significant interaction effect between Group x Stimulus x Epochs in the opposite direction than expected.

A second possible methodological drawback might be that the sample of participants with dyspareunia in our study was not a representative one with respect to demographic variables, complaint severity, and sexual anxiety. Although our sample of participants seemed not to differ from Wouda et al.'s sample concerning demographic variables, it is possible that in our study a selection bias occurred such that the most anxious women with dyspareunia did not respond to the recruitment advertisements. Unfortunately, a comparison of anxiety data between our sample

and Wouda et al.'s study was not possible, because Wouda et al. did not measure anxiety concerning sex (such as the SAI). As an alternative, we compared our sample of women with dyspareunia to a sample of patients with dyspareunia, who were referred to the outpatient clinic of Psychosomatic Gynecology and Sexology at the Leiden University Medical Center in 2003. Data were selected from 40 consecutive patients who were diagnosed with dyspareunia and who (would have) met the inclusion criteria for this study and for whom data on the FSFI and SAI were available. Both groups were compared on several complaint characteristics (VVS, onset and duration of dyspareunia), demographic variables (age, marital status, children), as well as on FSFI and SAI scores. The sample of women with dyspareunia participating in our study did not differ significantly from patients in the outpatient clinic with respect to all measured variables, except for average duration of dyspareunia (duration was longer in the participants). Therefore, the possibility that we were not dealing with a representative dyspareunia sample with serious complaints seems unlikely. It is thus improbable that the failure to find significant differences in genital response to a coitus clip between women with dyspareunia and controls was due to a selection bias of women with dyspareunia.

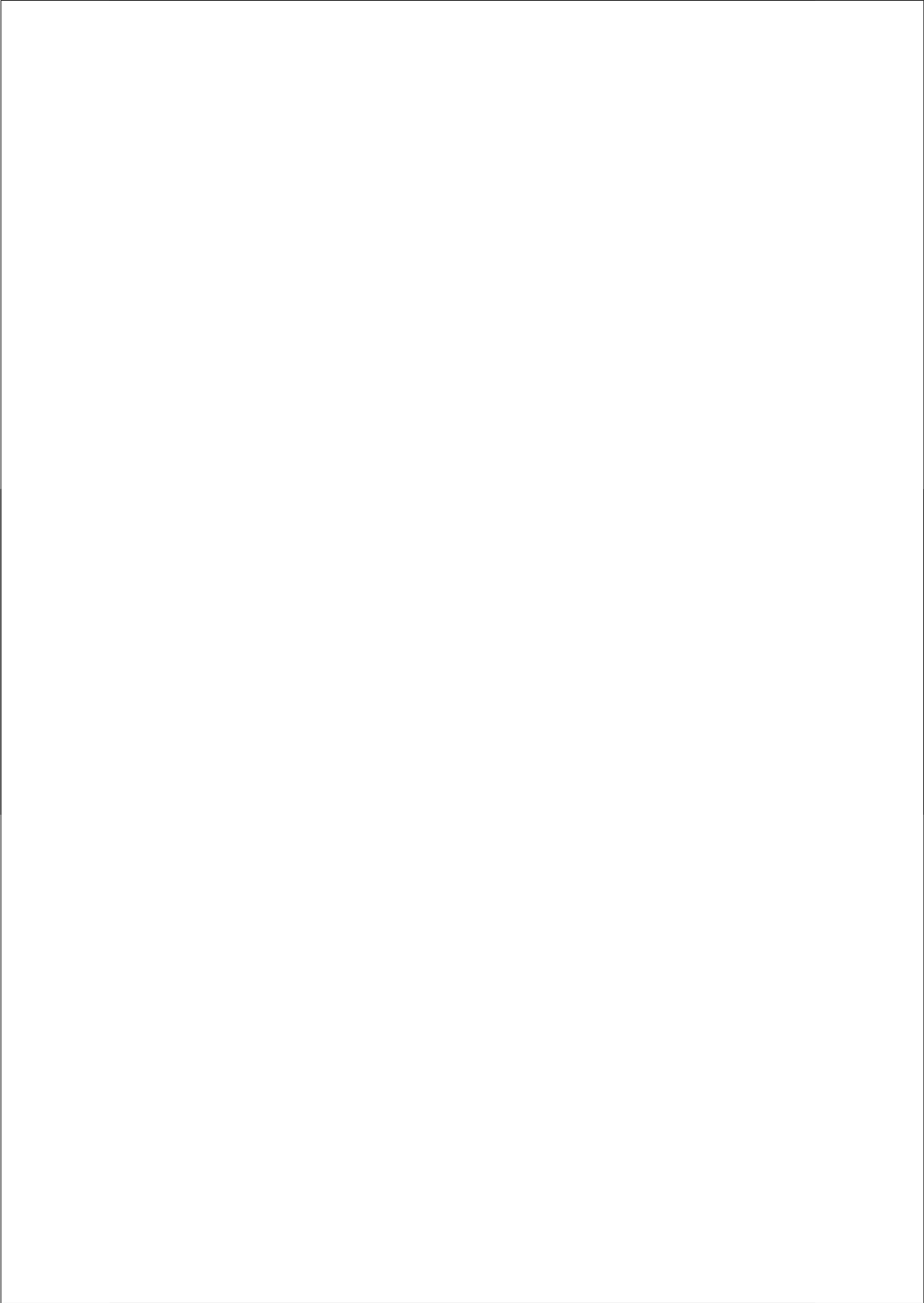
As a final possible methodological limitation, we suggest that, in this particular experiment, the coitus clip was not a true aversive stimulus for the dyspareunia group and, as a consequence, no reduction in genital arousal occurred. Additional support for this supposition is that the dyspareunia group did not differ in the level of reported anxiety and other negative feelings to exposure to the coitus stimulus in comparison with the oral sex stimulus. So, at present, it remains unresolved if anxiety affects genital responsiveness in women with dyspareunia.

Although we have found no evidence for an association between genital arousal and dyspareunia, women with dyspareunia do have subjective sexual arousal problems in the sense that they experience less positive affect during sexual stimulation. The finding that the dyspareunia group reported less positive affect than controls during exposure to the erotic stimuli is in line with previous research in several female sexual dysfunction groups (e.g., Laan, van Driel, & van Lunsen, 2003; Morokoff & Heiman, 1980). A plausible explanation for this finding is that women with sexual dysfunctions in general, and perhaps those with dyspareunia in particular, may differ from women without sexual complaints in their appreciation of sexual

stimuli. As a consequence, in real life situations, women with dyspareunia might refrain from seeking out sexual stimuli to become or remain sexually aroused. As a result of lack of sexual arousal, insufficient lubrication may occur, but nevertheless, they engage in intercourse, resulting in genital pain. More research regarding (in)adequate sexual stimulation is recommended.

Given the finding that the dyspareunia group did not show lower levels of genital arousal to coitus than controls, we found no support for the circular model of dyspareunia (Spano & Lamont, 1975). Nevertheless, we still think that the hypothesis that fear of pain underlies lack of sexual arousal deserves further investigation. In the current study, a coitus situation without any associations with pain was presented. However, it is conceivable that in more ecologically valid circumstances, such as in the privacy of a bedroom, the prospect of having to engage in coitus may evoke fear of pain and, as a result, may inhibit sexual arousal in women with dyspareunia. Future research with more ecologically valid aversive stimuli (e.g., a pain stimulus within an experimental situation) may show a more pronounced decrease in genital arousal in women with dyspareunia than in women without sexual complaints, which would then provide support for the model of dyspareunia.

Notwithstanding the above mentioned suggestions, our study shows that under certain conditions, women with dyspareunia were able to become genitally sexually aroused to a similar degree as were women without sexual complaints.



C H A P T E R

**The effect of pain-related
fear on sexual arousal in
women with superficial
dyspareunia**

3

BRAUER, M., TER KUILE, M. M., JANSSEN, S. A., & LAAN, E. (2007).
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ABSTRACT

The role of pain-related fear in the etiology and/or maintenance of superficial dyspareunia is still unclear. The objective of this experiment was to investigate the effects of pain-related fear on sexual arousal in women with superficial dyspareunia ($n = 48$) and women without sexual complaints ($n = 48$). To induce pain-related fear, participants were told that they had a 60% chance of receiving painful stimuli while being exposed to one of two erotic film clips. Genital arousal was assessed using vaginal photoplethysmography. Self-reported ratings of genital sensations and affect were collected after both erotic stimulus presentations. Elevated levels of skin conductance and higher ratings of experienced threat during the pain threat condition indicated that fear was successfully elicited. Pain-related fear impeded genital arousal in all women. Women of both groups reported significantly less positive affect and more negative affect when threatened. Although women with dyspareunia did not differ in their genital responsiveness from women without sexual complaints, they experienced overall significantly more negative affect than the control group. The present results indicate that pain-related fear reduces genital and subjective sexual responding in women with and without sexual problems. We conclude that emotional appraisal of the sexual situation determines genital responsiveness in both sexually dysfunctional and functional women.

INTRODUCTION

Dyspareunia, pain associated with penile-vaginal intercourse, is a common problem in women, with prevalence rates up to 15% in general gynecological practice. Research to date has focused primarily on underlying biomedical factors, but failed to prove a clear etiology (Lotery, McClure, & Galask, 2004).

From a cognitive-behavioral (CB) perspective, anxiety is thought to interfere with attention to sexually arousing stimuli, resulting in impaired sexual arousal (Barlow, 1986). With respect to dyspareunia, fear is thought to be activated by the prospect of painful intercourse (Spano & Lamont, 1975), leading to vaginal dryness and/or increased pelvic floor muscle tone (cf. ter Kuile & Weijnenborg, 2006; van Lunsen & Ramakers, 2002). This reaction subsequently causes friction between penis and vulvar skin, which may cause pain particularly at the entrance of the vagina (i.e., superficial dyspareunia) and even tissue damage, indicated as vulvar vestibulitis syndrome (VVS) (Friedrich, 1987). VVS is considered the most common type of premenopausal dyspareunia (Harlow, Wise, & Stewart, 2001). Its etiology is unknown and there are no generally accepted associated physical findings, with the possible exception of nonspecific inflammation (Lotery et al., 2004).

Only a few observational studies investigated the relationship between dyspareunia and sexual problems and showed a consistent relationship between dyspareunia and sexual arousal problems (e.g., Meana & Binik, 1994; Reissing, Binik, Khalifé, Cohen, & Amsel, 2003). These findings (indirectly) support the CB model of dyspareunia that fear (of pain) results in sexual arousal problems. However, these studies do not allow for definitive conclusions about the causal nature of these associations.

It is surprising that to date, no studies have been conducted that investigate the direct effects of experimentally induced pain-related fear on sexual arousal in this sexual pain condition, especially because pain-related fear has been identified as an important factor in several other medically unexplained chronic pain conditions, such as low back pain and fibromyalgia (e.g., Vlaeyen & Linton, 2000). The aim of the current experiment was therefore to clarify the hypothetical role of pain-related fear in women with superficial dyspareunia.

Following Barlow's CB model on sexual dysfunction, we hypothesized that (a) pain-

related fear, as induced by a threat to receive painful stimuli during exposure to an erotic stimulus, will adversely affect genital arousal and subjective reports in women with and without dyspareunia; (b) genital arousal during pain threat will be more impaired in symptomatic women. This expectation was based on research pointing to hypervigilance to intercourse as well as non-intercourse pain in women with VVS (Payne, Binik, Amsel, & Khalifé, 2005). Since individuals displaying hypervigilance to pain are assumed to demonstrate stronger fear of pain (threat) (Crombez, Van Damme, & Eccleston, 2005), we hypothesized that our pain threat will induce more fear of pain and greater distraction from sexually arousing stimuli in symptomatic women, thereby resulting in less genital arousal in these women than in controls; (c) corresponding to our previous study (Brauer, Laan, & ter Kuile, 2006) both groups will demonstrate similar genital responses in a condition without pain threat, and (d) symptomatic women will respond with overall less positive and more negative affect than controls.

METHOD

Participants

Premenopausal women aged between 18 and 45, in a steady heterosexual relationship for at least 6 months, were recruited through advertisements, media attention, professional referral and through notification to women who had participated in a previous psychophysiological study (Brauer et al., 2006). The inclusion criterion for women with dyspareunia was complaints of superficial dyspareunia in minimally 50% of intercourse attempts for at least 6 months. Exclusion criteria for women with dyspareunia were somatic causes of dyspareunia; vulvar pain not directly related to intercourse; and lifelong vaginismus. Women without sexual complaints were included if they had had no sexual complaints for at least one year, were sexually active including intercourse, had had their first coital experience more than a year ago, and had partners without severe sexual complaints that could impede intercourse. We excluded women from both groups if any of the following applied: pregnancy or lactation; a diagnosis of mood-, psychotic- or substance related disorder according to DSM-IV-TR as assessed with a psychiatric interview (APA, 2000); and having undergone a hysterectomy or prolapse surgery.

Following an initial telephone screening, 99 women were invited for further screening by the first author at the sexology outpatient clinic of the department of gynaecology of a university medical center. Prior to screening detailed information about the study was given. Women were told that the purpose was to investigate the effect of pain on sexual arousal. Thereafter, an informed consent was obtained from the participants. Screening consisted of a semi-structured sexual function interview and a structured psychiatric interview. The psychiatric interview was conducted by means of the MINI International Neuropsychiatric Interview (MINI), a shortened version of the SCID-1 (First, Spitzer, Gibbon, & Williams, 1997; Lecrubier et al., 1997; Sheehan et al., 1997). The MINI is a standardized interview regarding mental disorders according to the DSM-IV-TR (American Psychiatric Association, 2000). The inter-rater reliability proved to be satisfactory, with $\alpha > 0.75$ for all diagnoses, and $\alpha > 0.90$ for the majority (16/23) of observations (Sheehan et al., 1997). Alpha-coefficients of test-retest reliability between .77 and .96 were found for the disorders that were relevant for the assessment of the exclusion criteria of participants in the present study. The first author was trained in the use of the MINI by an experienced psychiatrist. In addition, a standardized gynecological examination for sexual pain disorders was carried out by a female gynecologist in order to exclude women with somatic pathology, and to verify the presence or absence of VVS in the dyspareunia group (see de Kruiff, ter Kuile, Weijnenborg, & van Lankveld, 2000).

Three out of 99 women were excluded after the psychological/sexological screening. Of the two excluded women without sexual complaints, one was diagnosed with depression and the other one reported recent experiences of dyspareunia. The excluded woman with dyspareunia was diagnosed with depression. The final sample consisted of 48 women with dyspareunia and 48 controls. Women who had taken part in a previous psychophysiological study (Brauer et al., 2006) and whose condition had remained unchanged, visited the hospital only once for the psychophysiological assessment. The study protocol was approved by the Medical Ethics Committee of the Leiden University Medical Center. Participants received a compensatory fee of € 50,- and travelling expenses.

Design

Women with dyspareunia and women without sexual complaints were presented with two erotic stimuli, only one of which was preceded by a pain-related fear induction (i.e., pain threat condition). Assignment of Threat Order (i.e., pain threat - no-threat/no-threat - pain threat) was counterbalanced among participants.

In the pain threat condition women received an instruction regarding a 60% chance of receiving painful stimuli on the participants' ankle while watching the erotic clip. A 2 (Group) x 2 (Pain Threat) x 2 (Threat Order) design was employed with Group and Threat Order as between-subjects variables.

Measures

Assessment of sexual function. At the end of the sexological screening, participants completed the Female Sexual Function Index (FSFI). The FSFI consists of 19 items, which assess sexual (dys)function in women (Rosen et al., 2000). There are six subscales: desire (2 items; range, 1-5), arousal (4 items; range, 0-5), lubrication (4 items; range, 0-5), orgasm (3 items; range, 0-5), satisfaction (3 items; range, 0-5) and pain (3 items; range, 0-5). The data were scored using the scoring system as described by Rosen et al. (2000). Lower scores indicate worse sexual function. Based on a Dutch sample consisting of approximately 350 women with and without sexual complaints, the internal consistency and stability of the FSFI were found to be satisfactory-to-good. The FSFI's ability to discriminate between sexually functional and dysfunctional women was excellent as well as the ability to predict the presence or absence of sexual complaints. Finally, the convergent and divergent construct validity was good (ter Kuile, Brauer, & Laan, 2006).

Determination of pain tolerance level. Prior to the psychophysiological assessment of sexual arousal each individual's pain tolerance level (the highest level that was rated as still tolerable) was established by administering painful stimuli to the participant's ankle. This was done to convince participants that there was a realistic probability of receiving pain stimuli during exposure to one of two erotic film fragments. Pain stimuli consisted of electrical stimulation (20-ms rectangular pulses with an interpulse time of 20 ms) produced by a safe muscle stimulation apparatus (Grass S48 [CE]) with an isolation unit. They were administered by electrodes, fastened on the left ankle. These pain stimuli produce a painful, stinging sensation, which is unlike

shocks caused by electrical fencing, electric mains, etc., and have been used in several experimental studies (e.g., Janssen & Arntz, 1997; Janssen, Arntz, & Bouts, 1998; Janssen, Spinhoven, & Arntz, 2004). Administering painful stimuli in this manner has been shown to effectively induce pain-related fear in research on the attentional interference of pain (-related fear) in somatically healthy volunteers (e.g., Arntz, Dreessen, & Merkelbach, 1991; Arntz, Dreessen, & de Jong, 1994; Crombez, Eccleston, Baeyens, & Eelen, 1998a;1998b; Van Damme, Crombez, & Eccleston, 2004; Van Damme, Crombez, Eccleston, & Goubert, 2004) and also, although limited to one study, in chronic pain patients (Crombez, Eccleston, Van den Broeck, Van Houdenhove, & Goubert, 2002).

Based upon the participants' direction the pain stimulus intensity was gradually increased in steps of 0.2 mA. Each pain stimulus lasted 2 seconds. It was stressed that it was necessary to reach pain tolerance level in order to adequately examine the effect of pain on sexual arousal. During this procedure, the participant was asked to indicate tactile threshold (first time that she felt something) and pain threshold (the lowest level rated as painful) and finally pain tolerance level. When the participant indicated that the pain stimulus approached the tolerance level, the procedure was terminated. The participant was informed that during the experiment this individually determined "just tolerable" pain level would be administered for 2 seconds. All three levels were recorded by the experimenter (see also Janssen & Arntz, 1997; Janssen et al., 1998; Janssen et al., 2004). No pain stimuli were actually administered during the assessment of sexual arousal.

Instructions. Prior to the psychophysiological assessment of sexual arousal participants were told that during one of two erotic clips they might receive pain stimuli. Whether they would receive these stimuli during the first or the second clip was randomly determined by the computer. Immediately preceding the no-threat condition, women read the following instruction on the computer screen: "During the presentation of the next erotic film clip you will receive no pain stimuli." In the pain threat condition the instruction was: "During the presentation of the next erotic film clip it is possible that you receive up to five pain stimuli arbitrarily throughout the film. There is a 60% chance of receiving these painful stimuli." During the pain threat condition, however, no pain stimuli were administered, because the purpose was to induce pain-related fear and to not actually inflict pain. The instruction in the pain

threat condition that there was a 60% chance - and not 100% - of receiving painful stimuli was offered to ensure that subjects with Treat Order pain threat - no-threat would still judge the procedure to be credible even though they had not received painful stimuli.

Stimulus materials. Two neutral and two sexual film clips with sound were used. The neutral video clips were taken from *Die Salzmänner von Tibet*, a documentary about a nomadic tribe in Tibet. The duration of the first neutral film clip was 11 min, the second neutral clip, presented after the first erotic clip, lasted 6 min. The erotic video clips were selected from the 2th and 4th scene of *One Size Fits All*, a so-called women-friendly erotic film directed by Candida Royalle (Laan, Everaerd, Hanewald, & van Bellen, 1994). Both erotic stimuli depicted non-coital sex with erotic kissing, manual and oral sex (cunnilingus and fellatio), lasting 4 min. Participants were explicitly told that the erotic clips did not contain depictions of coitus. This was done to provoke pain-related fear solely by threat of pain stimuli rather than by expectations raised by being exposed to a coitus scene. All clips were presented on a computer screen. The order of presentation of the erotic clips was counterbalanced over participants to control for stimulus order effects.

Physiological recordings. To measure genital arousal, vaginal pulse amplitude was assessed by a vaginal photoplethysmograph. The photoplethysmograph is a menstrual tampon-sized device, containing an orange-red light source and a photocell. The light source illuminates the capillary bed of the vaginal wall and the phototransistor responds to the light backscattered by the vaginal wall and the blood circulating within it. When the signal is connected to an alternating current (AC) amplifier, vaginal pulse amplitude (VPA) is measured, which reflects the phasic changes in vaginal engorgement accompanying each heartbeat, with larger amplitudes reflecting higher levels of vaginal vasocongestion. For a detailed description of this measure see Laan, Everaerd, & Evers, 1995. During the experimental session VPA was continuously recorded. VPA was sampled at 20 Hz across baseline and subsequent trials. A two-pass algorithm for automatic artefact removal (© Molenkamp Technical Support Group, University of Amsterdam) was used to analyze the VPA data. After artefact deletion peak-to-trough amplitude was calculated for each remaining pulse. Depth of the probe and orientation of the light source were controlled by a plate attached to the cable within 5 cm of the light

sensor. Participants were instructed to insert the probe such that the plate touched their labia. The probe and plate were disinfected by means of a plasma sterilisation procedure between uses.

As a manipulation check, skin conductance levels (SCL) were assessed via two Ag-AgCl electrodes (ConMed) attached to the medial phalanges of the index and second finger of the non-dominant hand. This autonomic measure was recorded along with the assessment of genital arousal. The recording of SCL followed after an 8 min stabilization period. Between uses the electrodes were cleaned with alcohol.

Subjective reports. Immediately following each erotic film clip, the participant was asked to rate on a 7-point Likert scale the degree to which she was experiencing genital sensations (6 items, e.g., genital pulsing and throbbing), positive (5 items, e.g., excited and longing), and negative affect (6 items, e.g., disgust and shame). The extremes of the 7-point scales were "not at all" and "very strong." These 17 items were taken from a questionnaire constructed to assess affective and cognitive responses to erotic stimulation (Rowland, Cooper, & Heiman, 1995). Eight items were added as a manipulation check for fear (distracted, threatened, concentrated, anxious, worried, relieved, tensed, and concerned). Two items (anxious and worried) came from the negative affect subscale. An Explorative Principal Component Analysis (PCA) was performed on the correlation matrix of the 8 items. Using the scree test criterium (Cattell, 1966), a two-factor solution was obtained. The explained variance of the two factors was 56.9% and 14.9%, respectively. Items with a loading on one component exceeding 0.70 and a difference between loadings on the two components of at least 0.40 were considered to belong to a subscale. The first factor consisted of the following six items; threatened, anxious, worried, tensed, distracted, and concerned, whereas the second factor consisted of the items concentrated and relieved. It was decided to use the mean ratings on the first subscale as a manipulation check and was termed "subjective threat." The internal consistency of the subscale ($\alpha = 0.93$) proved to be satisfactory (Nunnally, 1967).

Procedure

Prior to the psychophysiological assessment of sexual arousal each participant was informed about the experimental procedures in detail. Then, each individual's pain tolerance level was established. Subsequently, the experimenter left the room and

waited in the adjacent room until the woman informed the experimenter by intercom that she had inserted the vaginal photoplethysmograph according to instructions and had covered her lap with a sheet. The experimenter re-entered the room and attached the electrodes on the participants' fingers for the assessment of skin conductance. To reduce subject's awareness of the experimental hypotheses with regard to the SCL recordings, participants were told that these electrodes measured natural, involuntary physiological reactions evoked by film stimuli. After the experimenter left the room, the actual measurement of sexual arousal began. The participant was presented with the film excerpts in the following order: neutral - erotic - neutral - erotic. For the baseline and return-to-baseline measurement, respectively the last 3 and 1 min of the neutral film excerpts were used. Prior to the presentations of the erotic clips, the woman was informed by an instruction on the computer screen whether she would receive no pain stimuli (no threat) or whether there was a 60% chance of receiving pain stimuli (pain threat). Self-report ratings were collected immediately following the first neutral clip and both erotic stimuli. At the end of the experiment, a short exit interview took place as a manipulation check, followed by a questionnaire regarding the presented film clips and the participants' reactions to the experimental procedure. All women were tested individually by the first author.

Data reduction, scoring, and data analysis

After VPA artefact deletion, peak-to-through amplitude was calculated for each remaining pulse, and averaged over 30-second epochs. Mean VPA levels for both erotic film stimuli were computed by averaging across the entire duration of both films. For the baseline recordings a mean baseline score per participant was calculated. A mean VPA difference score was calculated by subtracting the participant's mean VPA levels of the erotic stimuli, minus the participant's mean preceding baseline. A 2 (Group) x 2 (Pain Threat) x 2 (Threat Order) ANOVA was conducted on mean VPA difference scores. In addition, we wanted to inspect the time course for genital responses during both the pain threat and no-threat condition in order to examine whether between-group differences would occur in the process of responding to each of the two conditions. Therefore, the 30-sec VPA epochs minus each participant's mean baseline were evaluated in a 2 (Group) x 2 (Pain Threat) x 2 (Threat Order) x 8 (Epoch) ANOVA. The Greenhouse-Geisser epsilon (ϵ)

procedure was applied to the repeated measures ANOVA to correct for the violation of the sphericity assumption in repeated measures designs (Vasey & Thayer, 1987).

In order to examine differences in SCL and ratings of genital sensations, positive and negative affect, and subjective threat, five 2 (Group) $\times$ 2 (Pain Threat) $\times$ 2 (Threat Order) ANOVA's were conducted with mean difference scores relative to preceding baselines. For all tests, α was set at .05.

For all dependant variables, effect sizes (f) were calculated as a function of η^2 (see Cohen, 1988, p. 284). For the purpose of interpretation, Cohen considered $.10 < f < .25$ as small, $.25 < f < .40$ as medium and $f > .40$ as large (Cohen, 1988).

To inspect differences in sample characteristics, t -tests and chi-square tests were used. To investigate the concordance between VPA levels and subjective threat, Pearson's product moment correlations were calculated.

With respect to the analysis of SCL, data of 7 women with dyspareunia were lost due to a defect of the apparatus for SCL-recordings during two subsequent days; the analysis of SCL therefore included data of 41 women with dyspareunia and 48 controls.

RESULTS

Sample characteristics

Table I lists demographic and complaint characteristics. The mean age of women with dyspareunia was 25.9 years ($SD = 5.6$) and of controls 23.9 years ($SD = 5.1$). Significantly more women with dyspareunia cohabitated with a partner than controls. The average duration of dyspareunia was 5.4 years ($SD = 4.4$). For 28 (58.3%) of the women with dyspareunia, the pain during intercourse was a lifelong problem, and 34 (70.8%) women with dyspareunia were diagnosed with VVS.

To examine whether there were any differences in sexual function between the two groups of women, participants completed the FSFI (see Table I). T-tests indicated significant lower levels of Desire, Arousal, Lubrication, Orgasm, Satisfaction, and significant higher levels of Pain among the dyspareunia group versus the control group ($p < .0001$). These results serve as a validity check on the classification of women as sexually functional and dysfunctional.

Table I. Demographic and sexual function characteristics

	Dyspareunia (<i>n</i> = 48)		Controls (<i>n</i> = 48)		χ^2 or <i>t</i> -values
<i>Characteristics</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
Age (in years)	25.9	5.6	23.9	5.1	<i>t</i> = 1.90
Duration relationship (in years)	5.6	4.7	2.9	3.2	<i>t</i> = 3.31*
Married/co-habiting, N (%)	31 (64.6)		15 (31.3)		χ^2 = 10.69*
Children, N (%)	3 (6.3)		3 (6.3)		χ^2 = 0.0
Onset dyspareunia					
Lifelong, N (%)	28 (58.3)				
Diagnosis of VVS, N (%) ^a	34 (70.8)				
Duration dyspareunia (in years)	5.4	4.4			
FSFI subscales					
<i>Desire</i>	3.1	1.0	4.3	0.7	<i>t</i> = 6.70**
<i>Arousal</i>	3.8	1.5	5.4	0.6	<i>t</i> = 8.01**
<i>Lubrication</i>	3.9	1.7	5.9	0.2	<i>t</i> = 9.17**
<i>Orgasm</i>	4.1	1.7	5.2	1.0	<i>t</i> = 4.09**
<i>Satisfaction</i>	3.6	1.2	5.5	0.7	<i>t</i> = 10.27**
<i>Pain</i>	1.4	1.2	5.8	0.4	<i>t</i> = 29.41**

Note: Range for FSFI subscales: *Desire* (1-5), *Arousal* (0-5), *Lubrication* (0-5), *Orgasm* (0-5), *Satisfaction* (0-5) and *Pain* (0-5). Lower scores indicate worse sexual function. FSFI = Female Sexual Function Index; VVS = Vulvar Vestibulitis Syndrome.

^aData of one subject were missing.

**p* < .01. ** *p* < .0001.

Differences in tactile and pain thresholds, and pain tolerance levels were nonsignificant between the dyspareunia and control group. However, when a distinction was made between women with dyspareunia resulting from VVS and women with dyspareunia complaints without a diagnosis of VVS, significant differences were found for pain threshold levels, $F(2, 92) = 3.81, p < .03$, and pain tolerance levels, $F(2, 92) = 3.12, p \leq .05$, and a trend effect was observed for tactile thresholds, $F(2, 92) = 2.41, p = .096$, when these two dyspareunia subgroups and controls were

Table II. Tactile and pain thresholds and pain tolerance levels in milli Amperes (mA)

	Dyspareunia with VVS (<i>n</i> = 34)	Dyspareunia without VVS (<i>n</i> = 14)	Controls (<i>n</i> = 48)	<i>F</i> -values	Post hoc analyses ^a
	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>		
Tactile thresholds	0.48 (0.23)	0.71 (0.44)	0.64 (0.44)	2.41	1 < 2 = 3
Pain thresholds	1.52 (1.31)	2.79 (1.79)	2.68 (2.57)	3.81*	1 < 2 = 3
Pain tolerance levels	11.91 (17.21)	20.7 (18.77)	22.18 (27.87)	3.11*	1 < 2 = 3

Note: The table presents untransformed data. Analyses are conducted on transformed data. VVS = Vulvar Vestibulitis Syndrome.

^a1 = dyspareunia with VVS; 2 = dyspareunia without VVS; 3 = controls

**p* ≤ .05

compared. As listed in Table II, post-hoc analyses revealed that women with dyspareunia resulting from VVS indicated significantly lower pain thresholds and pain tolerance levels and lower tactile thresholds as compared to both women with dyspareunia without VVS and controls, whereas the dyspareunia group without VVS and the control group did not differ on those variables.

Preliminary results

Prior to analysis, all dependent variables were examined for fit between their distributions and the assumptions of multivariate analyses. Data for difference scores for VPA and negative affect had a positively skewed distribution. For VPA a square root transformation was applied, whereas for negative affect a reciprocal transformation was applied. These transformations resulted in a quasi-normal distribution with adequate skewness (< 1.0) (Tabachnick & Fidell, 2001).

To inspect if there were any differences in baseline levels of genital arousal and subjective sexual arousal prior to the erotic film clips between groups and conditions, the data were compared for Group and Pain Threat. It was found that baselines did not significantly differ between groups and conditions (pain threat/no-threat).

In addition, it was checked if genital arousal increased during erotic stimuli compared to neutral stimuli (i.e., baselines). Therefore, comparisons of mean VPA levels during the erotic fragments and neutral films were conducted between the

dyspareunia group and the control group by pain threat conditions. Genital arousal during the erotic films significantly increased compared to preceding baselines, indicating that the erotic films were effective in enhancing sexual arousal in both groups of women during both the pain threat and no-threat condition. Furthermore, the two erotic stimuli were equally genitally arousing.

Manipulation check

Skin Conductance Levels (SCL). A 2 (Group) x 2 (Pain Threat) x 2 (Threat Order) ANOVA for mean SCL difference scores revealed a significant main effect for Pain Threat, $F(1, 85) = 22.07, p < .0001, f = 0.51$. In addition, a significant Pain Threat x Threat Order interaction effect, $F(1, 85) = 80.59, p < .0001$, was observed, such that participants displayed lower SCL while watching the second erotic clip, irrespective of threat condition. This effect can be attributed to the finding that SCL during the second baseline was significantly higher than SCL during the first baseline, such that the difference scores in SCL to the second erotic clip were smaller. When only the first presented erotic clip was inspected, it was found that participants exposed to the pain threat displayed higher SCL than participants who were not threatened. Similarly, when only the second erotic clip was inspected, participants in the pain threat condition displayed higher SCL than participants in the no-threat condition. As such, these results support the Pain Threat main effect. That is, the pain threat condition resulted in significantly higher SCL than the no-threat condition. These results signify that the manipulation of pain-related fear had been successful (see Table III).

Subjective threat. A 2 (Group) x 2 (Pain Threat) x 2 (Threat Order) ANOVA for mean ratings on the subjective threat subscale revealed significant main effects of Pain Threat, $F(1, 94) = 43.09, p < .0001, f = 0.68$, and Group, $F(1, 94) = 4.55, p \leq .05, f = 0.22$. Participants had higher scores on the subjective threat subscale during the threat condition compared to the no-threat condition. Besides, the dyspareunia group reported overall more subjective threat than the control group (see Table III). Together with the results for skin conductance levels, these findings indicate that pain-related fear was successfully elicited during the pain threat condition.

Table III. Group differences in difference scores (relative to preceding baseline) for Mean Vaginal Pulse Amplitude (VPA) levels (in millivolts [mV]), mean Skin Conductance Levels (SCL [in uSiemens]), and mean ratings on the subscales genital sensations, positive affect, negative affect and subjective threat scale during the Pain Threat and the No-threat condition.

	Dyspareunia (<i>n</i> = 48)	Controls (<i>n</i> = 48)	<i>F</i> -values	
<i>Measure / Condition</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	Condition	Group
Genital sexual arousal				
Pain Threat	1.70 (1.29)	1.62 (1.30)	5.77*	0.02
No-threat	1.90 (1.53)	1.94 (1.45)		
Total	1.78 (1.32)	1.77 (1.28)		
Genital sensations				
Pain Threat	2.79 (1.25)	2.75 (1.41)	3.48	0.03
No-threat	2.96 (1.41)	3.04 (1.58)		
Total	2.88 (1.19)	2.89 (1.38)		
Positive affect				
Pain Threat	1.83 (1.05)	2.75 (1.41)	16.19**	0.70
No-threat	2.13 (1.31)	3.04 (1.58)		
Total	1.98 (1.10)	2.08 (1.34)		
Negative affect				
Pain Threat	0.51 (0.65)	0.29 (0.61)	29.18**	6.79*
No-threat	0.21 (0.60)	-0.02 (0.35)		
Total	0.36 (0.55)	0.13 (0.41)		
Skin Conductance Level#				
Pain Threat	1.52 (3.84)	1.54 (3.88)	22.07**	0.56
No-threat	-1.13 (2.83)	-0.52 (3.72)		
Total	0.20 (1.79)	0.51 (2.09)		
Subjective threat				
Pain Threat	0.75 (1.15)	0.49 (1.36)	43.03**	4.55*
No-threat	-0.15 (1.37)	-0.37 (0.51)		
Total	0.30 (0.65)	0.06 (0.76)		

Note: The table presents untransformed data. For VPA and negative affect analyses (including effect sizes) are conducted on transformed data. Mean difference scores were calculated over both threat orders. Mean difference scores separately for each threat order are available on request.

#SCL-recordings of 7 women with dyspareunia were not conducted.

* $p \leq .05$. ** $p < .0001$.

Effects of the experimental manipulation

Genital sexual arousal. Table III shows the untransformed mean VPA difference scores for both groups. A 2 (Group) x 2 (Pain Threat) x 2 (Threat Order) ANOVA for square root transformed VPA difference scores yielded a significant main effect of Pain Threat, $F(1, 92) = 5.77, p < .02, f = 0.25$. In addition, a significant Pain Threat x Threat Order interaction effect, $F(1, 92) = 5.40, p < .025$, was observed, such that mean VPA levels in the no-threat condition were higher than in the threat condition when the no-threat condition was presented first, whereas mean VPA in the no-threat condition was similar to mean VPA in the threat condition when the no-threat condition was presented second. This effect was due to the finding that participants did not return to their original VPA baseline levels. Because of higher baseline levels during the second baseline assessment, the difference scores in VPA in response to the second erotic clip were smaller. When only the first presented erotic clip was inspected, it was found that participants exposed to the pain threat reacted with lower VPA levels than participants who were not threatened. Similarly, inspection of the second erotic clip revealed that participants in the pain threat condition displayed lower VPA levels than participants in the no-threat condition. As such, these results support the Pain Threat main effect. Thus, in line with expectations, threat of pain was found to negatively affect genital arousal in both the dyspareunia group and the control group. Contrary to our expectations, however, was the absence of a significant Pain Threat x Group interaction, $F(1, 92) = 0.77, p > .38, f = .09$, implying that the dyspareunia group had similar VPA levels as the control group irrespective of pain threat induction (see Table III).

To examine whether genital responses of both groups would differ over time during the pain threat and no-threat condition, a 2 (Group) x 2 (Pain Threat) x 2 (Threat Order) x 8 (Epoch) analysis was conducted. As can be seen in Figure 1, the pattern of VPA levels over time for both groups during both conditions was quite similar ($p > .38$).

Subjective reports: genital sensations, positive and negative affect. Three separate 2 (Group) x 2 (Pain Threat) x 2 (Threat Order) ANOVA's were conducted with mean difference scores for genital sensations and positive affect and with reciprocal-transformed difference scores for negative affect. A significant main effect of Pain Threat was found for positive affect, $F(1, 94) = 16.19, p < .0001, f = 0.42$, and

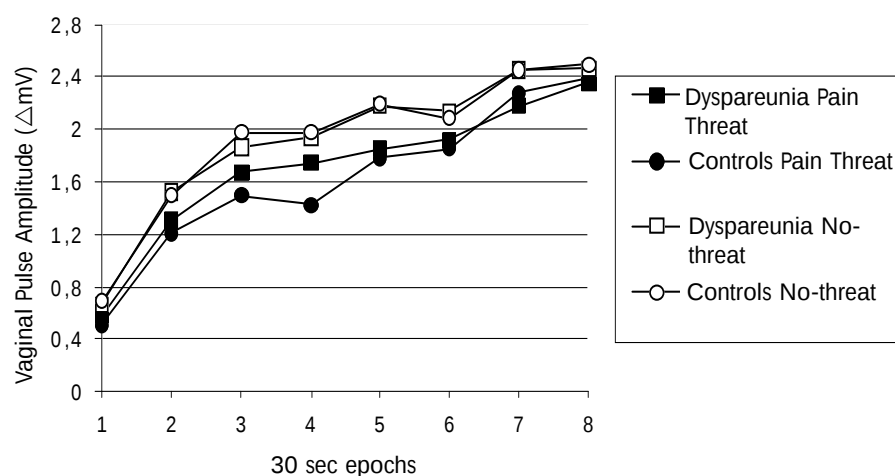


Figure 1. Variations in Vaginal Pulse Amplitude (in millivolts [mV]) relative to preceding baseline during the Pain Threat and the No-Threat condition in women with dyspareunia and controls. Data are averaged over 30-second epochs and are calculated over both Threat Orders.

negative affect, $F(1, 94) = 29.18, p < .0001, f = 0.56$, and a trend for genital sensations, $F(1, 94) = 3.48, p = .065, f = 0.19$, respectively. In line with our expectations, these results indicate that under threat participants rated the erotic film clip as less positive and more negative. Women had marginally lower ratings of genital sensations during the pain threat condition. In addition, a significant main effect of Group was found for negative affect, $F(1, 94) = 6.77, p < .015, f = 0.27$. Compared to the control group, the dyspareunia group reported significantly more negative feelings to exposure to the erotic stimuli, whether with or without pain threat. Contrary to expectations, no significant group differences were found in ratings of positive affect. Table III provides the mean difference scores on subjective reports for both groups of women.

Concordance between genital arousal responses and subjective reports
Pearson product-moment correlations were calculated between mean VPA difference scores and mean difference scores for ratings of genital sensations, positive and negative affect, and subjective threat collapsed across groups and conditions¹. Significant and negative correlations were found between VPA levels and negative

¹Post-hoc multiple regression analyses did not reveal a Group x Pain Threat interaction in the concordance between genital arousal and subjective measures.

affect ($r = -.27, p < .01$) and subjective threat ($r = -.29, p < .01$). The negative association between VPA levels and subjective threat supports our finding that genital arousal declined when women were threatened.

Post-hoc analyses

Since women with dyspareunia resulting from VVS differed from women with dyspareunia without VVS and controls in tactile/ pain sensitivity, data for all dependent variables were subjected to 3 (Group: VVS/no-VVS/controls) $\times$ 2 (Pain Threat) $\times$ 2 (Threat Order) ANOVA's. The findings of these post-hoc analyses were comparable with the findings of the 2 (Group) $\times$ 2 (Pain Threat) $\times$ 2 (Threat Order) ANOVA's.

DISCUSSION

This experiment examined the role of pain-related fear in women with superficial dyspareunia. As predicted, pain threat impeded genital arousal and positive affect, whereas it amplified negative affect in both women with superficial dyspareunia and sexually functional women. The dyspareunia group did not differ from controls in genital arousal during the pain threat condition. They also showed similar genital responsiveness during the no-threat condition as controls. As expected, the dyspareunia group reported overall more negative feelings than the control group. In addition, the dyspareunia group experienced more threat during the entire experiment than the control group.

During pain threat, skin conductance levels and ratings of experienced threat were significantly elevated in both groups of women. These findings convert to the conclusion that pain-related fear was adequately elicited. Based on research pointing to hypervigilance to both genital-related and non-genital related pain in women with dyspareunia resulting from VVS, as assessed by an emotional Stroop task and questionnaires (Payne et al., 2005), we expected pain-related fear to result in a more pronounced decline in genital arousal in symptomatic women. Given their general hypervigilance to pain, we reasoned that the *threat* to receive painful stimuli, irrespective of location of the pain stimuli, would be sufficient to evoke a more intense fear response in women with dyspareunia relative to controls, resulting in a

lower genital arousal response in the dyspareunia group. However, genital arousal was decreased in all women *to the same extent*.

An explanation for this unexpected finding might be that our pain-related fear manipulation may have targeted a more generalized fear of pain rather than a genital or situation specific fear of pain associated with dyspareunia. Recent findings of Payne and colleagues (Payne, Binik, Pukall, Thaler, Amsel, & Khalifé, *subm.*), however, suggest that this is implausible. In their study of women with dyspareunia resulting from VVS and controls, painful stimuli were administered to non-genital body parts as well as the vulva, both prior to and during exposure to sexual stimuli. They found that genital and non-genital pain stimuli had an equally unfavourable effect on genital sexual arousal in both groups of women. Thus, it is unlikely that the absence of a differential genital response pattern between the two groups during pain threat was caused by a lack of ecological validity.

Another explanation for the analogous pain threat-related decline in genital responding in women with dyspareunia and controls might be related to underpowering. However, this explanation seems unlikely since the study was sufficiently powered to detect differences with medium to large effect sizes. In contrast, an effect size of only .09 for the pain threat x group interaction was found, which is very small and can be considered as a negligible effect (Cohen, 1988). This suggests that pain-related fear truly reduces genital response in symptomatic and control women to the same extent.

A third explanation might be that the dyspareunia sample was not representative with respect to complaint characteristics. A comparison between the present dyspareunia sample and a sample of dyspareunia patients visiting an outpatient clinic for sexology of a university medical hospital ($N = 99$) revealed no significant differences between these samples regarding demographic variables (age, marital status, duration relationship, children), and sexual (dys)function as assessed by the FSFI, although the average duration of dyspareunia was significantly longer in the present sample. Furthermore, in line with other studies (Granot, 2005; Granot, Friedman, Yarnitski, & Zimmer, 2002; Payne et al., 2005; Pukall, Binik, Khalifé, Cohen, & Amsel, 2002), our VVS subgroup demonstrated enhanced pain sensitivity as indicated by lower tactile and pain thresholds and pain tolerance levels during sensory testing on the ankle. Therefore, the possibility that we are not dealing with a

representative dyspareunia sample with serious complaints seems unlikely.

All in all, we believe that the finding that symptomatic women displayed a similar pain threat-related decline in genital arousal as controls should not be attributed to a methodological artifact. The present results cast doubt on the idea that pain-related fear differently affects genital responding in women with and without dyspareunia.

Nevertheless, the present experiment clearly evidenced that pain-related fear impedes genital responding in both women with and without dyspareunia. This observation corresponds with other experimental studies in women that also induced fear simultaneously with the exposure to an erotic stimulus (Beggs, Calhoun, & Wolchik, 1987; Both, Everaerd, & Laan, 2003; Laan et al., 1995). As such, the decline in genital responding might be explained as the result of cognitive distraction from erotic cues. Support for this explanation stems from two laboratory studies demonstrating that cognitive distraction reduces both genital and subjective arousal to erotic stimuli in sexually functional and dysfunctional women (Elliott & O'Donohue, 1997; Saleminck & van Lankveld, 2006). Further support is obtained from studies on chronic pain pointing to an attentional disruption by pain threat (as induced by painful stimuli) (Crombez et al., 1998a; Crombez et al., 1998b; Crombez et al., 2002; Van Damme et al., 2004a; Van Damme et al., 2004b). To conclude this issue, we think that in both groups of women cognitive distraction was responsible for the decline in genital response during pain threat. This is not to say that we can infer the content and/or focus of the distracting cognitions. These may differ between the two groups of women. Further research should be conducted to shed more light on this issue. To the extent that stimuli associated with pain threat are found to demand attention at the expense of other stimuli, our findings bear striking resemblance to Barlow's CB model (1986) that anxiety interferes with attention for erotic cues, thereby impeding sexual arousal.

Pain-related fear also adversely affected subjective reports in both groups of women. When threatened, women reported less positive affect, more negative affect, and they tended to report less genital sensations. These results are consistent with other laboratory studies in women (Both et al., 2003; Laan et al., 1995; Palace & Gorzalka, 1990). In addition, symptomatic women not only reported significantly more negative affect than controls during pain threat, but also during the no-threat

condition. This finding parallels those of previous research in women with dyspareunia as well as other female sexual dysfunction groups (e.g., Brauer et al., 2006; Brauer et al., *subm.*; Laan, van Driel, & van Lunsen., 2003; Meston, 2006; Morokoff and Heiman, 1980), demonstrating that dysfunctional women report more negative affect to sexual stimuli in general, not only during conditions in which negative affect is elicited. A plausible explanation for these differences in subjective reports is that women with sexual dysfunctions in general, and perhaps those with dyspareunia in particular, may differ from sexually functional women in their appraisal of sexual stimuli. The contribution of appraisal of sexual stimuli in the onset and maintenance of sexual (dys)functioning warrants further investigation.

Since the current experiment demonstrated that under the same laboratory conditions women with dyspareunia and controls reacted with similar genital arousal but differed in subjective reports, we infer that dyspareunia seems unassociated with impaired genital responsiveness, but that subjective arousal may be implicated. Additional support for this position stems from other laboratory studies in women with dyspareunia versus controls (Brauer et al., 2006; Brauer et al., *subm.*; Payne et al., *subm.*).

We speculate that differences in genital arousal become apparent in the naturalistic situation at home. Barlow's CB model of sexual dysfunction (1986) and Spano and Lamont's circular model of dyspareunia (1975) combined, we argue that in the case of dyspareunia, during a sexual encounter attention is shifted towards non-erotic stimuli instead of sexually arousing stimuli as a consequence of a negative appraisal of sexual stimuli (e.g., fear of pain). This might result in lack of both genital and subjective sexual arousal. Consequently, insufficient lubrication may occur, causing genital pain. This, in turn, exaggerates feelings of fear and other negative feelings, which might perpetuate dysfunctional sexual responding by contributing to a further avoidance of erotic cues and consequent focus on nonerotic cues. In contrast, sexually functional women are expected to focus on sexually arousing stimuli in the home situation, which enhances sexual arousal, resulting in adequate sexual responding.

In conclusion, pain-related fear adversely impacts genital responsiveness in women with and without dyspareunia to a similar degree, whereas its adverse influence on negative affect is stronger in symptomatic women than in controls. Consistent with

recent reconceptualisations of sexual problems in women (Basson et al., 2003; Laan, Everaerd, & Both, 2005), these results emphasize the relevance of subjective sexual arousal problems in the development and maintenance of dyspareunia. As such, these findings are analogous to research on chronic pain pointing to a discrepancy between objective physiological pathology and subjective variables such as pain-related fear and catastrophizing (e.g., Peters, Vlaeyen, & Weber, 2005; Severeijns, Vlaeyen, van den Hout, & Weber, 2001). The current results advocate a therapy focused at anxiety reduction and enhancement of subjective sexual arousal.

C H A P T E R

4

**Effects of appraisal of sexual stimuli on sexual
arousal in women with and without superficial
dyspareunia**

BRAUER, M., TER KUILE, M. M., & LAAN, E. (IN PRESS).
ARCHIVES OF SEXUAL BEHAVIOR.

ABSTRACT

This study examined the effects of appraisal of sexual stimuli on sexual arousal in women with superficial dyspareunia ($n = 50$) and sexually functional women ($n = 25$). To elicit different appraisals of an erotic film fragment, participants received an instruction prior to viewing it, with a focus on genital pain or on sexual enjoyment. A neutral instruction served as a control condition. Assignment to instruction condition was randomized. Genital arousal (vaginal pulse amplitude) and self-report ratings of affect and genital sensations were obtained in response to the erotic stimulus. As predicted, appraisal of the erotic stimulus affected genital responding, albeit marginally significant. Follow-up tests indicated that women who received the genital pain instruction responded with marginally significant lower genital arousal levels than women who received the sexual enjoyment instruction ($d = 0.67$). A significant instruction effect for negative affect was found, signifying that negative affect ratings were highest after the genital pain instruction and lowest after the sexual enjoyment instruction ($d = 0.80$). A marginally significant group by instruction interaction effect was observed for positive affect, indicating that women with dyspareunia reported significantly less positive affect than controls after the sexual enjoyment instruction ($d = 1.48$). Whereas women with dyspareunia reported overall marginally significant more negative affect than controls ($d = 0.48$), there were no differences in genital responsiveness between groups. These results provided preliminary evidence for the modulatory effects of appraisal of sexual stimuli on subsequent genital responding and affect in women with and without sexual complaints.

INTRODUCTION

Most people have expectations of enjoyment when encountering a sexual situation, although some people, under the same circumstances, experience fear, disgust, and other negative emotions. Apparently, one and the same stimulus event may be evaluated or "appraised" in different or even opposite ways. Appraisal refers to the mechanisms which give a stimulus event emotional meaning and is widely held to shape experiential/emotional, physiological, and behavioral responses to stimulus events (e.g., Cacioppo, Berntson, Larsen, Poehlmann, & Ito, 2000). Also, current information processing models on sexual arousal (Janssen, Everaerd, Spiering, & Janssen, 2000; Laan & Janssen, 2007; but see also Barlow, 1986; Basson, 2002) posit that the appraisal of a sexual cue is important in determining whether or not a full-blown sexual response will occur. This means that individuals who appraise a sexual cue positively are hypothesized to maintain their attention to it. This, in turn, will further enhance autonomic arousal resulting in adequate genital sexual responding together with a subjective experience of sexual arousal. In contrast, individuals who appraise sexual stimuli in a predominantly negative way are thought to be more likely to attend to nonsexual, threatening cues (e.g., performance related concerns or anticipated pain during intercourse) which minimizes further processing of sexual stimuli. Distraction from sexually arousing stimuli may subsequently lead to low levels of genital and subjective sexual arousal which interferes with adequate sexual functioning (e.g., Barlow, 1986; Janssen et al., 2000; Laan & Janssen, 2007; Sbrocco & Barlow, 1996).

In women, lack of genital sexual arousal may lead to vaginal dryness. One of the most prevalent female sexual dysfunctions is dyspareunia (i.e., persistent or recurrent genital pain associated with intercourse), in which vaginal dryness in combination with enhanced pelvic floor muscle tone is hypothesized to play an important role in the onset and/or maintenance of this medically unexplained condition (Spano & Lamont, 1975; ter Kuile & Weijnenborg, 2006; van Lunsen & Ramakers, 2002).

There are some indications that a negative appraisal of sexual stimuli is implicated in dyspareunia given the observation that symptomatic women have consistently reported more negative cognitive-affective evaluations of sexual encounters than

women without sexual complaints (Brauer, ter Kuile, Laan, & Trimbos (in press); Nunns & Mandal, 1997; van Lankveld, Weijnenborg, & ter Kuile, 1996). Further support was obtained in an experimental study in which women with and without dyspareunia were threatened to receive painful stimuli during exposure to an erotic film fragment (Brauer, ter Kuile, Janssen, & Laan, 2007). As compared to a control condition consisting of an erotic film without simultaneous threat, diminished genital arousal was observed in both groups of women in the threat condition. The erotic film in the threat condition also evoked more negative affect in both groups of women. These findings suggest that the threatening context in which the erotic stimulus was shown adversely influenced the meaning of that stimulus, resulting in diminished genital arousal and stronger negative affect.

Along the same lines, several experimental manipulations (e.g., suppression, performance demand, sexual scripts, stress) in sexually functional women have resulted in different levels of genital and subjective sexual arousal relative to control conditions (e.g., Laan, Everaerd, van Aanhoud, & Rebel, 1993; Kuffel & Heiman, 2006; ter Kuile, Vigeveno, & Laan, 2007). For instance, Beck and Baldwin (1994) asked sexually functional women to suppress sexual arousal through any means other than looking away from the screen on which an erotic film fragment was presented. Women who successfully suppressed their genital arousal responses reported the use of negative cognitive evaluations regarding the film or the sexual acts, such as "I imagined that she [the actress] was in pain." In other words, a negative (re-)appraisal of the sexual stimulus inhibited subsequent genital responding.

Corresponding with the above outlined model on sexual arousal, these cumulative findings suggest that experimental manipulations bias the way sexual stimuli are appraised, which, in turn, influences genital responses and subjective reports (Janssen et al., 2000; Laan & Janssen, 2007).

Suggestive as these observations may be, they provide no direct support for the assumption that appraisal influences genital and subjective sexual arousal. Perhaps other cognitive (e.g., distraction) or physiological mechanisms (e.g., enhanced sympathetic nervous system activation) were (to some extent) responsible for the dissimilar levels of genital arousal in experimental versus control conditions. Despite a growing body of literature describing how appraisal mechanisms modulate physio-

logical responses and emotional reactions to other emotional stimuli (for a review, see Ochsner & Gross, 2005), we do not know of any direct empirical assessment of the influence of appraisal of sexual stimuli on genital and subjective sexual arousal in women. Therefore, the purpose of the present study was to experimentally manipulate directly the appraisal of a sexual stimulus in order to study its effects on sexual arousal in women with and without dyspareunia.

Relying on research in other fields of psychology that have shown that the appraisal of one and the same stimulus can be successfully manipulated by providing discrepant information regarding that stimulus (cf. Arntz & Claassens, 2003; Lamm, Batson, & Decety, 2007; Mosely & Arntz, 2007), the present study used a similar methodology. All participants were presented with an erotic film fragment depicting explicit heterosexual intercourse, in which the actress was behaving ambiguously. That is, it was not obvious whether she enjoyed having intercourse or that she disliked it and maybe experienced it as painful. Prior to viewing, participants were given one of three instructions. In the genital pain instruction, participants were informed that the actress' behavior reflected expressions of genital pain. In the sexual enjoyment instruction they were told that her behavior was indicative of enjoyment and pleasure. Also a control condition was created, in which no specific information regarding the actress' behavior was given. The genital pain instruction prior to the erotic stimulus was chosen as an analogue of the expectation of experiencing pain during intercourse as assumed to exist in women with dyspareunia (e.g., Payne, Binik, Amsel, & Khalifé, 2005; Spano & Lamont, 1975; ter Kuile & Weijenborg, 2006), whereas the sexual enjoyment instruction was used as an analogue to the expectation of experiencing enjoyment during intercourse in sexually functional women.

In conjunction with current information processing models on sexual arousal (Janssen et al., 2000; Laan & Janssen, 2007), it was predicted that, of all three instruction conditions, the pain instruction would result in the lowest levels of genital arousal and the sexual enjoyment instruction in the highest levels. With respect to subjective reports of affect, participants were predicted to report the highest level of negative affect and lowest level of positive affect in the genital pain instruction condition, whereas the reverse pattern was expected for the sexual enjoyment instruction condition. Based on the assumption that the modulatory effects of

appraisal on sexual arousal refer to a general mechanism, we hypothesized the manipulation effects on genital and subjective sexual responding to point in the same direction for both women with dyspareunia and sexually functional women. Furthermore, exploratory analyses were conducted to investigate whether women with dyspareunia differed from controls in their genital arousal levels and subjective reports.

METHOD

Participants

The study sample consisted of 50 women with dyspareunia and 25 women without sexual complaints. These women had taken part in a psychophysiological study on sexual arousal and were immediately following the experimental assessment invited to stay and participate in the present study. All participants gave their informed consent for the present study and participated. The objective of the preceding study was to investigate whether women with dyspareunia and sexually functional women differed in their genital and subjective sexual arousal responses to visual sexual stimuli, including coitus (Brauer et al., 2006). With respect to the present study, participants were informed that the purpose was to evaluate new erotic stimulus materials on its suitability for a future study. The Local Ethics Committee of the Leiden University Medical Center approved both studies.

The inclusion criterion for women with dyspareunia was complaints of superficial (=introital) dyspareunia in minimally 50% of intercourse attempts for at least 6 months. Exclusion criteria for women with dyspareunia were somatic conditions responsible for dyspareunia (e.g., active vulvovaginal infections), generalized vulvodynia (unprovoked chronic vulvar burning, itching or irritation in the whole vulvar region), and lifelong vaginismus. Vulvar vestibulitis syndrome (VVS), recently redefined as provoked vestibulodynia (Edwards, 2004), was not an exclusion criterion since the etiology of VVS remains largely unknown (Lotery, McClure, & Galask, 2004). Women without sexual complaints were included if they had had no sexual complaints for at least one year, were sexually active including intercourse, had had their first coital experience more than a year ago, and had partners without severe sexual complaints that could impede intercourse. Women from both groups

were excluded if any of the following applied: pregnancy or lactation; a diagnosis of affective, psychotic or substance related disorder according to DSM-IV-TR (American Psychiatric Association, 2000); and having undergone a hysterectomy or prolapse surgery.

The screening procedure was already conducted in advance of the preceding study. Following an initial telephone screening, women underwent subsequent screening at the Sexology Outpatient Clinic of the Department of Gynecology of a university medical center to determine further suitability for the study. Screening consisted of a structured sexual function interview, a DSM-IV-TR based semi-structured psychiatric interview (MINI International Neuropsychiatric Interview [MINI]; Lecrubier et al., 1997; Sheenan et al., 1997), and a standardized gynecological examination for sexual pain disorders (see de Kruiff, ter Kuile, Weijnenborg, & van Lankveld, 2000).

Of 113 women who responded to the advertisements, 84 (74%) women appeared eligible during the first telephone interview and were further screened at the Sexology Outpatient Clinic. Of 57 screened women with dyspareunia, 4 (7%) were excluded and 3 (5%) eligible women withdrew from the study. Of the excluded symptomatic women, one was diagnosed with lifelong vaginismus during the physical examination and one was diagnosed with vulvodynia. The third woman experienced pain during less than 50% of intercourse attempts. The fourth woman was excluded because she experienced difficulties with comprehending the questions during the interview and with completing the questionnaires. Of the women with dyspareunia who withdrew, one explained that she was afraid of inserting the vaginal photoplethysmograph. The second woman became severely ill and the third one withdrew without offering a reason. Of 27 screened women without sexual complaints, 25 (93%) were eligible. One ineligible woman had had first coital experience less than 1 year ago. The other woman was diagnosed with depressive disorder. Women who withdrew or were excluded after screening were paid €12.50.

At the end of the psychophysiological assessment of the preceding study, participants were presented with a 9 min neutral film clip as a return to baseline measurement. The last minute was used as the new VPA baseline level. After the participant had given her informed consent to participate in the present study, she was presented with one of the three instructions followed by the erotic film clip. Self-

report ratings of affect and genital sensations were collected immediately after exposure to the erotic stimulus. Next, the credibility of the genital pain and sexual enjoyment instructions was assessed as a manipulation check. Participants received a compensatory fee of €50 for completing the entire procedure. Travelling expenses were also reimbursed.

Table I shows the demographic and complaint characteristics. The mean age of women with dyspareunia was 28.2 years ($SD = 6.7$) and of controls 26.6 years ($SD = 7.5$). There were no significant group differences with respect to age, relationship duration, and parental status. In contrast to controls, a significantly larger percentage of women with dyspareunia lived together with their partner. The average duration of dyspareunia was 6.2 years ($SD = 4.2$). Twenty-three (47.9%) symptomatic women had experienced genital pain since first intercourse, and 31 (64.6%) symptomatic women were diagnosed with VVS (provoked vestibulodynia).

Table I. Demographic and sexual function characteristics

<i>Characteristics</i>	Dyspareunia (<i>n</i> = 48)		Controls (<i>n</i> = 24)		χ^2 or <i>t-values</i>
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
Age (in years)	28.2	6.7	26.6	7.5	$t = 0.95$
Duration relation (in years)	6.4	4.8	4.9	7.3	$t = 1.05$
Married/co-habiting, N (%)	38 (79.2)		10 (41.7)		$\chi^2 = 10.13^*$
Children, N (%)	5 (10.4)		4 (16.7)		$\chi^2 = 0.57$
Onset dyspareunia					
Lifelong, N (%)	23 (47.9)				
Diagnosed with VVS	31 (64.6)				
Duration dyspareunia (in years)	6.2	4.2			
FSFI subscales					
<i>Desire</i>	2.6	1.1	4.1	1.0	$t = -5.72^*$
<i>Arousal</i>	3.1	1.7	5.1	1.3	$t = -5.70^*$
<i>Lubrication</i>	3.4	1.8	5.6	1.3	$t = -6.16^*$
<i>Orgasm</i>	3.4	1.9	4.9	1.6	$t = -3.49^*$
<i>Satisfaction</i>	3.3	1.3	5.5	0.5	$t = -10.48^*$
<i>Pain</i>	1.2	1.3	5.6	1.3	$t = -13.68^*$
Total score	17.1	6.8	30.9	5.8	$t = -9.09^*$

Note: VVS = Vulvar Vestibulitis Syndrome; FSFI = Female Sexual Function Index

* $p < .01$.

Measures

Instructions. In the experimental conditions, participants were informed that the actress' behaviors reflected either expressions of genital pain (genital pain instruction condition) or sexual enjoyment (sexual enjoyment instruction condition). In the control condition, an instruction was given in which no specific information regarding the actress' behavior was provided (neutral instruction condition). By means of a blocked randomization procedure, participants were assigned to one of the three instructions. The instruction was conveyed by the experimenter via an intercom. The genital pain instruction was: "At the moment, we are preparing another study for which we selected an erotic fragment. Up till now, several women have watched this fragment. Some of them told us that they had the impression that the actress was experiencing pain during intercourse and that she shouted because she felt pain. We would like you to watch this video as well and rate it afterwards. We are interested in your opinion". The sexual enjoyment instruction was: "At the moment, we are preparing another study for which we selected an erotic fragment. We have chosen this fragment because we had the impression that the actress really enjoyed having intercourse. We would like you to watch this video as well and rate it afterwards. We are interested in your opinion". The neutral instruction was: "At the moment, we are preparing another study for which we selected an erotic fragment. We would like you to watch this video as well and rate it afterwards. We are interested in your opinion".

Stimulus materials. A neutral and a sexual film clip with sound were used. The neutral video clip was taken from *Die Salzmänner von Tibet*, a documentary about a nomadic tribe in Tibet. The duration of the neutral film clip was 9 min. The erotic video clip was selected from *One Size Fits All*, a so-called women-friendly erotic film directed by Candida Royalle (Laan, Everaerd, van Bellen, & Hanewald, 1994). The sex stimulus was taken from the first scene of the film and lasted 3 min. The sex clip depicted an intercourse scene with explicit penis in vagina movements. The actress in the film was behaving ambiguously: it was not obvious whether she enjoyed having intercourse or that she disliked it and maybe experienced it as painful. Although the actress encouraged the actor verbally, her nonverbal behavior suggested the opposite (e.g., cramping, pushing the actor away during initial penetration). The sounds she produced could be interpreted as either an expression

of enjoyment or as an expression of pain.

Manipulation check. In order to assure the credibility of the genital pain and sexual enjoyment instructions, two face-valid open questions were used. Participants in the genital pain instruction were asked: "Prior to watching the film fragment, we informed you that several women who have already seen this fragment thought that the female actress was experiencing pain during intercourse and that she shouted because she felt hurt. What is your opinion about the actress' behavior?" Participants in the sexual enjoyment instruction condition were asked: "We have selected this fragment because we had the impression that the actress really enjoyed having intercourse. What is your opinion about the actress' behavior?" Participants in the neutral condition were asked if they had any comments on the film fragment. All participants were requested to write down their answer.

Genital sexual arousal. To measure genital arousal, vaginal pulse amplitude (VPA) was assessed by a vaginal photoplethysmograph. The photoplethysmograph is a menstrual tampon-sized device, containing an orange-red light source and a photocell. The light source illuminates the capillary bed of the vaginal wall and the phototransistor responds to the light backscattered by the vaginal wall and the blood circulating within it. When the signal is connected to an alternating current (AC) amplifier, VPA is measured, which reflects the phasic changes in vaginal engorgement accompanying each heart beat, with larger amplitudes reflecting higher levels of vaginal vasocongestion. For a detailed description of this measure, see Laan, Everaerd, and Evers (1995). During the experimental session, VPA was continuously recorded. VPA was sampled at 20 Hz across baseline and subsequent trials. A two-pass algorithm for automatic artefact removal (© Molenkamp Technical Support Group, University of Amsterdam) was used to analyze the VPA data. After artefact deletion, peak-to-trough amplitude was calculated for each remaining pulse. Depth of the probe and orientation of the light source were controlled by a plate attached to the cable within 5 cm of the light sensor. Participants were instructed to insert the probe such that the plate touched their labia. The probe and plate were disinfected by means of a plasma sterilization procedure between uses.

Subjective self-reports. Immediately following the erotic film clip, the participant was asked to assess on a 7-point Likert scale the degree to which she was experiencing negative affect (6 items, e.g., disgust and shame), positive (5 items, e.g., excited and

longing), and genital sensations (6 items, e.g., genital pulsing and throbbing). The extremes of the 7-point scales were "not at all" and "very strong." These 17 items were taken from a questionnaire constructed by Heiman and Rowland (1983).

Assessment of sexual function. At the end of the sexological screening, participants completed the Female Sexual Function Index (FSFI; Rosen et al., 2000). The FSFI is a brief self-report measure composed of six subscales: desire, arousal, lubrication, orgasm, satisfaction, and pain. Based on a Dutch sample consisting of approximately 350 women with and without sexual complaints, the internal consistency and stability of the FSFI were found to be satisfactory to good. The FSFI's ability to discriminate between sexually functional and dysfunctional women was excellent as was the ability to predict the presence or absence of sexual complaints. Finally, the convergent and divergent construct validity was good (ter Kuile, Brauer, & Laan, 2006).

As can be seen in Table I, analysis of the FSFI scores indicated significantly lower levels of desire, arousal, lubrication, orgasm, and satisfaction, and significantly higher levels of pain in the dyspareunia group than the control group ($ps < .01$). These results serve as a validity check on the classification of women as sexually functional and dysfunctional.

Data analysis

VPA data were entered in a computer program. After artefact deletion, peak-to-through-amplitude was calculated for each remaining pulse, and averaged over 30-sec epochs. For the baseline recording, a mean baseline score per participant was calculated. For the erotic stimulus, a mean VPA difference score was calculated by averaging all epochs (6) of the erotic stimulus minus the mean preceding baseline. The genital arousal data were evaluated in a 2 (Group) $\times$ 3 (Instruction) ANOVA, with mean VPA difference scores as the dependent variable. In order to investigate differences in subjective experience, the three subscales, negative and positive affect, and genital sensations were evaluated in 2 (Group) $\times$ 3 (Instruction) ANOVA's. For all analyses, two-tailed tests were used with α set at .05. We used f as an effect size measure for the ANOVA's, with f being calculated as a function of η^2 (see Cohen, 1988, p. 284), and Cohen's d for Tukey HSD post-hoc contrasts between instruction conditions. For the sake of clarity, all effect sizes were expressed as ds . For the

purpose of interpretation, $d = 2f$ (see Cohen, 1988, p. 276). Cohen considered effect sizes as small ($d = .20$), medium ($d = .50$), and large ($d = .80$).

Data of one participant with dyspareunia and one sexually functional woman were excluded from analyses. The data of the sexually functional woman were excluded because of too many artefacts in the assessment of VPA. The participant with dyspareunia was excluded from the analyses because the initial doubt of both the experimenter and the gynecologist about the diagnosis was further supported by inconsistencies in her answers to the questions about sexual dysfunction. Due to technical failures, both VPA data and subjective ratings of one woman with dyspareunia were lost, and only subjective ratings for another woman with dyspareunia were lost. Therefore, the VPA analysis consisted of data of 48 women with dyspareunia and 24 women without sexual complaints. The distribution of participants in the three instruction conditions was as follows: Of the 48 women with dyspareunia, 17 participants received the pain instruction, 15 the sexual enjoyment instruction, and 16 the neutral instruction. The number of women without sexual complaints in the three instruction conditions was 9, 8, and 7, respectively.

Prior to analysis, all dependent variables were examined for the assumption of normality (Tabachnick & Fidell, 2001). Data for VPA difference scores and the subscales negative and positive affect had a positively skewed distribution. For VPA, a square root transformation was applied, for negative affect a reciprocal transformation was applied, and for positive affect a logarithmic transformation.

To assess if there were any differences in baseline levels of genital responding prior to the erotic film clips between groups and conditions, the data were compared using a 2 (Group) $\times$ 3 (Instruction Condition) ANOVA. It was found that VPA baselines did not significantly differ between the two groups and three instruction conditions as there were no significant main or interaction effects (all $F_s < .1$).

In addition, to verify that the erotic stimulus facilitated genital responsiveness, a 2 (Group) $\times$ 3 (Instruction Condition) $\times$ 2 (Film Type: Neutral vs. Erotic) MANOVA was conducted with mean baseline VPA levels and mean VPA levels during the erotic clip as the dependent variables. The analysis yielded a main effect of Film Type, $F(1, 66) = 186.73$, $p < .01$, indicating a significant increase in genital responses during exposure to the erotic stimulus than during the neutral stimulus. Follow-up tests indicated that, in every instruction condition, women with and without dyspareunia

reacted with a significant increase in genital response to the erotic film ($p < .01$). It thus can be concluded that the erotic film was effective in eliciting genital arousal in both groups of women during all instruction conditions.

RESULTS

Preliminary analyses

It is imaginable that the insertion of a vaginal probe to measure arousal elicits genital pain in women with dyspareunia whereas it may cause no discomfort in controls. If so, experiences of pain before or during the experimental manipulation, especially in the genital-pain instruction, may have affected the impact of the manipulation differently in the two groups. For instance, painful experiences may strengthen the impact of the genital pain instruction in symptomatic women. Therefore, we checked whether the insertion of the vaginal probe caused more discomfort/pain in symptomatic women than in control women. They could indicate their level of discomfort on a five-point Likert scale, ranging from 1 (not at all) to 5 (intensely). The mean level of discomfort in the dyspareunia group was 1.7 ($SD = 0.8$) versus 1.4 ($SD = 0.7$) in the control group and did not significantly differ between groups, $t(70) = 1.44$, $p > .15$. Pertaining to discomfort due to insertion of the probe, twenty-four symptomatic women (50%) reported "not at all", 16 (33.3%) "very low", and six women (12.5%) "moderate". Only two symptomatic women reported considerable discomfort. Exclusion of their data did not change the results.

Effects of the experimental manipulation

Genital sexual arousal. Table II shows untransformed mean VPA responses in the three instruction conditions. A 2 (Group) $\times$ 3 (Instruction) ANOVA for mean square root transformed VPA difference scores yielded a marginally significant main effect for Instruction, $F(2, 66) = 2.48$, $p = .092$, $d = 0.54$. Participants tended, as expected, to respond with lowest levels of genital sexual arousal to the erotic stimulus when it was preceded by the genital pain instruction and with highest levels of genital arousal when it was preceded by the sexual enjoyment instruction. Tukey HSD contrasts showed that genital arousal responses were only different between the genital pain instruction condition and the sexual enjoyment instruction condition (p

= .06, $d = 0.67$), although it was still a marginally significant effect.

Subjective self-reports: negative and positive affect, and genital sensations. Table II shows untransformed subjective ratings. A 2 (Group) $\times$ 3 (Instruction) ANOVA was conducted with reciprocally transformed ratings of negative affect as the dependent variable. A main effect for Instruction was found, $F(2, 65) = 5.27, p < .01, d = 0.80$, indicating that, in line with predictions, women who received the genital pain instruction reported highest levels of negative affect, whereas women who received the sexual enjoyment instruction reported lowest levels of negative affect. Tukey HSD contrasts showed that the level of negative affect differed significantly between the two experimental conditions (genital pain versus sexual enjoyment) ($p < .05, d = 0.86$) on the one hand, and marginally significant between the sexual enjoyment instruction condition and the neutral instruction condition on the other hand ($p = .07, d = 0.68$). In addition, a marginally significant main effect for Group was found, $F(1, 65) = 3.70, p = .059, d = 0.48$, signifying that the dyspareunia group had overall marginally higher ratings of negative affect than the control group.

For (logarithmically transformed) ratings of positive affect, a 2 (Group) $\times$ 3 (Instruction) ANOVA yielded a marginal interaction effect, $F(2, 65) = 2.98, p = .058, d = 0.60$. Subsequent t -tests were conducted to test for group differences per instruction condition. These analyses indicated that significant group differences were observed only for the sexual enjoyment instruction condition, such that the dyspareunia group reported significantly lower levels of positive affect than the control group, $t = -2.80, p < .05, d = 1.24$. Next, follow-up contrasts were conducted to see how ratings of positive affect were influenced by instruction in each group separately. Analyses showed that, in the dyspareunia group, no significant differences in positive affect ratings existed between the three instruction conditions. Instruction did influence positive affect in the sexually functional group: Tukey HSD contrasts revealed that sexually functional women reported marginally significant lower positive affect when they received the pain instruction ($p = .097$) or the neutral instruction ($p = .081$) as compared to the sexual enjoyment instruction. Women did not differ in their ratings of positive affect in the genital pain and neutral instruction condition.

Finally, a 2 (Group) $\times$ 3 (Instruction) ANOVA with ratings of genital sensations as the dependent variable revealed no significant main or interaction effects.

Table II. Mean scores for genital sexual arousal and mean ratings on the subscales negative affect, positive affect, and genital sensations

	Dyspareunia (<i>n</i> = 48)	Controls (<i>n</i> = 24)	Combined (<i>N</i> = 72)
<i>Measure / Condition</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>
Genital sexual arousal (VPA)			
Pain	1.17 (0.87)	1.34 (0.85)	1.23 (0.85)
Sexual enjoyment	1.79 (1.24)	2.23 (1.79)	1.95 (1.43)
Neutral	1.83 (1.06)	1.33 (1.14)	1.68 (1.08)
Combined	1.59 (1.08)	1.63 (1.32)	
Negative affect			
Pain	2.04 (0.97)	1.61 (0.62)	1.89 (0.88)
Sexual enjoyment	1.52 (0.70)	1.08 (0.13)	1.36 (0.60)
Neutral	1.79 (0.91)	1.71 (0.64)	1.77 (0.82)
Combined	1.80 (0.88)	1.47 (0.57)	
Positive affect			
Pain	2.21 (0.81)	2.56 (0.94)	2.33 (0.86)
Sexual enjoyment	2.39 (1.07)	3.58 (0.88)	2.82 (1.14)
Neutral	2.91 (1.31)	2.54 (1.25)	2.80 (1.10)
Combined	2.50 (1.10)	2.89 (1.09)	
Genital sensations			
Pain	2.64 (0.85)	3.32 (1.59)	3.00 (1.32)
Sexual enjoyment	2.86 (1.78)	4.29 (1.34)	3.66 (1.68)
Neutral	3.16 (1.42)	2.89 (1.54)	3.02 (1.46)
Combined	2.88 (1.36)	3.52 (1.58)	

Note: The table presents untransformed data.

Manipulation check

With respect to the genital pain instruction, 15 (88%) out of 17 women with dyspareunia answered that they thought that the actress experienced pain during intercourse against 2 (22%) out of 9 control women. A subsequent chi-square test revealed that the percentage of women who thought that the actress experienced pain during intercourse was significantly higher in the dyspareunia group than in the control group, $\chi^2(1) = 11.33$, $p < .01$. This finding indicates that the genital pain

instruction was especially credible for symptomatic women. With respect to the sexual enjoyment condition, the majority of women answered to the question "What is your opinion about the actress' behavior?" with statements signifying that the actress had exaggerated her expressions of enjoyment. It was impossible to determine whether these statements indicated that the instruction was credible or not.

Correlations between genital sexual arousal and subjective self-reports
Pearson product-moment correlations were calculated between mean VPA difference scores and mean scores for ratings of genital sensations, positive and negative affect collapsed across instruction conditions and groups. Only a significant and positive correlation was found between VPA levels and genital sensations, $r(69) = .27, p < .05$.

DISCUSSION

This study was the first to investigate directly the effects of experimentally manipulated appraisal of a sexual stimulus on sexual arousal in women with and without dyspareunia. The main findings can be summarized as follows: (1) Appraisal of a sexual stimulus (erotic film fragment) appeared to modulate genital arousal responses and evaluations of negative affect; (2) Whereas women with dyspareunia did not differ in their genital responsiveness from sexually functional women, they reported overall higher levels of negative affect to the erotic stimulus; (3) The sexually functional women seemed more susceptible to the appraisal manipulations given that the largest differences in positive affect resulting from the instructions were found in this group.

The experimental manipulation of appraisal of a sexual stimulus appeared to evoke the intended patterns of genital arousal levels. That is, women who received negative information concerning the erotic film fragment (focus on genital pain) prior to viewing the fragment tended to respond with lower levels of genital arousal as compared to women who received positive information (focus on sexual enjoyment). These results concur with the findings obtained by Beck and Baldwin (1994) in their study on instructional control of genital responding in sexually functional women. They found that women who successfully suppressed their levels of genital arousal

reported the use of negative cognitive evaluations regarding the film or the sexual acts. Moreover, the present results corroborate the modulatory effects of appraisal on physiological responses to other emotional stimuli as reported in earlier studies (see, e.g., Ochsner & Gross, 2005).

Although genital arousal levels in the control condition (neutral information) were, as expected, in between the levels in the two experimental conditions, the effect of the information about the sexual stimulus on genital responsiveness was only marginally significant when the three instruction conditions were statistically compared. Unfortunately, follow-up contrasts revealed that differences in genital responding between the two experimental conditions were also marginally significant ($p = .06$). However, the effect size ($d = 0.67$) that was obtained, points to the magnitude of the impact of appraisal on subsequent genital arousal in the two experimental conditions. As the medium effect size indicates that the sample sizes in the present study were too small, it therefore is conceivable that the study was not sufficiently powered to substantiate these differences. Taken into consideration this medium effect size, an α -value of .05, and a power of .80, only a larger sample size -at least 36 participants per cell- would find a significant differential effect of appraisal of the sexual stimulus on genital arousal responses. Following this, it would be advisable to replicate the present study with a larger sample size in order to arrive at a more solid conclusion regarding the differential impact of appraisal of sexual stimuli on genital responding.

Both women with and without dyspareunia tended to respond with lower levels of genital arousal to the genital pain instruction in contrast to the sexual enjoyment instruction. This observation supports our hypothesis that the modulatory effects of appraisal on sexual arousal refer to a general mechanism in women, irrespective of sexual function status.

Exploratory analysis revealed that the dyspareunia group did not differ in their genital responsiveness from controls. The absence of differences in genital arousal between women with and without dyspareunia concurs with previous laboratory research showing that, relative to controls, women with dyspareunia (Brauer et al., 2006; 2007; Payne et al., 2007) and also women with sexual arousal dysfunction (e.g., Brotto, Basson, & Gorzalka, 2006; Laan, van Driel, & van Lunsen, in press; Meston & Gorzalka, 1996; Middleton, Kuffel, & Heiman, in press; Morokoff &

Heiman, 1980; Salemink & van Lankveld, 2006) were equally genitally responsive. These cumulative findings point to a lack of physiological differences between women with and without superficial dyspareunia, at least under laboratory conditions.

The experimental manipulation of appraisal of a sexual stimulus also had the intended impact on ratings of negative affect such that women who received the genital pain instruction reported significantly more negative affect than women who received the sexual enjoyment instruction. In addition, the dyspareunia group reported overall marginally significantly more negative affect in response to the erotic stimulus than the control group, with a medium effect size ($d = 0.48$). This latter finding parallels those of previous research in women with dyspareunia as well as other female sexual dysfunction groups (e.g., Brauer et al., 2007; Brauer, de Jong, Huijding, Laan, & ter Kuile, in press; Laan et al., in press; Meston, 2006; Morokoff & Heiman, 1980), demonstrating that dysfunctional women report more negative affect to sexual stimuli in general. Elevated reports of negative affect in women with dyspareunia have not only been restricted to the laboratory context, but have also been observed in the home situation (Brauer, ter Kuile, Laan, & Trimbos, in press; Nunns & Mandal, 1997; van Lankveld et al., 1996). These cumulative findings point to a negative appraisal of sexual stimuli associated with sexual dysfunction in women.

The impact of appraisal of a sexual stimulus on ratings of positive affect seemed to be especially apparent in the sexually functional group. These women reported significantly higher levels of positive affect when they received the sexual enjoyment instruction than when they received the genital pain instruction and neutral instruction, respectively. Relative to controls, women with dyspareunia reported significantly less positive affect in the sexual enjoyment instruction condition. Since the same sample of symptomatic women also experienced less positive affect during exposure to sexual stimuli in the experimental study that was conducted prior to the present one (Brauer et al., 2006), this would suggest that women with dyspareunia report less positive affect to sexual stimuli in general. Again, it is possible that the study was not sufficiently powered to substantiate the differences between the two groups in the genital pain instruction condition.

All in all, the current research provided a unique experimental exploration of the

effects of appraisal of sexual stimuli on subsequent sexual arousal in both sexually functional and dysfunctional women. Based on the reasoning that instructions regarding a sexual stimulus influence the appraisal of that stimulus, the present results provide preliminary support for current information processing models on sexual arousal to the extent that appraisal is assumed to modulate levels of genital and subjective sexual arousal (Janssen et al., 2000; Laan & Janssen, 2007). These models presume that when a stimulus elicits predominantly sexual meaning in the memory system, attention further enhances the processing of sexual meaning, eventually leading to the occurrence of a full-blown activation of genital as well as subjective arousal responses. In contrast, inhibition of genital and subjective sexual responding can be understood to involve a predominantly non-sexual or emotionally negative appraisal of relevant stimuli. The sexual enjoyment instruction in the present study might have elicited a positive meaning (appraisal) of the erotic film fragment, leading to enhanced genital arousal responses and reduced levels of negative affect, whereas the instruction with a focus on genital pain might have provoked a predominantly negative appraisal of the sexual stimulus, leading to impaired genital responding and attenuated negative affect.

The observation that the erotic stimulus elicited genital arousal responses after the genital pain instruction in comparison to baseline corresponds with previous studies demonstrating that in women an automatized genital response to sexual stimuli occurs, even when these stimuli have a threatening content (e.g., Laan, Everaerd, & Evers, 1995; Both, Laan, & Everaerd, 2003) or are presented in a threatening context (e.g., Brauer et al., 2007; ter Kuile, Vigeveno, & Laan, 2007). These cumulative findings can be explained in terms of the above information processing model on sexual arousal (Janssen et al., 2000; Laan & Janssen, 2007) which posit that different levels of cognitive processing differentially influence sexual arousal responses. More precisely, when exposed to a sexual cue, the initial -unconscious-appraisal of that cue automatically elicits a genital response. As a next step, the conscious appraisal of the stimulus as emotional (e.g., "this is [not] a sexual arousing stimulus") further determines whether or not a full-blown genital response will occur together with a subjective experience of sexual arousal. Thus, whereas exposure to the erotic stimulus immediately elicited genital responses, the genital pain instruction might have biased the conscious appraisal of the erotic film fragment, such that

further genital responding was impaired.

Although women with dyspareunia and controls reacted genitally similarly under the same laboratory conditions, we speculate that differences in genital responding between these groups of women may become apparent in the more naturalistic situation at home. We expect that the control group only appraised the sexual stimulus as negative in the laboratory setting, because they were influenced by negative information regarding painful intercourse prior to watching the erotic stimulus. It is assumed that they normally appraise sexual stimuli in a positive way, based on past positive sexual experiences. Conversely, in symptomatic women, it is hypothesized that their memories contain more, or more easily accessible threat- or fearful-related information based on prior sexual experiences (e.g., Barlow, 1986; Janssen et al., 2000; Everaerd, Both, & Laan, 2006; van der Velde, & Everaerd, 2001). Hence, they may appraise daily life sexual situations in a predominantly non-sexual, negative way (e.g., "intercourse is painful"). In this respect it is interesting to note that the majority of symptomatic women, but only a minority of control women, concurred with the suggestion in the genital pain condition that the actress was experiencing pain. This suggests that symptomatic women more readily associate a sexual situation with pain. In conclusion, our study suggests that appraisal of a sexual situation is an important determinant in subsequent genital responding and experienced affect in women, irrespective of their sexual function status.

C H A P T E R

5

**Automatic and deliberate affective associations with
sexual stimuli in women with superficial dyspareunia**

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ABSTRACT

Current views suggest that in women with superficial dyspareunia the prospect of penile-vaginal intercourse automatically activates fear-related associations. The automatic activation of negative associations is assumed to interfere with the development of sexual arousal. In turn, this may further aggravate the dyspareunia-related complaints. To assess whether automatic negative associations are involved in this sexual pain disorder, women with superficial dyspareunia ($n = 35$) and a control group ($n = 35$) completed a modified pictorial Affective Simon Task (AST). Questioning the role of dysfunctional automatic associations in superficial dyspareunia, the AST indicated that symptomatic women displayed relatively positive rather than negative automatic associations with sexual stimuli. At the self-report level, however, affective associations with sex cues were significantly more negative for women with dyspareunia than for controls. This discrepancy between "reflective" and "reflexive" affective associations with sexual stimuli in women with dyspareunia points to the relevance of conscious appraisal and deliberate rather than automatic processes in the onset and maintenance of dyspareunia.

INTRODUCTION

Dyspareunia, pain associated with penile-vaginal intercourse, is a common problem in women, with community prevalence rates between 3 and 18% (e.g., Simons & Carey, 2001). In the vast majority of women with dyspareunia, pain is located at the entrance of the vagina, which is the distinguishing factor of superficial dyspareunia. To date, possible underlying somatic and psychological mechanisms have been explored, but a clear etiology has yet to be established (Binik, Meana, Berkely, & Khalifé, 1999; Lotery, McClure, & Galask, 2004).

Anxiety has been implicated as a core feature of sexual dysfunctions in general and dyspareunia in particular (Barlow, 1986; Meana & Binik, 1994; Spano & Lamont, 1975) by impairing sexual arousal. The cognitive theory of anxiety (e.g., Beck, 1976; Beck, Emery, & Greenberg, 1985) posits that fearful individuals are more attentive to emotionally negative, potentially threatening stimuli, which interferes with cognitive processes. Applied to sexual dysfunctions, it is assumed that when attention is preferentially allocated to threatening stimuli during sexual activity, fewer attentional resources will be available for the processing of sexually arousing stimuli. This distraction from sexually arousing stimuli might subsequently result in lack of sexual arousal (Barlow, 1986; Janssen, Everaerd, Spiering, & Janssen, 2000; Laan & Janssen, 2007; Sbrocco & Barlow, 1996; van den Hout & Barlow, 2000). In women, lack of sexual arousal might lead to vaginal dryness and/or increased pelvic floor muscle tone (ter Kuile & Weijnenborg, 2006; van Lunsen & Ramakers, 2002). These reactions, in turn, may result in friction between penis and vulvar skin, which may cause pain (i.e., dyspareunia). Given the threatening nature of pain (e.g., Eccleston & Crombez, 1999; Vlaeyen & Linton, 2000), it is assumed that fear in women with dyspareunia is related to genital pain during intercourse.

The information processing model of sexual arousal has been used to explain in more detail how cognitive processes might affect sexual responding (Janssen et al., 2000; Laan & Janssen, 2007). In this model different levels of cognitive processing are assumed to differentially affect subjective and physiological sexual arousal. That is, relatively automatic cognitions are linked to the physiological components of sexual arousal (e.g., genital arousal), whereas more deliberate cognitions are linked

to the experience of sexual excitement¹. This deliberate appraisal of sexual stimuli is, apart from situational factors, dependent upon recollections of sexual encounters, explicit attitudes towards sex, sexual costs and rewards, and sexual fantasies (Spiering, Everaerd, & Laan, 2004). Awareness of physiological arousal, along with a positive cognitive appraisal of sexual stimuli, may eventually result in the occurrence of full-blown genital and subjective sexual arousal responses. In sexually dysfunctional individuals on the other hand, it is proposed that when a personally relevant stimulus is identified, a threat processing template is automatically activated that serves to attract attention to nonsexual, threatening cues (e.g., cues related to pain during intercourse) and minimizes further processing of sexual stimuli (cf. Beck & Clark, 1997). Consequently, this might lead to low levels of genital and subjective sexual arousal (Janssen et al., 2000; Laan & Janssen, 2007).

The observation that women with dyspareunia report more negative affect, less positive affect, and less subjective sexual arousal than controls to exposure to sexual stimuli in a laboratory setting (Brauer, Laan, & ter Kuile, 2006; Brauer, ter Kuile, Janssen, & Laan, 2007; Brauer, ter Kuile, & Laan, in press; Payne et al., 2007) suggests that at least at the explicit level, negative, fear-related associations with sexual stimuli are present in symptomatic women. However, the critical question remains whether self-reported negative affect in symptomatic women is primarily related to a deliberate negative evaluation of sexual stimuli or that also automatic negative affective evaluations are involved in the processing of sexual cues.

In line with the information processing model of sexual arousal (Janssen et al., 2000; Laan & Janssen, 2007), it can be assumed that, in women with superficial dyspareunia, the prospect of penile-vaginal intercourse automatically activates fear-related associations and that this automatic activation of negative associations interferes with the development of sexual arousal. In its turn, this may further aggravate the dyspareunia-related complaints. If so, this may have important clinical implications, since information processing models share the assumption that automatic associations are less susceptible to change than deliberate associations (e.g., Strack & Deutch, 2004; Wilson, Lindsey, & Schooler, 2000). This would imply that traditional cognitive-behavior therapy modalities, which are primarily focused on pain control (cf. ter Kuile & Weijnenborg, 2006), might well fail to tap into and

¹Automatic cognitive processes refer to fast and unintentional responses, whereas deliberate (or controlled) cognitive processes refer to responses that are under intentional control (cf. De Houwer, Crombez, Baeyens, & Hermans, 2001; Moors & De Houwer, 2006).

modify deeply ingrained automatic sex-related affective associations (e.g., Huijding & de Jong, in press). Even if dyspareunia patients would report a strong attenuation of dysfunctional beliefs after treatment, residual dysfunctional automatic associations may remain and render patients vulnerable for relapse. Following this, an important first step is to examine whether automatic fear-related associations are indeed involved in this sexual pain disorder.

It is also on theoretical grounds important to assess automatic associations in women with dyspareunia. According to the information processing model of sexual arousal, automatically elicited associations are assumed to be related to genital responses (e.g., lubrication) whereas deliberate, controlled associations are linked to the experience of sexual excitement and further strategic/planned behavior. Furthermore, it is stressed that automatically, reflexively elicited responses may diverge from more strategic, reflectively initiated responses. In agreement with this, there is often discordance between self-reported sexual arousal and genital arousal in women (see for an overview, Laan & Everaerd, 1995). From here, it follows that in order to obtain a more comprehensive picture of the differential contribution of cognitive processes in the onset and/or maintenance of superficial dyspareunia, both deliberate and more automatically activated sex-related associations should be assessed.

It has been argued that automatic fear responses may be best predicted by indirect measures of automatic fear-relevant associations, whereas more controllable fear behaviors may be best predicted by direct, self-report measures (e.g., Egloff & Schmuckle, 2002; Huijding & de Jong, 2006). That is, self-report measures provide the opportunity to reflect on each response, whereas indirect measures of automatic associations leave little or no room for conscious reflection on a response because participants are urged to respond as quickly as possible to stimuli presented in quick succession. Participants' responses on these indirect measures will therefore primarily reflect automatically activated associations that are assumed to play a critical role in the automatically initiated components of the fear response². In support of this, recent work in the context of phobic fears showed that relatively controllable

²Note that the constructs measured by indirect measure are not necessarily unconscious constructs. Participants may be unaware what the test measures, but that does not imply that they are also unaware of their evaluations (Fazio & Olson, 2003). Hence, in the present context the term automatic is not equivalent to the term unconscious, but rather means that an indirect measure leaves insufficient time for participants to purposefully control their response.

avoidance behavior was best predicted by self-reported associations, whereas relatively uncontrollable fear responses (startle probe reflex) were best predicted by automatically activated associations (Huijding & de Jong, 2006).

Thus far, research on cognitive-affective evaluations of sex-related stimuli has relied upon explicit measures. Therefore, the purpose of the present empirical investigation was to set up and implement an indirect measure to see whether negative affective associations in women with dyspareunia are (also) evident at the automatic level (in the sense of fast and unintentional). Such indirect measures have already been successfully used to assess disorder-relevant automatic associations in a range of psychological complaints, including pain (Vancleef, Peters, Gilissen, & de Jong, 2007), specific fears (e.g., Teachman, Gregg, & Woody, 2001), social phobia (e.g., de Jong, 2002), depression (e.g., De Raedt, Schacht, Franck, & De Houwer, 2006), and addiction (e.g., Huijding, de Jong, Wiers, & Verkoijen, 2005).

To test implicit affective associations with sex-related stimuli, we used a modified pictorial Affective Simon Task (AST; De Houwer & Eelen, 1998). The AST is a reaction time paradigm designed to capture the unintentional influence of the affective value of a stimulus on task performance. Participants are instructed to choose as fast as possible between a positive and a negative response on the basis of a non-affective stimulus feature (i.e., relevant stimulus feature) meanwhile ignoring the valence of the presented stimuli (i.e., irrelevant stimulus feature). Various studies have shown that the time to select the correct response is influenced by the match between the valence of the response and the (irrelevant) valence of the stimulus. That is, reaction times (RT) are typically shorter when the valence of the required response matches with the valence of the stimulus, thereby revealing indirectly the valence of the stimulus for the participant (De Houwer, Crombez, Baeyens, & Hermans, 2001; De Houwer & Eelen, 1998). Earlier studies showed that the AST can be successfully applied to assess automatic affective associations in the context of phobic and generally threatening stimuli (de Jong, van den Hout, Rietbroek, & Huijding, 2003).

We preferred the Affective Simon Task (AST) (De Houwer & Eelen, 1998) as an indirect measure of automatic affective associations. The AST has some distinct advantages above the most widely used Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). Most important, inherent to its design the IAT is a relative measure and assesses the strength of affective associations of a target

relative to a contrast category (e.g., black vs. white, ingroup vs. outgroup). Unlike the IAT, the AST is a non-relative measure of automatic associations, allowing for a more straightforward assessment of concepts that have no meaningful contrast (such as erotic stimuli). Furthermore, unlike the IAT, the AST can be used to examine associations involving subcomponents of the concept of interest within the same task (e.g., erotic stimuli with or without penetration). Finally, the AST seems more robust against non-associative explanations of the effects than the IAT (e.g., Rothermund & Wentura, 2004). The present AST included erotic pictures showing either explicit penis-in-vagina penetration or explicit heterosexual acts without any form of vaginal penetration (e.g., erotic kissing, cunnilingus, fellatio, and manual stimulation of the vulva). These two categories were created to test whether women with dyspareunia would only hold automatic negative affective associations concerning penetration stimuli (e.g., because penetration might have become associated with recurrent experiences of genital pain) or that sexual stimuli in general activate automatic negative associations in these women.

We investigated the following questions: (1) Do women with complaints of superficial dyspareunia show negative affective associations with sexual stimuli? (2) If so, are these negative associations restricted to penetration stimuli or do they exist for sexual stimuli in general? (3) Do these negative affective associations depend on conscious deliberation or can they also be found at the automatic level?

METHOD

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Participants

The study sample consisted of 35 women suffering from superficial dyspareunia and 35 women without sexual complaints. All participants were premenopausal women aged between 18 and 45 years and being in a steady heterosexual relationship for at least 6 months. The participants were recruited through advertisements, media attention, and professional referral. Eleven symptomatic women and 10 controls were also included in previous studies on dyspareunia (Brauer et al., 2006; 2007). The inclusion criterion for women with dyspareunia was complaints of superficial dyspareunia in minimally 50% of intercourse attempts for at least 6 months. Exclusion criteria for women with dyspareunia were somatic conditions responsible

for dyspareunia (e.g., active vulvovaginal infections), generalized vulvodynia (unprovoked chronic vulvar burning, itching or irritation in the whole vulvar region); and lifelong vaginismus. Vulvar vestibulitis syndrome (VVS), recently redefined as vestibulodynia (Edwards, 2004), was not an exclusion criterion since the etiology of VVS is largely unknown (Lotery et al., 2004). Women in the control group had had no sexual complaints for at least one year, were sexually active including intercourse, had had their first coital experience more than a year ago, and had partners without severe sexual complaints that could impede intercourse. We excluded women from both groups if any of the following applied: pregnancy or lactation; a diagnosis of a current depressive episode according to DSM-IV-TR (American Psychiatric Association, 2000); and medication that could influence reaction time.

Following a telephone screening, participants underwent subsequent testing at the sexology outpatient clinic of the department of gynaecology of a university medical center where they were informed about the study in greater detail and were examined to determine further suitability for the study. Screening consisted of a semi-structured sexual function interview. To check for current depressive episode, a part of the MINI International Neuropsychiatric Interview (MINI) was conducted. The MINI is a semi-structured diagnostic interview regarding the most common psychiatric disorders according to the DSM-IV on Axis 1 (APA, 2000; Lecrubier et al., 1997; Sheenan et al., 1997). Participants were told that the purpose of the study was to investigate the effects of sexual stimuli on emotions and cognitions by means of computer tasks and questionnaires. Participants received a compensatory fee of €12.50. Travel expenses were also reimbursed. The study protocol was approved by the Medical Ethics Committee of the Leiden University Medical Center.

One woman with dyspareunia was excluded after the screening, because she suffered from deep dyspareunia instead of superficial dyspareunia. In the case of one control participant, completion of the AST was terminated by the experimenter because the woman experienced difficulties with comprehending the task instructions, even after repeated instructions.

Table I lists demographic and complaint characteristics. The dyspareunia group (*m* age yrs 26.4, yrs *SD* = 6.0) and control group (*m* age yrs 24.5, yrs *SD* = 5.2) were successfully matched on age. Both groups did not differ significantly in educational level. The average duration of the genital pain complaint was 6.0 years (*SD* = 4.3).

For 15 (42.9%) of the women with dyspareunia, the pain during intercourse was a lifelong problem.

Table I. Demographic and sexual function characteristics

	Dyspareunia (<i>n</i> = 35)		Controls (<i>n</i> = 35)		χ^2 or <i>t</i> -values
<i>Characteristics</i>	Mean	SD	Mean	SD	
Age (in years)	26.4	6.0	24.5	5.2	<i>t</i> = 1.39
Duration relationship (in years)	6.5	4.7	2.9	1.8	<i>t</i> = 4.27*
Married/co-habiting, N (%)	21 (60.0)		10 (28.6)		χ^2 = 7.01*
Children, N (%)	5 (14.3)		1 (2.9)		χ^2 = 2.92
Education (%)					χ^2 = 3.04
Primary school-lower secondary	5 (14.3)		2 (5.7)		
Higher secondary	5 (14.3)		10 (28.6)		
College-university	25 (71.4)		23 (65.7)		
Duration dyspareunia (in years)	6.0	4.3			
Onset dyspareunia					
Lifelong, N (%)	15 (42.9)				
FSFI	20.5	6.9	32.0	2.5	<i>t</i> = -9.12*

Note: Range for FSFI 2-36. Lower scores indicate worse sexual function. FSFI = Female Sexual Function Index.

* *p* < .01.

Measures

Affective Simon Task. For several reasons, pictorial erotic stimuli rather than words were selected. First, the concept of sex may not be readily captured in words, since sex-related words might have a strong negative valence in themselves as they are

used as foul language (e.g., to fuck); might refer to medical language which individuals are unfamiliar with (e.g., coitus, cunnilingus); or are multi-interpretable (e.g., pussy). Second, research has demonstrated that pictures more easily activate semantic representations (e.g., De Houwer & Hermans, 1994) and, as such, might yield more robust findings (Huijding & de Jong, 2005). Finally, pictorial representations of sexual acts have been shown to elicit subjective experiences of sexual arousal (e.g., Spiering, Everaerd, Karsdorp, Both, & Brauer, 2006) and preliminary evidence exists that sexual pictures can activate genital responses in a laboratory context (Janssen et al., 2000; Laan & Everaerd, 1995b). As far as we know, for words with a sexual content it has not been investigated whether they elicit genital and subjective sexual arousal in women.

The computerized AST consisted of three phases. It started with a prime phase in order to strengthen the bond between the required response and the subjective valence of the pictorial stimulus, thus bolstering the affective Simon effect (cf. Huijding et al., 2005). During the prime phase, participants were instructed to say "positive" when they were presented with a picture with a positive valence and "negative" when they were presented with a picture with a negative valence. Six positive pictures and six negative pictures were selected from the photographs included in the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2005). The IAPS numbers of the positive category were 1441, 1750, 2050, 5760, 8496, 8501 and the IAPS numbers of the negative category were 2205, 2750, 9001, 9421, 9440, 9830. All pictures were presented twice in landscape format and twice in portrait format. Hence, the priming phase consisted of 48 trials.

During phases 2 and 3, participants were instructed to respond as fast as possible with saying either "Positive" or "Negative" to stimuli, depending on whether they were presented in a landscape format (longest side horizontal) or a portrait format (longest side vertical). In the second phase, the sex-AST, participants were presented with 12 pictures displaying explicit heterosexual acts. Half of these pictures depicted explicit penis-in-vagina penetration (i.e., penetration stimuli), whereas the other half depicted other heterosexual acts without anything being penetrated into the vagina (i.e., nonpenetration stimuli, for instance erotic kissing, cunnilingus, fellatio, and manual stimulation of the vulva). Prior to the experiment, a large selection of erotic

pictures had been generated to serve as potential stimuli. These pictures were shots taken from an erotic film, *One Size Fits All*, a so-called women-friendly erotic film directed by Candida Royalle (Laan, Everaerd, van Bellen, & Hanewald, 1994). In a pilot study among sexually functional women ($N = 35$), participants were instructed to categorize these pictures as fast as possible as either depicting "penetration" or "sexual activity without penetration" by means of pressing one of two computer keys. The pictures that revealed shortest reaction times and most correct responses were selected for the current sex-AST (Brauer, ter Kuile, & Laan, 2005). All pictures were presented eight times in landscape format and eight times in portrait format. In total, 192 trials were presented. To control for possible stimulus order effects on the sex-AST, two mirrored fixed random stimulus presentation orders were created. Prior to the sex-AST, participants were presented with 12 practice trials with neutral pictures chosen from the IAPS (numbers: 7004, 7006, 7009, 7010, 7035, 7080) to become familiarized with the procedure.

During the third phase, the control-AST, participants were presented with six positive and six negative pictures, selected from the IAPS (numbers of positive pictures: 1440, 1710, 2222, 2388, 2550, 7580; numbers of negative pictures: 2900, 6610, 9300, 9404, 9800, 9911). All pictures were presented three times in landscape format and three times in portrait format. Hence, the control-AST consisted of 72 trials. This control-AST was mainly included to see whether we could replicate the earlier reported general affective Simon effects (i.e., shorter RTs when picture valence and required response are congruent). If so, this would support the validity of the present experimental set-up (lay-out, instruction, etc.). In addition, adding the control-AST enabled us also to examine whether any between group effects on the sex-AST were specific for the sexual stimuli.

To optimize the sensitivity for finding interference (i.e., affective Simon) effects with respect to sex stimuli, we decided to present the sex-AST always prior to the control-AST (instead of counterbalancing the tasks) as it can be assumed that participants gradually learn to resist the interference of the irrelevant stimulus feature (i.e., the valence of the picture) due to practice (cf. de Jong et al., 2003).

During the second and third phase, response requirements were counterbalanced between participants: half of the participants were instructed to say "positive" upon presentation of a picture in landscape format and "negative" when a picture was

presented in portrait format, whereas the response assignment was reversed for the other half of the participants.

During all three phases, pictures were randomly depicted in five different dimensions. This was done to prevent participants from focusing on one point of the screen while discriminating between portrait and landscape pictures. Fixation on one point may limit the processing of picture content (cf. Huijding & de Jong, 2005). Depending on whether the pictures were presented in a landscape or portrait format, the longest side was horizontally or vertically depicted respectively (e.g., dimensions for landscape were 360 x 300 pixels, 380 x 320 pixels, 400 x 340 pixels, 420 x 360 pixels, 440 x 380 pixels).

Each phase was preceded by specific instructions on the computer screen. Participants were seated in front of the computer screen at a distance of approximately 40 cm. Participants were instructed to respond as fast and accurately as possible by saying "positive" or "negative." The voice-key recorded reaction times. Inaccurate responses and voice key failures were recorded on a computer by a female research assistant. The next trial was initiated after the experimenter entered a code. Each trial consisted of a fixation cross (500 ms) followed by a stimulus, which remained on the screen until the voice key had registered a response. If no response was registered, the stimulus disappeared automatically after 3000 ms.

Self-Reported Affective Responses to Sexual Stimuli. In order to examine subjective affective responses to erotic stimuli, participants were asked to provide ratings on five questions after each erotic picture that they had seen previously in the sex-AST. As a self-report equivalent of the AST, participants were asked to indicate their general feeling towards each picture on a 100 mm Visual Analogue Scale (VAS), with the left anchor of the VAS-scale being "negative" and the right anchor being "positive." To obtain a more complete impression of how the sexual stimuli were appraised, participants had to assess the degree to which they were experiencing "sexual arousal," "sexual desire," "fear," and "aversion," when looking at the picture. The items "sexual arousal" and "sexual desire" were selected since women associate positive sexual stimuli typically with these feelings (Brauer et al., 2005). The items "fear" and "aversion" were selected because we expected that these descriptors would be the most relevant negative emotional responses in women with dyspareunia. These affective descriptors were measured by separate VAS-scales, anchored at the left and

right by the words not at all and very strong, respectively. Three measures were derived: general affective evaluation, positive sexual affect (calculated as the mean score on sexual arousal and sexual desire), and negative affect (calculated as the mean score on fear and aversion).

Questionnaires. Participants completed the Dutch version of the Female Sexual Function Index (FSFI; Rosen et al., 2000; ter Kuile, Brauer, & Laan, 2006). The FSFI is a brief self-report measure of female sexual function, consisting of the following subscales; desire, arousal, lubrication, orgasm, satisfaction, and pain. As an indication for sexual functioning, the total score of the FSFI score was used in this study. Lower scores represent worse sexual function. Based on a Dutch sample consisting of approximately 350 women with and without sexual complaints, the internal consistency and stability of the FSFI were found to be satisfactory-to-good. The FSFI's ability to discriminate between sexually functional and dysfunctional women was excellent as well as the ability to predict the presence or absence of sexual complaints. Finally, the convergent and divergent construct validity was good (ter Kuile et al, 2006). A *t*-test indicated that the dyspareunia group reported significantly more sexual problems than the control group (see Table I).

Procedure

Participants were tested individually. After general instructions on the experimental procedure were given and informed consent was obtained, all participants first completed the AST. Next, explicit affective responses to the erotic pictures used in the AST were obtained, and finally, participants were asked to complete the questionnaires. Following the recommendations of Bosson, Swann, and Pennebaker (2000), the AST preceded the self-report measures.

Data analysis

We had planned to analyze data regarding mean reaction times as well as number of errors. However, because almost no errors were made during both the sex-AST and the control-AST, error data could not be meaningfully interpreted by means of univariate analyses. Therefore, we decided to only examine reaction time (RT) data. For the RT data, all incorrect responses were excluded. RTs less than 300 ms or greater than 3000 ms were excluded from analyses (cf. De Houwer, 2003). Mean

RTs on both the sex-AST and the control-AST were analyzed using separate univariate analyses (ANOVA). For the sex-AST, a 2 (Group) $\times$ 2 (Stimulus Category) $\times$ 2 (Required Response) $\times$ 2 (Stimulus Presentation Order) ANOVA was conducted. RT data obtained from the control-AST were entered in a 2 (Group) $\times$ 2 (Stimulus Valence) $\times$ 2 (Required Response) $\times$ 2 (Stimulus Presentation Order) ANOVA. Stimulus Valence refers to the pictures with either a positive or negative valence.

With respect to self-reported affective responses to the erotic stimuli used in the sex-AST, three separate 2 (Group) $\times$ 2 (Stimulus Category) ANOVA's were performed to analyze group differences. For RT effects and self-report responses, effect sizes (f) were calculated as a function of η^2 (see Cohen, 1988, p. 284). For the purpose of interpretation, Cohen considered $.10 < f < .25$ as small, $.25 < f < .40$ as medium and $f > .40$ as large. To inspect group differences in demographic variables and sexual function (FSFI), independent sample t -tests and chi-square tests were used. Pearson's product moment correlations were calculated between implicit and explicit measures.

RESULTS

Preliminary analysis

Preliminary analyses showed no significant differences between women with lifelong dyspareunia and women with acquired dyspareunia on automatic affective sex-related associations and self-reported affective responses to sexual stimuli. There was a striking resemblance in both groups in their automatic, $F(1, 33) = .35, p > .56$, and self-report responses, $F(1, 33) = 1.75, p > .20$. For both subgroups, the correlations between RT and self-report indices of the affective evaluation of sexual stimuli were non-significant. Therefore, in further analyses the entire dyspareunia sample was compared to the control sample.

General Affective Simon Effect (Control AST)

RT data were square-root transformed to normalize the positively skewed distribution. Untransformed mean RTs are displayed in Table II. A 2 (Group) $\times$ 2 (Stimulus Valence) $\times$ 2 (Required Response) ANOVA with mean RT as the dependent variable yielded a significant main effect of Required Response, $F(1, 68) = 12.12, p < .01, f = 0.42$,

Table II. Mean Reaction Times (in milliseconds [ms]) as a function of stimulus type and required response in both the Control-AST and the Sex-AST

	Dyspareunia (<i>n</i> = 35)		Controls (<i>n</i> = 35)		Combined (<i>N</i> = 70)	
	<i>Positive</i>	<i>Negative</i>	<i>Positive</i>	<i>Negative</i>	<i>Positive</i>	<i>Negative</i>
<i>Required response</i>						
<i>Stimulus Category</i>						
General affective stimuli						
Positive	641 (128)	703 (145)	606 (128)	648 (132)	623 (128)	675 (141)
Negative	694 (173)	674 (145)	621 (126)	635 (137)	658 (154)	654 (142)
Sexual Stimuli						
Penetration	651 (120)	664 (123)	574 (97)	609 (127)	612 (115)	636 (128)
Nonpenetration	658 (133)	680 (131)	582 (95)	615 (124)	620 (121)	648 (131)
Sex (total)	654 (125)	672 (126)	578 (94)	612 (124)	616 (117)	642 (128)

and a significant Stimulus Valence x Required Response interaction effect, $F(1, 68) = 17.71$, $p < .01$, $f = 0.51$. As can be seen in Table II, this interaction effect indicates, as expected, that participants were generally faster when there was a match than when there was a mismatch between the valence of the irrelevant feature (i.e., picture content) and the valence of the required response. There was a marginally significant tendency that this effect was more pronounced in the dyspareunia group, $F(1, 68) = 3.24$, $p = .076$, $f = 0.22$. Subsequent t -tests indicated that participants were significantly faster to positive stimuli when the required response was positive (match) than when the required response was negative (mismatch), $t(69) = -4.91$, $p < .01$. Although a similar pattern seems evident for the stimuli with a negative valence (see Table II), the influence of response requirement (positive vs. negative) did not approach significance, $t(69) = .360$, $p > .70$.

Sex-AST

Preliminary analysis revealed that there was neither a main effect for stimulus presentation order, $F(1, 66) = 0.74$, $p > .43$, nor were there any significant interaction effects, $F_s(1, 66) < 3.30$, $p_s > .074$. Therefore, we only report here the analyses

using the pooled data. Data were normally distributed. Mean RTs to sexual stimuli are shown in Table II. A 2 (Group) $\times$ 2 (Stimulus Category) $\times$ 2 (Required Response) ANOVA yielded a significant main effect for Required Response, $F(1, 68) = 11.86$, $p < .01$, $f = 0.42$, a significant main effect for Stimulus Category, $F(1, 68) = 10.74$, $p < .01$, $f = 0.40$, and a significant main effect for Group, $F(1, 68) = 6.31$, $p < .02$, $f = 0.30$. As can be seen in Table II, the main effect for Required Response signified that participants were generally faster on trials displaying sexual stimuli when the required response was "positive" than when the required response was "negative." Thus, contrary to expectations, symptomatic as well as complaint-free women displayed positive automatic associations with sexual stimuli and the strength of these associations did not differentiate between both groups of women. The significant main effect for Stimulus Category indicated that participants were generally faster when exposed to penetration stimuli than to nonpenetration stimuli. Furthermore, the main effect for Group implied that the dyspareunia group was overall significantly slower in responding than the control group.

Self-reported affective responses to sexual stimuli

General affective evaluation. A 2 (Group) $\times$ 2 (Stimulus Category) ANOVA for the general affective evaluation of the sexual stimuli yielded only a significant main effect for Group, $F(1, 68) = 6.59$, $p < .02$, $f = 0.31$. As can be seen in Table III, ratings on this self-report equivalent of the sex-AST were significantly more negative in the dyspareunia group than in the control group.

Positive sexual affect. A 2 (Group) $\times$ 2 (Stimulus Category) ANOVA for ratings of positive sexual affect revealed a significant main effect for Group, $F(1, 68) = 10.90$, $p < .01$, $f = 0.40$, indicating that the dyspareunia group experienced less positive sexual affect (i.e., arousal and desire) when looking at the sexual pictures (see Table III).

Negative affect. A 2 (Group) $\times$ 2 (Stimulus Category) ANOVA for ratings of negative sexual affect revealed a significant main effect for Group, $F(1, 68) = 12.29$, $p < .01$, $f = 0.43$, as well as a marginally significant Group by Stimulus Category interaction, $F(1, 68) = 3.81$, $p = .06$, $f = 0.24$. Follow-up tests of the Group by Stimulus Category interaction revealed that exposure to both nonpenetration stimuli, $F(1, 68) = 6.92$, $p < .05$, $f = 0.32$, and penetration stimuli, $F(1, 68) = 14.68$, p

Table III. Self-reported affective responses to erotic stimuli

	Dyspareunia (<i>n</i> = 35)			Controls (<i>n</i> = 35)		
	Penetration	Non- penetration	Combined	Penetration	Non- penetration	Combined
<i>Ratings</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>
General affective evaluation	48.7 (21.7)	53.9 (21.8)	51.3 (18.5)	64.2 (22.5)	63.0 (21.7)	63.6 (21.5)
Positive sexual affect	43.6 (23.4)	43.0 (20.1)	43.3 (19.6)	61.7 (21.2)	56.1 (21.0)	58.9 (20.0)
Negative affect	29.5 (23.0)	24.6 (18.2)	27.1 (18.7)	11.8 (12.7)	13.9 (13.5)	12.8 (12.6)

Note: Range for each descriptor, 0 - 100. Higher scores on the VAS-scale for a general affective evaluation of sex-related stimuli indicate more positive associations. Higher scores on the VAS-scales for positive sexual affect and negative affect indicate that affect was experienced more intense.

$< .01$, $f = 0.47$, elicited more negative affect in the dyspareunia group than in the control group. The level of experienced negative affect as elicited by both stimulus categories did not differ among women with dyspareunia, $F(1, 34) = 1.46$, $p > .24$, $f = 0.21$, negative affect tended to be higher for the nonpenetration stimuli than for penetration stimuli among complaint-free women, $F(1, 34) = 3.58$, $p = .07$, $f = 0.32$.

Relationship between reaction time and self-report indices of the affective evaluation of sexual stimuli

To examine the relationship between automatic and self-report measures, we first calculated sex-AST indices. Mean RTs on trials on which the correct response was positive were subtracted from trials on which the correct response was negative. Following this, a positive AST index indicates positive associations with target stimuli (i.e., sexual stimuli), whereas a negative AST index indicates negative associations (cf. De Houwer, 2003). Pearson product-moment correlations were calculated between sex-AST indices for each of the self-reported affective ratings of the sexual stimuli collapsed across stimulus categories and groups. No significant correlations were found between the AST index and the self-report measures.

DISCUSSION

This study examined whether dysfunctional (automatic) affective associations were involved in superficial dyspareunia. The main findings can be summarized as follows: (1) both symptomatic and complaint-free women displayed shorter reaction times when they had to respond with "positive" to sexual stimuli than when they had to respond with "negative", indicating that both groups displayed relatively positive automatic associations with sexual stimuli; (2) the strength of the positive automatic sex-related associations was similar for groups; (3) at the self-report level symptomatic women were characterized by both weaker positive (i.e., arousal and desire) and stronger negative (i.e., fear and aversion) associations with sex cues than controls.

To check the validity of the present pictorial AST as a measure of automatic affective associations, we added a control-AST to the design containing generally positive and negative pictorial stimuli selected from the IAPS (Lang et al., 2005). Sustaining the validity of the present task and replicating previous research using verbal (e.g., De Houwer & Eelen, 1998; de Jong et al., 2003; Huijding et al., 2005) and pictorial stimuli (De Houwer et al., 2001), results showed a general affective Simon effect. That is, participants were generally faster when there was a match than when there was a mismatch between the valence of the irrelevant feature (i.e., picture content positive or negative) and the valence of the required response ("positive" or "negative"), and there were no significant differences between both groups in this respect. These results clearly demonstrate that the valence of the pictures interfered with responding although picture content had to be ignored. This interference with responding can be interpreted as reflecting automatic (i.e., unintentional) affective associations with the target stimuli (cf. De Houwer & Eelen, 1998). Meanwhile, it should be acknowledged that the general Affective Simon effect appeared restricted to the positive stimuli. Unexpectedly, picture content did not interfere with task performance on trials depicting negative IAPS slides. One explanation could be that the negative stimuli were more complex and diverse than the positive stimuli, reducing their power to elicit bottom up interference effects. Another explanation could be that the selected pictures were not sufficiently negative to elicit automatic negative affective evaluations. Unfortunately, we did not assess

self-reported affect for these pictures, so it remains to be seen whether the absence of a straightforward negative appreciation was restricted to the automatic level.

The major aim of the present study was to examine the role of "reflective" and "reflexive" affective associations in women suffering from dyspareunia. The results of the explicit affective ratings of the erotic stimuli were in line with previous research (Brauer et al., 2006; 2007; in press; Payne et al., 2007) and converge to the conclusion that sexual stimuli activate more ambivalent meanings in women with dyspareunia, with less positive and more negative affect as opposed to sexually functional women. As earlier research indicated that erotic stimuli may elicit ambivalent emotional states in women (Laan & Everaerd, 1995; Peterson & Janssen, 2007), it is interesting in its own right that particularly the dyspareunia group seems to be characterized by a more pronounced ambivalence in affect concerning sexual stimuli. Explained in terms of the information processing model on sexual arousal, co-occurrence of contrasting or conflicting meanings of sexual stimuli can lower the intensity of an emotional experience in the sense that it may involve a process of weighing of positive and negative meanings. Especially when threat/fear-related nonsexual meanings prevail, sexual arousal may subsequently be inhibited (Janssen et al., 2000).

In contrast to the self-report measures, the sex-AST did not differentiate between women with and without dyspareunia. For both groups of women, responses were faster when the required response was "positive" than when the required response was "negative", indicating that both women with and women without dyspareunia are characterized by positive rather than negative automatic (reflexive) affective associations with sexual stimuli. The strength of the positive automatic associations was similar for stimuli depicting heterosexual acts without any form of penetration, and stimuli depicting explicit vaginal penetration. So, the present results counter the idea that negative automatic affective associations with sexual stimuli are critically involved in women with dyspareunia.

One testable explanation for the absence of relatively negative automatic associations in women suffering from dyspareunia might be related to the ecological validity of the sexual stimuli that were used in this study. The sexual pictures, either with or without explicit reference to vaginal penetration, may not have been sufficiently accurate symbolic representations of the actual domain of concerns. For example,

seeing pictures of other people having sex may well elicit different (automatic) affective associations than (the prospect of) having sex oneself. However, the finding that at the self-report level there was a clear differential pattern of affective responses, with symptomatic women reporting more negative affect (i.e., fear and aversion) together with less positive sexual affect (i.e., less arousal and desire), renders this explanation for the absence of differential automatic affect not very convincing. Meanwhile, it remains important to test in future research whether differential automatic affect will emerge in more personalized idiosyncratic sexual contexts.

Another explanation for the absence of overtly negative automatic associations in women with dyspareunia might be that the present sample of symptomatic women was not a representative one with respect to complaint characteristics. A comparison between our study sample of women with dyspareunia and a sample of patients with dyspareunia ($N = 99$) visiting an outpatient clinic for sexology of a university medical hospital showed that there were no significant differences between these two samples regarding demographic variables (age, marital status, duration relationship, children), and sexual (dys)function as assessed by the FSFI, although the average duration of dyspareunia was significantly longer among women participating in the present study. So there are no indications that we relied on an atypical group with relatively minor complaints. Therefore, it seems unlikely that the absence of relatively negative automatic affective associations in the present group of women suffering from dyspareunia can be attributed to our sample being characterized by an atypically low level of symptoms.

A third testable explanation for the absence of overtly negative automatic associations in women with dyspareunia might be that the current version of the sex-AST lacked sufficient sensitivity. Yet, previous work using a structurally very similar AST was successful in differentiating between high and low spider fearful individuals in both student (Huijding & de Jong, 2005) and community samples (Huijding & de Jong, 2006). Moreover, individuals' reaction times during the sex-AST were clearly affected by the task-irrelevant picture content, suggesting its sensitivity as an indirect measure of affect: Participants were systematically faster when the required response was positive than when the required response was negative. Although one may suspect that this finding may merely reflect a phonological advantage of saying

positive compared to negative, this seems not very likely. That is, a similar advantage for positive being the required response was absent in case of pictures representing generally negative stimuli. In addition, in none of the previous AST studies in the Netherlands and Belgium using the same verbal response options (e.g., De Houwer & Eelen, 1998, De Houwer et al., 2001; de Jong et al., 2003; Huijding et al., 2005) participants were generally faster when positive was the required response (i.e., irrespective of the valence of the irrelevant stimulus feature). Furthermore, a pilot study specifically testing the potential confounding influence of the phonological characteristics of saying positive versus negative provided no evidence to indicate that the phonological difference between positive and negative played a major role in participants' velocity of responding (de Jong, 2000). All in all, it seems not very likely that a lack of sensitivity played a crucial role in the absence of group differences in automatic affect. At the very least, it cannot explain why symptomatic women tended to show positive rather than negative associations with sexual stimuli.

The finding that women with dyspareunia displayed positive automatic associations with sexual stimuli regardless of their persistent intrusive painful intercourse experiences may be explained by assuming that the deliberate negative associations with sex are acquired at a relatively late age. That is, deliberate negative associations might develop during initial sexual experiences or at intercourse debut in women with lifelong dyspareunia and even later, after a period of pain-free intercourse, in women with acquired dyspareunia. The painful intercourse experiences may result in a relatively negative conscious appraisal of sexual stimuli but may not be sufficiently influential to render deeply ingrained automatic positive associations negative.

The apparent robustness of positive automatic associations is also consistent with emotion theories (e.g., Lang, Bradley, & Cuthbert, 1990), stating that species survival requires that emotionally significant stimuli are detected by automatic processing mechanisms, which immediately activate physiological responses. That is, defensive responses are activated when confronted with stimuli that threaten survival such as snakes and spiders, whereas approach responses are primed by stimuli that promote survival, such as sexual stimuli. In agreement with this view, it has been suggested that there must be a strong link between sexual stimuli and genital responses and that this link is likely to be highly prepared (in a biological sense) and automatic (in

a cognitive sense) (Janssen et al., 2000; Laan & Everaerd, 1995a; Laan & Janssen, 2007). Support for a strong link between sexual stimuli and genital responses stems from cumulative research demonstrating that sexual stimuli easily elicit genital responses even under adverse experimental conditions. These findings have been documented in sexually functional women as well as women with dyspareunia (e.g., Brauer et al., 2006; 2007; *in press*; Payne et al., 2007). Furthermore, research into sexual response specificity has shown that women respond with an increase in genital arousal to film fragments showing a woman being raped (e.g., Both, Laan, & Everaerd, 2003; Laan, Everaerd, & Evers, 1995) and to sexual stimuli depicting primates mating (Chivers & Bailey, 2005).

The low correlations between the reaction time (i.e., AST) and self-report measures of sex-related affective associations correspond with the predictions based on information processing models that emphasize the discrepancy between deliberate affective associations and automatically activated affective associations (e.g., Fazio & Towles-Schwen, 1999; Strack & Deutch, 2004; Wilson et al., 2000). This is consistent with neurobiological evidence for the presence of separate pathways for initial, lower order and slower, higher order processing of stimulus information (e.g., LeDoux, 1995).

The information processing model of sexual arousal (Janssen et al., 2000; Laan & Janssen, 2007) may also account for the discrepancy between automatically activated and deliberate affective associations regarding sexual stimuli in the dyspareunia group as it proposes that different levels of cognitive processing differentially influence subjective and physiological sexual arousal responses. Integrating our findings in this model, we argue that exposure to sexual stimuli automatically elicits a genital response in women with and without dyspareunia, but that in women with dyspareunia the sexual stimulus is consciously appraised as relatively negative, thereby impeding genital (i.e., lubrication) as well as subjective sexual arousal. Conversely, sexually functional women appraise sexual stimuli more positively, which may eventually result in the occurrence of full-blown genital and subjective sexual arousal responses.

Apart from the above mentioned main findings, results showed that irrespective of the required response the dyspareunia group displayed longer reaction times on the sex-AST than the control group. This slowed responding of the dyspareunia group

during the sex-AST may reflect a relatively strong attention-grabbing power (cf. Pratto & John, 1991) or relatively strong arousing properties (cf. Schimmack, 2005) of sexual stimuli within the dyspareunia group, possibly because of their threatening nature. Such an explanation would be in line with previous research using an AST showing that both generally threatening stimuli and cues that are specifically related to individual's phobic concerns resulted in longer response latencies than neutral control words, independent of the required response (de Jong et al., 2003). However, since the control-AST always followed the sex-AST, the present design precluded a direct test whether slower responding during the sex-AST was caused by the specific sexual stimulus content or whether women with dyspareunia were generally slower due to other factors. Future studies in which sex-relevant and sex-irrelevant ASTs are presented in a counterbalanced order are necessary to arrive at more solid conclusions in this respect.

Although statistical analysis indicated that there were no reliable differences between women with and without dyspareunia with respect to their automatic affective associations with sex stimuli, exploratory analyses indicated that the Simon effect was only small to medium in the dyspareunia group ($f = .26$) whereas it was large in the control group ($f = .63$). This might indicate that women with dyspareunia tend more towards ambivalent automatic affective associations with sex-related stimuli rather than overtly positive associations. One way to investigate the potential ambivalence of automatic sex-related associations in women with dyspareunia would be to design a unipolar AST (neutral vs. positive; neutral vs. negative) allowing to assess positive and negative affective associations separately (cf. Vancleef et al., 2007).

In addition, it would be important to test the specificity of the present pattern of findings for women suffering from dyspareunia. It would therefore be helpful to include clinical control groups (e.g., women with lifelong vaginismus or hypoactive sexual desire disorder) in future research on this issue.

Finally, this study opens the way for future research of automatic affective sex-related associations in women with dyspareunia (or other sexual dysfunctions) by means of additional indirect measures (e.g., facial EMG, sIAT).

In sum, the present findings suggest that dysfunctional automatic associations are not critically involved in superficial dyspareunia. Instead, our findings point to the

relevance of deliberate (reflective) appraisal of sexual stimuli in the onset and maintenance of superficial dyspareunia. Following this, reappraisal of deliberate affective associations with sexual stimuli seems the most appropriate focus of therapeutical interventions.

C H A P T E R

Cognitive-affective correlates
and predictors of superficial
dyspareunia

6

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ABSTRACT

This study investigated the role of cognitive-affective variables related to sexuality, chronic pain, individual and relational well-being in superficial dyspareunia. Although symptomatic women ($n = 80$) differed from complaint-free controls ($n = 62$) on all variables, sexuality related measures had the most important contribution into the prediction of group membership. Dyspareunia subgroups based on the presence/absence of a concomitant diagnosis of vulvar vestibulitis syndrome were only distinguishable on pain intensity but not on variables related to sexuality and psychological well-being. The present findings underscore the relevance of psycho-sexual factors in women with superficial dyspareunia.

INTRODUCTION

Dyspareunia, recurrent or persistent acute pain associated with penile-vaginal intercourse, is a common sexual problem in women, with community prevalence rates between 3 and 18% (e.g., Simons & Carey, 2001). In the vast majority of affected women pain is located at the entrance of the vagina, which is the distinguishing factor of superficial dyspareunia. The most common form of superficial dyspareunia in premenopausal women is vulvar vestibulitis syndrome (VVS) (Bergeron, Binik, Khalifé, & Pagidas, 1997; Harlow, Wise, & Stewart, 2001). VVS is characterized by severe pain and tenderness on vestibular touch or attempted vaginal entry, and physical findings limited to vulvar erythema (Friedrich, 1987). However, there are no generally accepted associated physical findings, with the possible exception of non-specific inflammation (Lotery, McClure, & Galask, 2004).

So far, possible causal mechanisms have been explored but a clear etiology of dyspareunia remains elusive (Lotery et al., 2004). Because genital pain directly interferes with a woman's sexuality, and may also have repercussions on her individual and relational well-being, this suggests that dyspareunia represents a complex multi-factorial condition. It is therefore remarkable that research to date has focused predominantly on underlying biomedical factors, such as genital infections, (genetic components of) inflammations, pathophysiological mechanisms involved in neuropathic pain, tissue abnormalities and immune system function (see for an overview Farage & Galask, 2005).

Unfortunately, although various psychological factors have been studied as possible correlates of dyspareunia, inconsistencies in findings have precluded a clear understanding of the relative contribution of these factors. The discrepant findings between studies can be explained by differences in instrumentation, inclusion criteria, or study samples. When comparing controlled studies that used validated self-report measures, consistent findings emerged with respect to sexual abuse history, indicating that the prevalence of sexual abuse is not larger among affected women than controls (Danielsson, Sjöberg, & Wikman, 2000; Meana, Binik, Khalifé, & Cohen, 1997; Reissing, Binik, Khalifé, Cohen, & Amsel, 2003). Comorbidity between dyspareunia and other sexual problems has also been consistently documented. For instance, it has been repeatedly shown that symptomatic women

are less satisfied with their sex-life, and experience more negative feelings during sexual activity (e.g., Brauer, de Jong, Huijding, Laan, & ter Kuile (in press); Gates & Galask, 2001; Meana et al., 1997; Nunns & Mandal, 1997; Payne, Binik, Pukall, Thaler, Amsel, & Khalifé, 2007; Reissing et al., 2003; van Lankveld, Weijenborg, & ter Kuile, 1996; White & Jantos, 1998). Furthermore, women with VVS report, similar to patients with medically unexplained chronic pain conditions (e.g., fibromyalgia, low back pain), enhanced pain catastrophizing (Granot, Friedman, Yarnitsky, & Zimmer, 2002; Granot & Lavee, 2005; Payne, Binik, Amsel, & Khalifé, 2005; Payne et al., 2007; Pukall, Binik, Khalifé, Amsel, & Abbott, 2002), pain-related fear and hypervigilance to pain than controls (Payne et al., 2005; Payne et al., 2007), albeit that studies are inconsistent with respect to whether these elevated levels are related to pain in general or to intercourse pain. Moreover, as these findings are based solely on data from VVS cases, generalizability to other subtypes of dyspareunia is disputable. In addition, it is still undecided whether dyspareunia is associated with psychopathology (e.g., anxiety, depression, somatisation, or phobias), with specific personality dimensions (e.g., neuroticism, introversion) (Danielsson, Eisemann, Sjöberg, & Wikman, 2001; Gates & Galask, 2001; Granot, 2005; Granot, et al., 2002; Granot & Lavee, 2005; Meana et al., 1997; Nunns & Mandal, 1997; Nylanderlundqvist & Bergdahl, 2003; Payne et al., 2005; Payne et al., 2007; Pukall et al., 2002; van Lankveld et al., 1996; Wylie, Hallom-Jones, & Harrington, 2004), or with relational satisfaction (Meana et al., 1997; Reissing et al., 2003; van Lankveld et al., 1996).

In sum, research examining cognitive-affective correlates of dyspareunia has not reached firm conclusions. In an attempt to overcome methodological limitations and differences between previous studies, the present study was set up to systematically assess cognitive-affective variables pertaining to sexual functioning, the experience of pain, and individual as well as relational well-being all together in women with superficial dyspareunia and sexually functional women by using validated self-report measures. The primary objective of the present study is to find out which of these variables discriminate between women with dyspareunia and women without sexual complaints. It is hypothesized that, except for sexual abuse history, women with dyspareunia differ from women without sexual complaints on all cognitive-affective variables. That is, symptomatic women are expected to report impaired sexual

functioning, elevated levels of sexual distress and negative affect and attitudes concerning sexuality, as well as higher levels of pain catastrophizing. It is also expected that women with dyspareunia report higher levels of somatization, anxiety and depression. Moreover, as far as we know, the present study is the first to determine which of the discriminating variables have the most important contribution into the prediction of group membership.

The current trend in research on unexplained chronic intercourse pain is to focus exclusively on women with superficial dyspareunia with a concomitant diagnosis of VVS. It is uncertain whether findings obtained in this specific subset of symptomatic women can be extended to women with superficial dyspareunia without VVS. As it has been suggested that psychosocial factors do not generalize across dyspareunia subtypes based on diagnosable physical findings (Meana et al., 1997), it would be worthwhile to examine whether subtypes of dyspareunia based on the presence or absence of a concomitant diagnosis of VVS are associated with different combinations of psychological factors. Until now, no studies have directly compared dyspareunia subgroups with or without VVS. This was therefore the second objective of the present study.

METHOD

Participants

The study sample consisted of 80 women with superficial dyspareunia and 62 women without sexual complaints. For logistic reasons, we decided to collect self-report data for the present study in women who were recruited for two separate psychophysiological studies that examined sexual arousal responses during exposure to visual erotic stimuli (Brauer, Laan, & ter Kuile, 2006; Brauer, ter Kuile, Janssen, & Laan, 2007). Women were recruited through advertisements, media attention, and professional referral. Women were informed that participation consisted of the completion of a battery of questionnaires as well as the assessment of sexual arousal in the laboratory.

To be included, all women were required to be premenopausal, aged between 18 and 45, and having a steady heterosexual relationship for at least 6 months. The inclusion criterion for women with dyspareunia was complaints of superficial

(introital) dyspareunia in minimally 50% of intercourse attempts for at least 6 months. Exclusion criteria for women with dyspareunia were somatic conditions responsible for dyspareunia (e.g., active vulvovaginal infections), generalized vulvodynia (unprovoked chronic vulvar burning, itching or irritation in the whole vulvar region); and lifelong vaginismus.

Women without sexual complaints were included if they had had no sexual complaints for at least one year, were sexually active including intercourse, had had their first coital experience more than a year ago, and had partners without severe sexual complaints that could impede intercourse. We excluded women from both groups if any of the following applied: pregnancy or lactation; a diagnosis of a mood-, psychotic-, or substance-related disorder according to DSM-IV-TR (APA, 2000).

Following an initial telephone screening, women underwent subsequent screening at the sexology outpatient clinic of the department of gynaecology of a university medical center to determine further suitability for the study. Screening consisted of a sexual function interview, a psychiatric interview, and a gynecological examination. The psychiatric interview was carried out by means of the MINI International Neuropsychiatric Interview (MINI). The MINI is a semi-structured diagnostic interview regarding the most common psychiatric disorders according to the DSM-IV on Axis 1 (American Psychiatric Association, 2000; Lecrubier et al., 1997; Sheenan et al., 1997). Women with a diagnosis of affective, psychotic or substance-related disorder were excluded. A standardized gynecological examination for sexual pain disorders (see de Kruiff, ter Kuile, Weijnenborg, & van Lankveld, 2000) was carried out by an independent female gynaecologist to exclude women with somatic pathology, and to verify the presence or absence of VVS in the dyspareunia group. In line with Friedrich's criteria (1987), a diagnosis of VVS was established when the woman experienced vulvar pain upon touch of the vestibule with a cotton-swab ('the touch-test') and when there were physical findings confined to vestibular erythema ('redness'). At the end of the screening, all questionnaires were administered.

In total, data from 80 women with dyspareunia and 62 women without sexual complaints have been collected. Of the women with dyspareunia, 52 (65%) of them were diagnosed with VVS by means of the gynaecological examination. Only measures and procedures relevant to the current data presentation are described in

the following section. For details about the entire protocol procedure, see Brauer et al., 2006; 2007.

The Local Ethics Committee of the Leiden University Medical Center approved both studies. Participants received a compensatory fee and travelling expenses.

Measures

Female Sexual Function Index (FSFI). The FSFI (Rosen et al., 2000) is a brief self-report measure of female sexual function composed of six subscales; desire, arousal, lubrication, orgasm, satisfaction, and pain. The range for the FSFI total score is 2-36 with lower scores representing worse sexual function. The psychometric quality of the FSFI is satisfactory (Wiegel, Meston, & Rosen, 2005). Based on a Dutch sample consisting of approximately 350 women with and without sexual complaints, the internal consistency and stability of the FSFI were found to be satisfactory-to-good. The FSFI's ability to discriminate between sexually functional and dysfunctional women was excellent as was the ability to predict the presence or absence of sexual complaints (ter Kuile, Brauer, & Laan, 2006). In line with ter Kuile et al.'s (2006) conclusion that the discriminative value of the FSFI total score is as good as that of the combined use of the six subscales, we only report the total score.

The Female Sexual Distress Scale (FSDS). To assess sexually related personal distress, FSDS (Derogatis, Rosen, Leiblum, Burnett, & Heiman, 2002) was administered. The FSDS consists of 12 items, inquiring about negative feelings and problems that were bothersome or caused distress during the past 30 days. Examples are "*how often did you feel worried about sex*" and "*how often did you feel angry about your sex life*." Response categories vary from 0 (never) to 4 (always). The range for the FSDS total score is 0-48. Higher scores indicate more sexual distress. Results in a Dutch study sample supported the unidimensional structure of the FSDS and its reliability and psychometric validity (ter Kuile et al., 2006).

Sexual Opinion Survey (SOS). To assess sexual attitudes, participants completed the SOS (Fisher, Byrne, White, & Kelley, 1988). The SOS is a reliable and validated 21-item measure of the disposition to respond to sexual cues along a negative-positive dimension of affect and evaluation (erotophobia/erotophilia). Each item describes a positive or negative affective-evaluative response to a sexual activity or situation. Examples are "*Seeing a pornographic movie would be sexually arousing to me*," "*I do*

not enjoy daydreaming about sexual matters," and *"Masturbation can be an exciting experience"*. Respondents indicate agreement-disagreement on a 7 point Likert scale with 1 (I totally agree) and 7 (I totally disagree). The range for the SOS total score is 0-126, with higher scores indicating more positive attitudes towards sexuality (erotophilia). To validate a Dutch version of the SOS, the survey was administered in a sample consisting of approximately 230 women with sexual complaints and 170 women without sexual complaints (ter Kuile, Brauer & Laan, in prep.) The internal consistency ($\alpha = .86$) and test-retest stability ($r = .87$) of the SOS proved to be satisfactory (Nunnally, 1967). The SOS subscale score was independent of biographic variables such as age, duration of relationship, parental status. The convergent and divergent construct validity of the SOS was good

Sexual Experiences Scale-Home version (SES-H). To index participants' self-reported affective and cognitive responses to erotic stimulation we used the SES (Heiman & Rowland, 1983; Rowland, Cooper, & Heiman, 1995). Usually, the SES is administered after exposure to audiovisual erotic stimuli to let the participant evaluate how he/she felt while being exposed to the stimuli. In the present study participants were asked to fill out the SES when thinking of their most recent sexual experience with their partner. This version of the SES is defined as the SES-Home version (SES-H). The SES(-H) is a list containing 37 descriptors. Response categories vary from 1 (not at all) to 7 (extremely). To validate this version, the SES-H was administered in a sample consisting of approximately 230 women with sexual complaints and 170 women without sexual complaints (ter Kuile et al., in prep.). Based on the scree test, a four factor solution emerged in both populations. A four-component simultaneous components analysis was conducted to find the components weights with which the components optimally summarized the variables in the two populations. This analysis revealed that the four factor solution accounted for 70.7% of the total variance in the group consisting of women with sexual complaints and for 53.3% in the control group. Items with a loading on one component exceeding 0.35 and a difference between loadings on two components of at least 0.10 were considered to belong to a subscale. The four subscales were considered to represent genital sensations, autonomic arousal, negative affect, and positive affect, respectively. The internal consistency of the subscales (Cronbach's α range .68 -.95) and the test-retest proved to be satisfactory (Nunnally, 1967). For the present study, only the subscales negative

affect and positive affect were used. The subscale negative affect includes 8 items (worried, anxious, guilty, sexually turned off, embarrassed, inhibited, angry, incompetent) and the subscale positive affect consists of 5 items (loving, feminine, sexy, sexually attractive, interested). The range for each SES subscale score is 1-7, with higher scores indicating that affect was experienced as being more intense.

Vulvar Pain Questionnaire (VPQ). The VPQ was developed at our department to obtain information regarding vulvar pain experienced upon physical contact. Women with dyspareunia were asked to indicate how often they experienced vulvar pain on a five point Likert scale with 0 (never) and 5 (always). This list consisted of 9 items and was validated in the present dyspareunia sample. Because more than 75% of women responded on three questions to experience "never" vulvar pain upon several forms of physical contact independent from intercourse, these three items were not entered in the analysis. An explorative PCA was performed on the correlation matrix of the 6 items that were left. A one factor solution with an eigenvalue > 1.0 was obtained that accounted for 55.2 % of the total variance. Five items loaded on this component with minimally 0.60. This subscale consisted items regarding vulvar pain experienced after (attempted) intercourse at the entrance of the vagina and was named vulvar pain provoked by physical contact following intercourse. An example is "*Following intercourse, do you experience vulvar pain due to friction with tight clothing?*" The internal consistency of the subscale proved to be good (Cronbach's $\alpha = .85$). The range for the VPQ subscale score is 1-5. Higher scores indicate that vulvar pain is experienced more often.

Genital Pain Ratings (GPR). A 7-item questionnaire was constructed by our department to assess the level of pain experienced by touch of the vulva and penetration of the vagina. Response categories vary from 0 (not at all) to 10 (worst imaginable pain). Higher scores indicate more pain. This list was validated in a patient population ($N = 117$) with complaints of superficial dyspareunia. An explorative PCA was performed on the correlation matrix of the items. Using the scree test criterium, (Cattell, 1966), a two factor solution was obtained that accounted for 81.4 % of the total variance. Items with a loading on one component exceeding 0.65 and a difference between loadings on two components of at least 0.15 were considered to belong to a subscale. The first subscale consisted of 6 items (pain by touch of the vulva by the patient herself, pain by touch of the vulva by the

patient's partner, pain during insertion of one/two own finger(s) into the vagina, and pain during insertion of one/two finger(s) of the patient's partner) into the vagina and was interpreted as pain upon vulvar touch and finger insertion. The internal consistency of this subscale proved to be good ($\alpha = .94$). Only one item, pain experienced during (attempted) intercourse, loaded on the second factor. The interscale correlation between the first subscale and pain during (attempted) intercourse proved to be medium ($r = .39$). For the present study, only women with dyspareunia were asked to complete this list.

Pain Coping and Cognition List (PCCL). To assess pain catastrophizing, the subscale pain catastrophizing of the PCCL was used (Stomp-van den Berg, et al., 2001). The PCCL is a questionnaire designed to assess cognitive reactions to pain. Respondents indicate agreement-disagreement on a 6 point Likert scale with 0 (I totally disagree) and 5 (I totally agree). De Gier et al. (2004) found support for the internal consistency and construct validity of the PCCL. The range for the subscale score of pain catastrophizing is 1-6, with higher scores denoting a higher degree of catastrophizing towards pain. For the present study, women with dyspareunia were asked to complete this subscale twice, once with reference to non-genital pain and once with reference to genital pain during intercourse, whereas control women completed this subscale solely with reference to non-genital pain.

State-Trait Anxiety Inventory (STAI). The STAI (Spielberger, Gorsuch, & Lushene, 1970), Dutch adaptation (Van der Ploeg, Defares, & Spielberger, 1979), is a self-report questionnaire measuring state (momentary, reactive) anxiety and trait (stable, dispositional) anxiety. Both subscales contain 20 items. The range for each subscale score is 20-80, with higher scores representing higher levels of anxiety.

Beck Depression Inventory-II (BDI-II). To index the current level of depressive symptoms, the 21-item BDI-II was administered (Beck, Steer, & Brown, 1996), Dutch adaptation (Van der Does, 2002). The range for the BDI total score is 0-63, with higher scores indicating more depressive symptoms.

Symptom Checklist-90 (SCL-90). The SCL-90 is a self-report measure to assess psychological distress (Derogatis & Cleary, 1977), Dutch adaptation (Arrindell & Ettema, 1981; 1986). Only the 12-item subscale somatization of the SCL-90 was used. The range for this subscale is 12-60, with higher scores denoting higher levels of somatization.

Maudsley Marital questionnaire (MMQ). For the present study only the subscale relationship satisfaction of the MMQ was used (Crowe, 1978), Dutch adaptation (Arrindell, Boelens, & Lambert, 1983). The range for this subscale score is 0-80, with higher scores denoting more relational dissatisfaction.

Sexual and Physical Abuse Questionnaire (SPAQ). The SPAQ is a short self-report instrument assessing the prevalence and severity of childhood and adult sexual and physical abuse. The SPAQ was found to have good criterion validity for the presence of sexual abuse experiences (Kooiman, Ouwehand, & ter Kuile, 2002).

Procedure

Upon arrival at the clinic, consenting women were interviewed individually, after which they completed the battery of questionnaires. This took approximately 1 h.

Data reduction, scoring, and data analysis

To inspect differences in demographic variables between women with dyspareunia and controls, *t*-tests and chi-square tests were used. For measures obtained from all participants (i.e., sex-related measures, individual and relational well-being measures, and the PCCL regarding general pain), we used multivariate analysis of variance (MANOVA) to test for differences between the entire dyspareunia sample and the control group. Significant results were further analyzed with univariate *F*-tests. Variables that turned out to be significantly different between the entire dyspareunia sample and the control group were submitted to a MANOVA to check whether the two dyspareunia subgroups would differ on these measures. For pain-related measures that were completed by the dyspareunia group only, a MANOVA was conducted to investigate differences between the two dyspareunia subgroups (i.e., women with and without VVS). Significant results were further analyzed with univariate *F*-tests. An overall α of .05 was chosen.

For all dependent variables that were compared between the entire dyspareunia and control sample as well as between the two dyspareunia subgroups, effect sizes (*f*) were calculated as a function of η^2 (see Cohen, 1988, p. 284). For the purpose of interpretation, Cohen considered $.10 < f < .25$ as small, $.25 < f < .40$ as medium, and $f > .40$ as large.

Logistic regression analyses were carried out to determine which of the dependent

variables that differed between the entire dyspareunia group and control group had the most important contribution in predicting group membership (dyspareunia/control). On the basis of the models produced by the logistic regression analyses, clinical decision analyses were performed to examine the classificatory qualities of the models. Sensitivity (how good the test is at detecting sexual dysfunction) and specificity (how well the test identifies women without sexual complaints) were calculated, which indicate the ability of the model to correctly demonstrate the presence or absence of sexual dysfunction (i.e., dyspareunia). In addition, positive and negative predictive values were calculated. A positive predictive value is defined as the proportion of positive predictions (the participant is predicted by the model to have dyspareunia), which coincides with the observed presence of dyspareunia. A negative predictive value is defined as the proportion of negative predictions (the participant is predicted by the model not to have dyspareunia), which coincides with the observed absence of dyspareunia.

Finally, the diagnostic properties of the variables that reliably predicted group membership were further examined by Receiver Operating Characteristics (ROC) analyses that provide area under the curves (AUCs). The AUC is a measure of model accuracy.

RESULTS

Prealyses

Prealyses revealed that there were no significant differences between women participating in one of the two psychophysiological studies. Therefore, we only report here the analyses using the pooled data. Prior to analysis, all continuous variables were examined for fit between their distributions and the assumptions of multivariate analyses. When skewnesses were observed lower than -1.0 and higher than 1.0, transformations were applied to return the data to a normal distribution (Tabachnick, & Fidell, 2001).

Sample characteristics

Detailed demographic data and test values for the dyspareunia group and control group are provided in Table I. In comparison to the control group, the dyspareunia

group was significantly older, had a significantly longer relationship duration, and a significantly larger percentage of them cohabited with their partner. There were no significant differences between the two groups with respect to education level and parental status. Moreover, no differences were observed between the two dyspareunia subgroups on demographic variables.

Table I. Demographic characteristics

	Dyspareunia (<i>n</i> = 80)		Control (<i>n</i> = 62)		χ^2 or <i>t</i> -values
<i>Characteristics</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
Age (in years)	26.9	6.4	24.7	6.0	<i>t</i> = -2.36*
Duration relationship (in years)	5.7	3.4	3.4	5.0	<i>t</i> = 4.99**
Married/co-habiting (% yes)	68.8		33.9		χ^2 = 17.08**
Has a Child (% yes)	8.8		9.7		χ^2 = .36
Education (%)					χ^2 = 4.48
Primary school-					
lower secondary	3.8		0		
Higher secondary	57.0		71.0		
College-university	39.2		29.0		

**p* < .05. ** *p* < .01.

Comparisons between women with dyspareunia and controls

Means, standard deviations, test-values and effect-sizes on cognitive-affective variables are provided in Table II. A MANCOVA was conducted to examine differences in cognitive-affective variables between women with and without dyspareunia, while controlling for significant group differences on demographic variables (age, duration relationship, cohabiting).

A significant multivariate main effect for group was obtained, $F(11, 126) = 24.51$, $p < .01$. Univariate tests revealed that the dyspareunia sample differed significantly from the control group on all cognitive-affective variables related to sexual functioning, chronic pain, individual and relational well-being. As hypothesized, the dyspareunia group was more sexually impaired and reported to be more distressed

about their sexual functioning than the control group. The dyspareunia group held more negative sexual attitudes and reported to have experienced less positive and more negative affect during their latest sexual experience with the partner. With respect to cognitive reactions to pain as assessed by the PCCL, data for non-genital pain were compared between the dyspareunia group and control group. In line with predictions, a significant group difference was found, indicating that the dyspareunia group demonstrated elevated levels of catastrophizing to pain in general (see Table II). Significant group differences were also observed for somatization, state and trait anxiety, depression, and marital satisfaction. As expected, these results demonstrate that in comparison to controls, women with dyspareunia displayed elevated levels of somatization, state and trait anxiety and depression, and were less satisfied with their relationship.

No group differences were found on the prevalence of physical or sexual abuse. No differences in prevalence were observed when considering severity of abuse. The groups also did not differ with respect to the occurrence of abuse during childhood versus adulthood (see Table II).

Comparisons between women with dyspareunia with and without VVS Means, standard deviations, test-values, and effect sizes on pain-related measures exclusively assessed in the dyspareunia group are provided in Table III. The mean duration of the complaint of genital pain during intercourse did not differ for women with dyspareunia without VVS and women with dyspareunia with VVS. For the majority of women dyspareunia was a lifelong problem. There were no differences between the two subgroups in the percentages regarding the onset of dyspareunia (i.e. lifelong or acquired).

A MANOVA was performed on data from pain-related questionnaires. A significant multivariate main effect of Group was found, $F(4, 75) = 4.89, p < .01$. Follow-up univariate tests revealed that the dyspareunia with VVS-subgroup reported significantly higher levels on the GPR subscale "pain upon vulvar touch and finger insertion" as well as the GPR subscale "pain during intercourse" than the dyspareunia without VVS-subgroup. Furthermore, the dyspareunia with VVS-subgroup tended to catastrophize more regarding genital pain during intercourse than the dyspareunia without VVS-subgroup ($p = .057$). Finally, the dyspareunia with VVS-subgroup

Table II. Mean ratings on cognitive-affective variables related to sexual functioning, chronic pain and psychological well-being for women with dyspareunia and controls

	Dyspareunia (<i>n</i> = 80)	Control (<i>n</i> = 62)	<i>F</i> -values	Effect sizes (<i>f</i>)
<i>Measures</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>		
FSFI				
Total	18.1 (6.5)	31.5 (4.0)	<i>F</i> = 140.74*	1.02
FSDS				
Sexual distress	22.7 (9.6)	4.2 (5.1)	<i>F</i> = 174.31*	1.13
SOS				
Sexual attitudes	82.8 (17.2)	93.2 (15.2)	<i>F</i> = 10.41*	0.28
SES-H				
Positive affect	4.5 (1.2)	5.8 (0.8)	<i>F</i> = 38.72*	0.53
Negative affect	2.4 (1.1)	1.1 (0.2)	<i>F</i> = 96.13*	0.84
PCCL non-genital pain				
Catastrophizing	2.0 (0.6)	1.7 (0.5)	<i>F</i> = 9.88*	0.27
SCL-90				
Somatization	16.3 (4.0)	15.3 (3.5)	<i>F</i> = 8.41*	0.25
STAI				
State anxiety	32.5 (8.5)	28.8 (6.8)	<i>F</i> = 10.15*	0.27
Trait anxiety	35.7 (9.9)	32.4 (6.9)	<i>F</i> = 11.21*	0.29
BDI				
Depression	5.0 (4.5)	2.9 (3.5)	<i>F</i> = 13.0*	0.31
MMQ				
Relationship satisfaction	13.9 (9.7)	8.6 (6.8)	<i>F</i> = 7.45*	0.23
SPAQ				
History of sexual interference <i>N</i> (% yes)	24 (30.4)	20 (32.3)	$\chi^2 = .06$	-
History of physical assault <i>N</i> (% yes)	11 (13.8)	13 (21.0)	$\chi^2 = 1.30$	-

Note: The table presents untransformed data. Analyses are conducted on transformed data. FSFI = Female Sexual Function Index; FSDS = Female Sexual Distress Scale; SOS = Sexual Opinion Survey; SES-H = Sexual Experiences Scale- Home version. PCCL = Pain Coping and Catastrophizing List; SCL-90 = Symptom Check List; STAI = State Trait Anxiety Inventory; BDI = Beck Depression Inventory; MMQ = Maudsley Marital Questionnaire; SPAQ = Sex and Physical Abuse Questionnaire.

* $p < .05$. ** $p < .01$.

tended to experience more often vulvar pain provoked by physical contact following intercourse as assessed with the VPQ ($p = .073$).

To test whether the dyspareunia groups with and without a diagnosis of VVS had a different psychological profile, a MANOVA was conducted on those sex-related and individual and relational well-being variables that turned out to be significantly different between the entire dyspareunia sample and the control group. The MANOVA revealed no significant group main effect, $F(10, 69) = 0.48, p > .89$. As can be seen in Table III, the two dyspareunia subgroups did not differ significantly on sexual functioning, sexually related distress, cognitive-affective reactions to sexual stimuli and situations, catastrophizing to pain in general, and individual as well as relational well-being, respectively. In support of this, negligible effect sizes were found on these measures.

Predictors of group membership (dyspareunia/control)

A direct logistic regression analysis was performed on group membership (dyspareunia versus control) as criterion. Because significant differences were found in demographic variables between the dyspareunia and control group (age, duration relationship, cohabitation), these demographic variables were entered in the first block. Since all cognitive-affective variables significantly discriminated between the dyspareunia and control group, they were all selected as predictors in the second block: FSFI, FSDS, SES-H positive and negative affect, SOS, MMQ, STAI state and trait anxiety, BDI, SCL somatization, and PCCL catastrophizing regarding pain in general. Data of 80 women with dyspareunia and 62 controls were included in the analysis. The first block, consisting of demographic covariates, produced a significant regression model (Model: $\chi^2(3) = 27.43$). Duration relationship (Wald (1) = 8.77, $p < .01$) and cohabitation (Wald (1) = 3.97, $p < .05$) significantly contributed to the model. The second step, including the eleven cognitive-affective predictors significantly improved the regression model (Model: $\chi^2(11) = 131.04, p < .01$). The FSFI (Wald (1) = 11.15, $p < .01$) and the FSDS (Wald (1) = 8.14, $p < .01$) significantly contributed to the model. This model correctly predicted group membership in 95.8% of the cases. Sensitivity of the model was 96.3%, and the specificity was 95.2%. The positive and negative predictive values of the model were 96.3% and 95.2%, respectively. Two outliers were observed: one woman with

Table III. Mean ratings on pain characteristics and cognitive-affective variables related to sexual functioning, chronic pain and psychological well-being for women with dyspareunia without and with VVS

	Dyspareunia with VVS (<i>n</i> = 52)	Dyspareunia without VVS (<i>n</i> = 28)	χ^2 - <i>t</i> or <i>F</i> -values	Effect- sizes (<i>f</i>)
<i>Measures</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>		
Duration dyspareunia (in years)	5.3 (4.3)	5.8 (4.1)	<i>t</i> = -0.62	-
Onset (% primary)	56.9	53.8	χ^2 = 0.60	-
Vulvar Pain Questionnaire				
Vulvar pain provoked by physical contact following intercourse	2.7 (0.9)	2.4 (0.8)	<i>F</i> = 3.30	0.21
Genital Pain Ratings				
Pain upon vulvar touch and finger insertion	3.7 (2.3)	2.0 (1.9)	<i>F</i> = 11.24**	0.38
Pain during intercourse	7.8 (1.5)	6.8 (2.0)	<i>F</i> = 6.36*	0.28
PCCL genital pain				
Pain Catastrophizing	2.5 (0.8)	2.2 (0.6)	<i>F</i> = 3.73	0.22
FSFI				
Total	17.7 (6.3)	18.8 (7.1)	<i>F</i> = 0.54	0.08
FSDS				
Sexual distress	23.3 (9.8)	21.6 (9.2)	<i>F</i> = 0.46	0.08
SOS				
Sexual attitudes	82.2 (17.1)	83.9 (17.6)	<i>F</i> = 0.18	0.04
SES-H				
Positive affect	4.6 (1.3)	4.5 (1.2)	<i>F</i> = 0.06	0.03
Negative affect	2.4 (1.1)	2.3 (1.2)	<i>F</i> = 0.23	0.05
PCCL non-genital pain				
Catastrophizing	2.1 (0.7)	1.8 (0.4)	<i>F</i> = 2.98	0.20
STAI				
State anxiety	32.6 (9.0)	32.4 (7.8)	<i>F</i> = 0.00	0.00
Trait anxiety	35.8 (9.3)	35.4 (11.0)	<i>F</i> = 0.04	0.03
BDI				
Depression	5.1 (4.7)	4.7 (4.2)	<i>F</i> = 0.14	0.04

Table III. Continued

	Dyspareunia with VVS (<i>n</i> = 52)	Dyspareunia without VVS (<i>n</i> = 28)	χ^2 - <i>t</i> or <i>F</i> -values	Effect- sizes (<i>f</i>)
<i>Measures</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>		
MMQ				
Relationship satisfaction	13.9 (9.2)	13.8 (10.7)	<i>F</i> = 0.08	0.03

Note: The table presents untransformed data. Analyses are conducted on transformed data. VVS = Vulvar Vestibulitis Syndrome; VPQ = Vulvar Pain Questionnaire; GPR = Genital Pain Ratings; PCCL = Pain Coping and Catastrophizing List; FSFI = Female Sexual Function Index; FSDS = Female Sexual Distress Scale; SOS = Sexual Opinion Survey; SES-H = Sexual Experiences Scale- Home version; STAI = State Trait Anxiety Inventory; BDI = Beck Depression Inventory; MMQ = Maudsley Marital Questionnaire.

**p* < .05. ** *p* < .01.

dyspareunia was misclassified as sexually functional and one control woman was misclassified as having dyspareunia. Because these outliers did not influence the adequateness of the model fit, they were not excluded from further analyses.

However, it is not surprising that a sexual dysfunction measure such as the FSFI discriminates well between women with and without dyspareunia given that the primary purpose of this measure is to distinguish between women with and without sexual dysfunctions. As sexual distress is considered an essential component of the definition of female sexual dysfunction (Basson et al., 2003), it is also not surprising that the FSDS, a sexual distress measure that is known for its good discriminative value (Derogatis et al., 2002; ter Kuile et al., 2006), discriminates well between women with and without dyspareunia. It would thus be interesting to see whether other cognitive-affective variables, apart from sexual dysfunction and sexual distress, can reliably predict group membership. Therefore, a direct logistic regression analysis was performed with nine independent variables (all cognitive-affective variables that were entered in the first logistic regression analysis except for the FSFI and FSDS). Again, we controlled for demographic variables in the first block. Inclusion of these nine cognitive-affective variables in the second block resulted in a significant improvement of the regression model (Model: $\chi^2(9) = 78.62$, *p* < .01). It was found that the subscale negative affect of the SES-H (Wald (1) = 23.58, *p* < .05) and the subscale positive affect of the SES-H (Wald (1) = 7.92, *p* < .01) signi-

ificantly contributed to the model. This model correctly predicted the overall presence or absence of sexual dysfunction in 90.8% of the cases. Sensitivity of the model was 91.3%, and the specificity was 90.3%. The positive and negative predictive values of the model were 92.4% and 88.9%, respectively. These data indicate that also measures assessing negative and positive affect experienced during a sexual encounter are important in discriminating between women with dyspareunia and controls.

As a next step, it would be interesting to see whether, apart from sexuality related measures, cognitive-affective variables related to the experience of chronic pain as well as individual and relational well-being contribute to the prediction of group membership (dyspareunia/control). Therefore, a subsequent direct logistic regression analysis was performed with the aforementioned demographic variables in the first block and the MMQ, STAI state and trait anxiety, BDI, SCL somatization and PCCL-catastrophizing to pain in general were enclosed in the second block. Inclusion of these six measures did not significantly improve the regression model.

ROC curves were created for the FSFI and FSDS combined, and for the SES-H positive and negative affect combined, respectively (see Fig. 1). To create each ROC, we modelled the predicted probabilities of the presence of dyspareunia that were calculated through logistic regression analysis. As can be seen in Figure 1, the ROC curve of the FSFI and FSDS together had an AUC of .99 (95% CI: 0.969-1.001), and the ROC curve of the SES-H subscales positive affect and negative affect had an AUC of .95 (95% CI: 0.911-0.987).

Predictors of group membership (dyspareunia with VVS/dyspareunia without VVS)

A direct logistic regression analysis was performed on VVS (dyspareunia with a concomitant diagnosis of VVS versus dyspareunia without a concomitant diagnosis of VVS) as criterion and all variables that differed between the dyspareunia subgroups with $p < .10$ were chosen as predictors: GPR subscale "pain upon vulvar touch and finger insertion", GPR subscale "pain during intercourse", VPQ subscale "vulvar pain provoked by physical contact following intercourse" and PCCL subscale catastrophizing to genital pain. Data of 52 women with dyspareunia with VVS and 28 women with dyspareunia without VVS were entered in the analysis. Inclusion of

these four variables resulted in a significant regression model (Model: $\chi^2(4) = 17.97$, $p < .01$). Only the GPR subscale "pain upon vulvar touch and finger insertion" (Wald (1) = 4.44, $p < .05$) significantly contributed to the model. This model correctly predicted the overall presence or absence of sexual dysfunction in 72.5% of the cases. Sensitivity of the model was 88.5%, and the specificity was 42.9%. The positive and negative predictive values of the model were 74.2% and 66.7%, respectively.

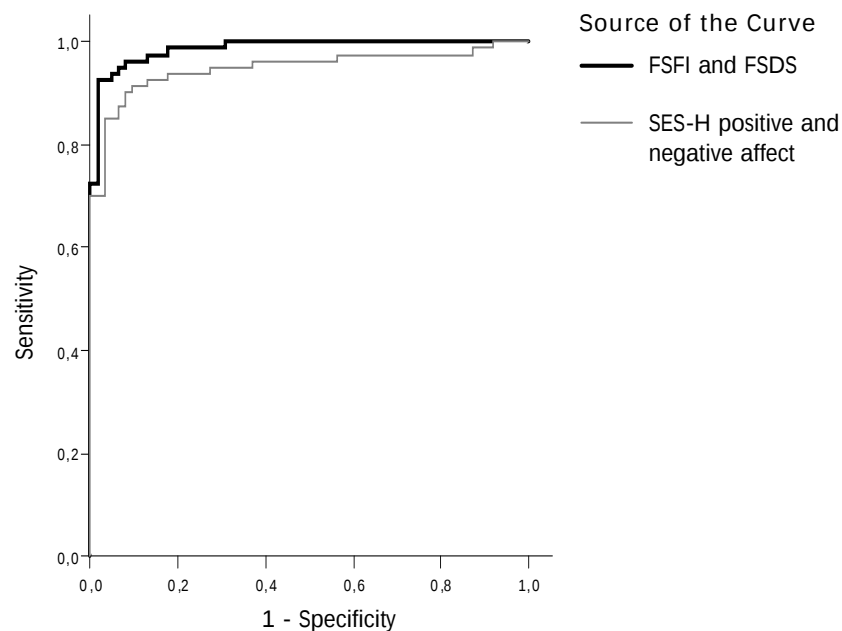


Figure 1. Receiver Operating Characteristics (ROC) Curves for the significant predictors of the classification into dyspareunia and sexually functional. The true positive rate (y-axis) is plotted against the false positive rate (x-axis). Any increase in sensitivity will be accompanied by a decrease in specificity.

DISCUSSION

The present study sought to determine the role of cognitive-emotional variables regarding sexuality, the experience of chronic pain, and relational as well as individual well-being in women with complaints of superficial dyspareunia using self-report measures. The main results can be summarized as follows: 1) All cognitive-affective variables were found to discriminate between women with superficial dyspareunia and controls; 2) only sex-related variables reliably predicted group membership. 3) The dyspareunia subgroups based on the presence or absence of a concomitant diagnosis of VVS were only distinguishable on pain intensity but did not differ on cognitive-affective variables related to sexuality and psychological well-being.

In line with our expectations based on previous studies, we found that cognitive-affective variables related to sexuality, but also variables related to the experience of pain and individual and relational well-being discriminate between women with and without dyspareunia. That is, women with superficial dyspareunia reported, as expected, impaired sexual functioning, higher levels of sexually related personal distress, more negative sexual attitudes, and a more negative appraisal of the woman's latest sexual experience than controls (Brauer et al., 2006; Brauer et al., 2007; Brauer et al., in press; Gates & Galask, 2001; Meana et al., 1997; Nunns & Mandal, 1997; Reissing et al., 2003; Payne et al., 2007; van Lankveld et al., 1996; White & Jantos, 1998). Symptomatic women also displayed more catastrophizing to pain in general (Payne et al., 2005; Pukall et al., 2007) and tended to somatise more than controls (Granot & Lavee, 2005; van Lankveld et al., 1996; Wylie et al., 2004). With respect to individual and relational well-being, symptomatic women scored significantly higher on depression, state and trait anxiety (Danielsson et al., 2001; Gates & Galask, 2001; Granot et al., 2002; Granot & Lavee, 2005; Granot, 2005; Meana et al., 1997; Nylanderlundqvist & Bergdahl, 2003; Nunns & Mandal, 1997; Pukall et al., 2002; Payne et al., 2005; Payne et al., 2007; van Lankveld et al., 1996; Wylie et al., 2004) and marital dissatisfaction (Meana et al., 1997; Reissing et al., 2003) as compared to controls. Finally, similar to other studies no group differences were noted for sexual abuse history (Danielsson et al., 2000; Meana et al., 1997; Reissing et al., 2003).

However, subsequent logistic regression analyses revealed that of all discriminating cognitive-affective variables only measures related to sexual functioning (as assessed with the FSFI) and sexually related personal distress (as assessed with the FSDS) reliably predicted group membership. These findings are not surprising given that the primary purpose of a sexual dysfunction measure is to reliably discriminate between individuals with and without sexual complaints. As recent consensus-based characterizations of female sexual dysfunction have emphasized personal distress as an essential component of the definition of female sexual dysfunction (Basson et al., 2003), it was also not surprising that the FSDS discriminates well between women with and without dyspareunia. Therefore, a subsequent logistic regression analysis without the FSFI and FSDS was conducted, indicating that negative affect and positive affect as experienced during a sexual encounter (as assessed with the SES-H) also reliably contributed to the prediction of group membership.

To the best of our knowledge, this is the first study in which an attempt was made to identify the cognitive-affective variables that have the most important contribution in discriminating between women with dyspareunia and controls. The present finding that only sexuality-related measures significantly predicted group membership whereas measures related to psychological functioning, marital satisfaction, and pain did not, converts to the conclusion that dyspareunia is primarily a sexual dysfunction associated with impairment at all stages of the sexual response cycle. Abundant evidence for this conclusion is provided by multiple studies showing comorbidity between dyspareunia and other sexual problems (e.g., Brauer et al., *subm.*; Gates & Galask, 2001; Meana et al., 1997; Nunns & Mandal, 1997; Reissing et al., 2003; Payne et al., 2007; van Lankveld et al., 1996; White & Jantos, 1998). However, it should be noted that we can not infer from our correlational data the causality between dyspareunia and problematic sexual functioning. It is conceivable that dyspareunia *causes* problematic sexual functioning in some women, whereas dyspareunia *results* from underlying sexual problems, such as sexual arousal disorder or sexual aversion, in other women.

The observation that both the level of sexually related personal distress and the level of experienced negative affect during a woman's latest sexual experience with the partner are important variables discriminating between women with dyspareunia and controls, suggests that feelings associated with distress concerning a woman's

own sexual functioning (e.g., worry, fear, incompetence, guilt, frustration) are experienced most intense during sexual activity and/or exposure to sexual stimuli. This is in line with the high correlation that was found between the FSDS and SES-H negative affect ($r = .71$).

In the present study, negative and positive affect were assessed in relation to the women's latest sexual experience using the SES-Home version. In the same study population, the SES was also used to assess positive and negative affect while being exposed to visual sexual stimuli (erotic film fragments containing various heterosexual activities) in a laboratory setting (Brauer et al., 2006; 2007; in press). As compared to controls, the dyspareunia group reported significantly more negative affect and less positive affect in the home situation as well as in the laboratory setting. Levels of affect in both situations correlated significantly (for positive affect $r = .31$, and for negative affect $r = .30$). Following this, it might be speculated that higher levels of negative and lower levels of positive affect are not limited to sexual encounters during which symptomatic women are sexually dysfunctional (e.g., experience painful intercourse), but reflect a general negative appraisal of sexual situations and stimuli in women with dyspareunia.

Interestingly, although variables related to the experience of pain and individual as well as relational well-being were also found to discriminate between women with and without dyspareunia, albeit with smaller effect sizes than for sex-related measures, they did not classify women into dyspareunia versus sexually functional when controlling for sex-related measures. This pattern of findings seems to conflict with the prevailing notion that women with dyspareunia/VVS are characterized by several forms of psychopathology (see e.g., Basson & Weijmar Schultz, 2007). It should be emphasized that this notion is based on previous studies demonstrating impairment on several aspects of psychological functioning in symptomatic women without any further research into the discriminative values of these factors in this genital pain complaint. At present, our findings might indicate that impaired psychological functioning, relational dissatisfaction, and pain catastrophizing are somehow associated with the specific occurrence of sexual dysfunction, but do not characterize women with dyspareunia per se. In other words, our data seem to suggest that women with dyspareunia are relatively psychologically healthy. However, as our study sample of symptomatic women mainly consisted of women who responded to

advertisements for psychophysiological studies on sexual arousal responses and were not in treatment for their complaints, it is possible that this sample was not a representative one with respect to complaint severity and psychological functioning. This might indeed have been the case, since a closer look at the descriptive data revealed that even though the scores on psychological dysfunctioning, relational dissatisfaction, and pain catastrophizing in the dyspareunia group were on average significantly higher than those of the control group, the means were still in the low to moderate range as compared to available norms from general community samples. As such, the present data must be interpreted with caution.

We observed a striking resemblance of the dyspareunia subgroups on variables related to sexuality and individual and relational well-being. These data contradict Meana et al.'s observation that a VVS subgroup was characterized by severe sexual impairment, whereas a dyspareunia subgroup without VVS was characterized by psychological and relational problems (Meana et al., 1997). The conflicting results might be explained by differences in statistical analyses. That is, whereas Meana et al. compared each subgroup only with its own control group, we directly compared the two subgroups.

However, in the present study women with dyspareunia with VVS were found to evaluate genital pain upon vulvar touch and finger insertion, as well as during intercourse as significantly more severe than symptomatic women without VVS. The dyspareunia subgroup with VVS reported also marginally significant higher levels of catastrophizing specifically related to genital pain during intercourse than symptomatic women without VVS, but both subgroups reported equal levels of catastrophizing to non-genital pain. Only pain intensity appeared to be a significant predictor of the classification into the dyspareunia with VVS-subgroup or the dyspareunia without VVS-subgroup. The observation that the two dyspareunia subgroups could only be classified on pain intensity, may suggest that dyspareunia without VVS is a milder form of genital pain than dyspareunia with VVS. It also might be that women with VVS are hypersensitive to touch/pain in contrast to women with dyspareunia without VVS. Support for this suggestion stems from our previous laboratory finding that during a sensory testing procedure on the ankle (in a part of the present study population), women with dyspareunia with VVS indicated significantly lower pain thresholds and pain tolerance levels and lower tactile thresholds as

compared to both women with dyspareunia without VVS and controls, whereas the latter two groups did not differ on those variables (Brauer et al., 2007). These findings combined, symptomatic women with and without VVS might be distinguishable on pain sensitivity and on cognitive-affective variables related to the experience of chronic pain. In this study only pain catastrophizing was assessed. However, besides pain catastrophizing, also pain-related fear and hypervigilance to pain have recently been identified as important factors in several other medically unexplained chronic pain conditions such as low back pain and fibromyalgia (e.g., Crombez, Van Damme, & Eccleston, 2005; Goubert, Crombez, & Van Damme, 2004; Peters, Vlaeyen, & Leeuwen, 2005). Therefore, future research should include these additional variables to find out whether or not symptomatic women with or without a concomitant diagnosis of VVS are characterized by different psychological profiles.

This study has several strengths: the use of validated questionnaires and large samples, and the inclusion of measures related to sexuality, pain, and psychological well-being in one dyspareunia sample. Furthermore, the study has been innovative by applying logistic regression analyses to find out which of all discriminating variables reliably predict group membership. Another unique facet of the present study was the direct comparison between dyspareunia subgroups.

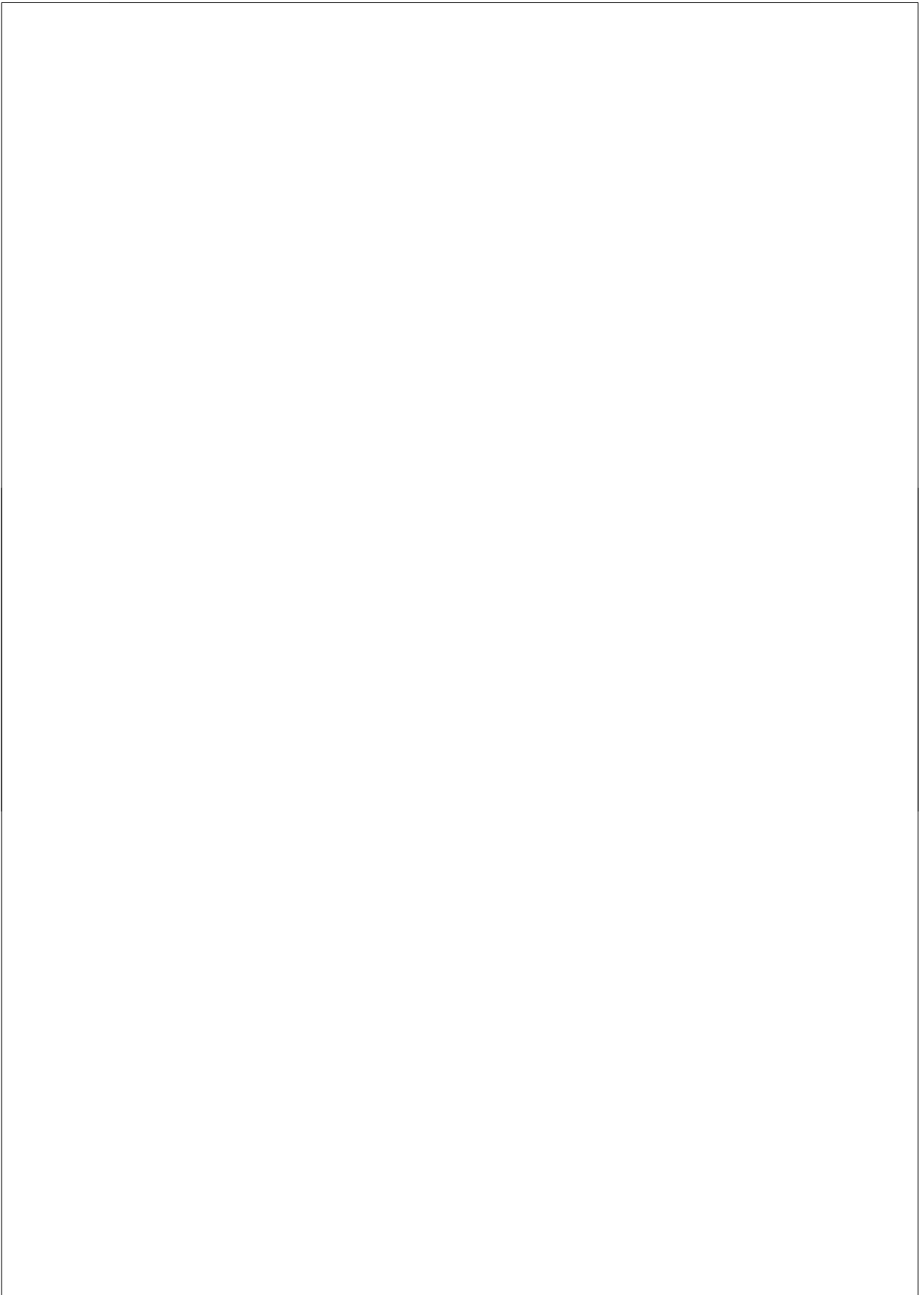
Nonetheless, the study also has a number of shortcomings, each of which points to recommendations for future research. As already mentioned, the generalizability of the present findings to a clinical dyspareunia population is questionable. It therefore would be advisable to replicate the present study within a clinical sample to examine whether there also exist other cognitive-affective variables above sex-related measures that predict group membership. Future research should also include other female sexual dysfunction groups to clarify the shared and unique predictors of dyspareunia and other sexual dysfunctions. Likewise, the inclusion of other chronic pain populations would be recommended. Furthermore, the correlational nature of the data does not allow any conclusions regarding causal relationships between the variables. To gain a better understanding of the role of sexual distress, affect experienced in the presence of sexual activities and stimuli, erotophobia, anxiety, depression, marital dissatisfaction, somatization, and catastrophizing in dyspareunia, longitudinal and experimental studies are needed.

Summarizing the foregoing, the present finding that variables related to sexuality, but also to the experience of chronic pain, and individual as well as relational well-being discriminate between women with and without superficial dyspareunia provides further support for the assumed role of these variables in dyspareunia. Our finding that sexuality related measures were the most important variables that discriminated between women with dyspareunia and controls emphasizes the relevance of psychosexual factors in dyspareunia. Following this, we suggest that treatment for dyspareunia should also include cognitive and behavioural interventions aimed at enhancing adequate sexual activities, reducing sexual distress, and modifying the appraisal of sexual stimuli.

C H A P T E R

7

General discussion



According to the prevailing cognitive-behavioral model of dyspareunia, fear of pain and diminished sexual arousal are key components in the onset and maintenance of this poorly understood condition (Spano & Lamont, 1975). The present thesis was designed to gain more insight into the role of these factors in dyspareunia. For that purpose, a multi-method research project was initiated, consisting of four experimental studies and one observational study, in which women with superficial dyspareunia were compared to women without sexual complaints. In this concluding chapter the main outcomes of the studies will be summarized and recapitulated in terms of the main research question. Next, the findings will be discussed in relation to theory and other relevant findings in this field. After considering the limitations of the studies, implications of our conclusions for future research as well as for the treatment of dyspareunia will be presented.

SUMMARY OF THE STUDIES

Psychophysiological research

The experimental study described in Chapter 2 focused on the question whether women with dyspareunia are characterized by a generally impaired genital responsiveness or that they exhibit a conditioned fear response to stimuli that may induce fear of pain (i.e., coitus). To address this issue, participants were exposed to both a non-coital and a coital sex film fragment. While viewing these fragments, participants' genital arousal levels and subjective reports were assessed. In apparent contrast to Wouda et al.'s (1998) finding of diminished genital arousal in symptomatic women while viewing a coitus scene, we observed that the dyspareunia group reacted with comparable levels of genital arousal to both the non-coital and coital sex film fragments as control women. As such, these data did not confirm Spano & Lamont's hypothesis (1975) that fear of pain would lead to diminished sexual response. Although the dyspareunia group reported, as predicted, less positive affect in response to both erotic stimuli than the control group, they unexpectedly did not differ from the control group in the level of reported anxiety nor other negative emotions to exposure to the coitus stimulus. We considered this latter finding as support for our suggestion that the coitus clip was not a true aversive stimulus for the dyspareunia group because it did not incorporate any direct associ-

ations with pain, and therefore, no reduction in genital response to the coitus clip had occurred.

Elaborating on this study, the purpose of the second study (Chapter 3) was to induce fear of pain in more ecologically valid circumstances. Threatening with painful stimuli during exposure to a sexual stimulus was considered an effective operationalization of pain-related fear. Participants were told that they had a 60% chance of receiving painful stimuli (i.e., electrical stimulation on the ankle) while being exposed to one of two erotic film clips. While viewing these fragments, participants' genital arousal levels and subjective reports were assessed. Skin conductance levels and ratings of experienced threat, which were assessed as a manipulation check, were significantly elevated in both groups of women when threatened. These findings assured us that pain-related fear was adequately elicited. In line with predictions, pain-related fear inhibited genital arousal in both women with and without dyspareunia. However, the dyspareunia group, unexpectedly, did not display a stronger reduction in genital arousal when threatened than the control group. Instead, they showed similar genital responsiveness during both the threatening as well as the non-threatening condition as controls. As hypothesized, pain-related fear impeded ratings of positive affect, whereas it amplified negative affect in both groups of women. In addition, the dyspareunia group did report, as expected, overall more negative affect than the control group. The outcomes of this study provided direct evidence for Spano & Lamont's (1975) hypothesis that fear reduces sexual arousal.

In the third psychophysiological study (Chapter 4), the appraisal of a sexual stimulus was manipulated by providing discrepant information regarding that stimulus prior to viewing it, with either a focus on genital pain or sexual enjoyment. A neutral instruction served as a control condition. The experimental manipulation appeared to evoke the intended patterns of genital arousal levels. That is, women who received negative information concerning the erotic film fragment (focus on genital pain) prior to viewing it tended to respond with lower levels of genital arousal as compared to women who received positive information about the fragment (focus on sexual enjoyment). However, this finding was only marginally significant. Again, as in Chapter 2 and 3, symptomatic women did not differ from controls in genital responsiveness. The experimental manipulation also had the intended impact on ratings of negative affect such that women who received the genital pain instruction

reported significantly more negative affect relative to women who received the sexual enjoyment instruction. Particularly in controls the instructions had the hypothesized effects with highest ratings of positive affect in the sexual enjoyment instruction condition relative to the other two conditions. The dyspareunia group reported only significantly less positive affect in response to the sexual stimulus than controls in the sexual enjoyment instruction condition, but reported, as expected, albeit marginally significantly, more negative affect in all instruction conditions. We concluded that the findings of this study provided evidence for the modulatory effects of appraisal of sexual stimuli on subsequent genital responding and affect in both women with and without sexual complaints.

All three studies clearly demonstrated that women with dyspareunia did not differ from sexually functional women in genital responsiveness while being exposed to various kinds of visual sexual stimuli, however, they consistently reported to have experienced less positive affect and/or more negative affect than women without sexual complaints.

Indirect measure

Chapter 5 focused on a study that tested the hypothesis that automatic fear-related associations with sexual stimuli are involved in superficial dyspareunia. To assess automatic affective sex-related associations, we used the Affective Simon Task (AST) (De Houwer & Eelen, 1998), a reaction time paradigm designed to capture the unintentional influence of the affective value of a stimulus on task performance. In this paradigm, participants are instructed to choose as fast as possible between a positive and a negative response on the basis of a non-affective stimulus feature meanwhile ignoring the valence of the presented stimuli. With respect to the sex-AST, participants were instructed to respond as fast as possible by verbalizing either "positive" or "negative" to sex stimuli, depending on whether they were presented in a landscape format or a portrait format. Reaction times (RT) are typically shorter when the valence of the required response matches with the valence of the stimulus, thereby revealing indirectly the valence of the stimulus for the participant (De Houwer & Eelen; 1998; De Houwer, Crombez, Baeyens, & Hermans, 2001).

Contrary to our expectations, for both symptomatic and control women, responses were faster when the required response was "positive" than when the required

response was "negative". These findings indicate that there is no strong evidence that women with dyspareunia are characterized by especially negative automatic affective associations with sexual stimuli. The strength of the positive automatic associations was similar for stimuli depicting heterosexual acts without any form of penetration, and stimuli depicting explicit vaginal penetration. However, with respect to self-reported ratings of the sexual stimuli, the dyspareunia group was, as hypothesized, characterized by both weaker positive (i.e., arousal and desire) and stronger negative (i.e., fear and aversion) associations with sexual stimuli. We concluded that the discordance between automatic and deliberate sex-related associations in women with dyspareunia points to the relevance of conscious appraisal and deliberate rather than automatic processes in the onset and maintenance of dyspareunia.

Self-report measures

In Chapter 6, an observational study was documented, in which variables related to sexuality (sexual functioning, sexual distress, sexual attitudes, and affect experienced during women's latest sexual encounter), chronic pain (pain catastrophizing, pain intensity), psychopathology (depression, anxiety, and somatisation), and relational well-being were assessed by means of validated self-report questionnaires. Although women with dyspareunia differed from complaint-free controls on all variables in the expected directions, sexuality related measures (i.e., sexual function, sexual distress, and negative and positive affect as experienced during women's latest sexual encounter) contributed most significantly to the prediction of group membership. Furthermore, dyspareunia subgroups based on the presence or absence of a concomitant diagnosis of vulvar vestibulitis syndrome (VVS) were only distinguishable on pain intensity but did not differ on cognitive-affective variables related to sexuality, pain, and well-being. Our finding that sexuality related measures were the most important variables that discriminated between women with dyspareunia and controls emphasizes the relevance of psychosexual factors in dyspareunia.

RECAPITULATION

When evaluating the results of the present thesis in the light of the main research question *-are fear of pain and diminished sexual arousal key components in dyspareunia?*- the following answers can be generated: First, fear of pain (Chapter 3) and anticipation to pain (Chapter 4) indeed inhibit genital and subjective sexual arousal responses. Second, since both women with and without dyspareunia reacted with a similar decline in genital arousal in reaction to the experimental manipulations, these data point to a general mechanism in women to respond with diminished genital arousal when they experience fear of pain or anticipate on pain within a sexual context, rather than a response that is typical for women with dyspareunia. Furthermore, taking into consideration that there were also no differences in genital responding between both groups of women during non-manipulated conditions (Chapter 2, and the control conditions in Chapter 3 and 4), we can not infer from these results that the potential to become genitally aroused to explicit sexual stimuli is impaired in dyspareunia. It is possible, however, that differences in genital arousal would become apparent in the naturalistic situation at home, with symptomatic women responding with insufficient genital arousal during a sexual encounter because of the expectation and/or fear of pain, and women without sexual complaints responding with adequate genital arousal because they are not bothered by fearful thoughts. Our third answer is that, despite the undecided role of genital arousal in dyspareunia, the current results (Chapter 2, 3, 4, 5, and 6) convincingly evidenced that the subjective component of sexual arousal is implicated in women with dyspareunia.

DISCUSSION

In this section the main empirical findings will be evaluated along the line of the theoretical frameworks that were chosen to guide the present thesis, particularly the prevailing cognitive-behavioural model of dyspareunia by Spano & Lamont (1975).

The negative impact of the pain-related fear manipulation on genital arousal and affect (Chapter 3) provided direct evidence for Spano & Lamont's (1975) model, and also bears striking resemblance with Barlow's model of sexual arousal (1986) and

the information processing model of sexual arousal (Janssen et al., 2000), in the sense that all three models assume that fear is critically involved in inhibited sexual arousal responses. Our findings are in line with another recent study that induced pain threat in women with VVS (Payne, Binik, Pukall, Thaler, Amsel, & Khalifé, 2007) and with other experimental studies in women that induced fear simultaneously with the exposure to an erotic stimulus (Beggs, Calhoun, & Wolchik, 1987; Both, Everaerd, & Laan, 2003; Laan, Everaerd, & Evers, 1995).

Additional support has been obtained for the information processing model of sexual arousal (Janssen, Everaerd, Spiering, & Janssen, 2000) given that appraisal of a sexual stimulus has been found to influence genital and subjective arousal (Chapter 4). These results corroborate the modulatory effects of appraisal on physiological responses to other emotional stimuli (see e.g., Ochsner & Gross, 2005).

The combined findings of Chapter 3 and 4 indicate that the way in which women evaluate or anticipate a sexual situation (e.g., negative expectations of suffering from pain during intercourse) influences genital responsiveness and subjective experience of sexual arousal, irrespective of women's sexual function status. How is this decline in genital responding due to pain-related fear (Chapter 3) and negative appraisal (Chapter 4) to be understood? In terms of Barlow's model (Barlow, 1986; Sbrocco & Barlow, 1996), it is thought that fear and negative, worry-related expectations demand attention at the expense of sexually arousing cues. This cognitive distraction from erotic cues is assumed to subsequently impede sexual arousal. Support for this assumption stems from two laboratory studies demonstrating that cognitive distraction reduces both genital and subjective arousal to erotic stimuli in sexually functional and dysfunctional women (Elliott & O'Donohue, 1997; Salemink and van Lankveld, 2006).

All three psychophysiological studies (Chapter 2, 3, and 4) clearly demonstrated that women with dyspareunia did not differ from sexually functional women in genital responsiveness while being exposed to various kinds of visual sexual stimuli, in both experimental and control conditions. The absence of different genital arousal responses between women with and without dyspareunia concurs with other laboratory research showing that, as opposed to controls, women with dyspareunia (Payne et al., 2007) and also women with sexual arousal dysfunction (e.g., Brotto, Basson, & Gorzalka, 2004; Laan, van Driel, & van Lunsen, in press; Meston &

Gorzalka, 1996; Morokoff & Heiman, 1980; Salemink & van Lankveld, 2006) were equally genitally responsive in reaction to explicit visual sexual stimuli. Therefore, we conclude that women with dyspareunia are able to become genitally sexually aroused to a similar degree as women without sexual complaints. Stated differently, there is no such thing as lack of responsiveness of the sexual system in women with dyspareunia as long as they are exposed to explicit visual sexual stimuli.

Rather than genital responsiveness, subjective arousal is implicated in dyspareunia. Paralleling psychophysiological research in women with dyspareunia (Payne et al., 2007) and other female sexual dysfunction groups (e.g., Laan et al., in press; Meston, 2006; Morokoff and Heiman, 1980), dyspareunia populations consistently reported less positive affect and/or more negative affect while being exposed to explicit erotic film fragments and photos in a laboratory context (Chapter 2, 3, 4, 5) as compared to controls. These laboratory findings extend to the home situation (Chapter 6) (e.g., Nunns & Mandal, 1997; van Lankveld, Weijenborg, & ter Kuile, 1996). Taken together, our results are in favour of recent reconceptualizations of sexual problems in women, which emphasize the relevance of subjective sexual arousal problems (Basson et al., 2003; Everaerd, Laan, Both, & van der Velde, 2000; Laan, Everaerd, & Both, 2005).

A negative meaning of sexual stimuli in symptomatic women was found to be restricted to a conscious level. In other words, there are no indications that fear-related automatic (in the sense of fast and non-intentional) affective sex-related associations are implicated in dyspareunia (Chapter 5). These findings are in conflict with the information processing model of sexual arousal (Janssen et al., 2000), which posits that in sexually dysfunctional individuals a threat processing template is automatically activated in specific, personally relevant, sexual situations. Our observation that sex-related associations at an automatic level tended to be positive in symptomatic women, was explained in terms of prevailing emotion theories (e.g., Lang, Bradley, & Cuthbert, 1990; Ohman, 1993), stating that species survival requires that emotionally significant stimuli are detected by automatic processing mechanisms, which immediately activate physiological responses. In the case of stimuli that promote survival, such as sexual stimuli, approach responses are primed (e.g., vaginal vasocongestion). Deliberate sex-related associations, in contrast, are assumed to be under control of higher-level conscious cognitive processing, and

may be partially determined by sexually rewarding or unrewarding experiences in the past (Janssen et al., 2000; Everaerd, Both, & Laan, 2006; Spiering, Everaerd, & Laan, 2004; van der Velde, & Everaerd, 2001).

Replicating many other psychophysiological studies in women, there were low correlations between genital arousal and subjective reports (Chapter 2, 3, and 4). Apparently, women seem not to attend to genital sexual responses when assessing their subjective feeling of sexual arousal, but instead, to their conscious appraisal of erotic stimuli (cf. Laan & Janssen, 2007).

In harmony with previous research in women with dyspareunia, the study reported in Chapter 6 revealed that symptomatic women (either with or without a concomitant diagnosis of VVS) reported significantly higher levels of catastrophizing to pain in general, depression, state and trait anxiety, and marginally significant higher levels of somatisation than controls (e.g., Danielsson, Eisemann, Sjöberg, & Wikman, 2001; Gates & Galask, 2001; Granot, 2005; Granot & Lavee, 2005; Granot, Friedman, Yarnitsky, & Zimmer, 2002; Meana, Binik, Khalifé, & Cohen, 1997; Nunns & Mandal, 1997; Nylanderlundqvist & Bergdahl, 2003; Payne, Binik, Amsel, & Khalifé, 2005; Pukall, Binik, Khalifé, Amsel, & Abbott, 2002; van Lankveld et al., 1996; Wylie, Hallom-Jones, & Harrington 2004). Sensory testing on the ankle (Chapter 3) indicated that only women with dyspareunia with VVS demonstrated enhanced sensitivity to pain (e.g., Granot, 2005; Granot & Lavee, 2005; Granot et al., 2002; Payne et al., 2005; Pukall et al., 2002). All above variables have also been identified as important factors in several other medically unexplained chronic pain conditions such as low back pain, headache, and fibromyalgia (e.g., Leeuw, Goossens, Linton, Crombez, Boersma, & Vlaeyen, 2007; Okifuji, Turk, & Marcus, 1999; Vlaeyen & Linton, 2000). The resemblance between women with dyspareunia and chronic pain sufferers was one of the reasons, for some researchers, to argue that dyspareunia should be reconceptualized as a pain disorder instead of a sexual dysfunction (e.g., Binik, 2005). However, as we found that only sexuality-related measures significantly predicted group membership (dyspareunia/control) whereas measures related to pain, and individual and relational well-being did not, we feel that it is necessary to stress how important psychosexual aspects are in dyspareunia, and that dyspareunia should not be solely regarded as a pain disorder.

In conclusion, the studies in the present thesis were the first to experimentally

investigate the role of fear of pain and diminished sexual response in women with dyspareunia. Our results add to the limited evidence for the prevailing model of dyspareunia (Spano and Lamont, 1975), and to increasing evidence for general models on sexual arousal (Barlow, 1986; Janssen et al., 2000). Our findings definitely encourage further examination of the interplay between the components that constitute Spano & Lamont's model in order to enhance our understanding of how these components play a role in the onset and maintenance of superficial dyspareunia.

LIMITATIONS

The studies presented in this thesis have a number of limitations, of which some have already been discussed in the discussion sections of the respective chapters. The most important ones will be dealt with below.

Ecological validity

Considering the observation that women with dyspareunia were able to achieve genital arousal responses as high as controls in both experimental and control conditions (Chapter 2, 3, and 4), a critical question that arises is whether the laboratory situation has targeted the specific domain of fears present in women with dyspareunia. Apart from pain (threat), perhaps other stimuli (e.g., actual engagement in coitus with the partner, performance demand related concerns), present at home but absent in the laboratory, tap into the specific fear that symptomatic women may have, which, as such, would lead to impaired genital responding in private sexual encounters.

Another threat to the ecological validity is related to the kind of sexual stimuli (i.e., erotic films depicting explicit sexual activity) that were used to induce sexual arousal in the laboratory. Specifically, we presume that these stimuli were much stronger than the sexual stimuli that are available in the home situation, at least for women with dyspareunia. Explicit erotic film fragments are found to be superior in eliciting genital arousal as compared to other stimulus materials (e.g., pictures, fantasies, narratives and scripts), and almost immediately induce enhancements in genital arousal, as such reflecting a highly automatized response mechanism (e.g., Laan & Everaerd,

1995; Chivers & Bailey, 2005). The use of such strongly genital arousal eliciting film fragments thus might have overridden the possible differential effects of the experimental manipulations on genital arousal levels (Chapter 2, 3 and 4) in the two groups of women. The overriding effects of erotic film stimuli on experimental manipulations has been evidenced by previous studies into sexual arousal in sexually functional women (e.g., Laan, Everaerd, van Aanhold, & Rebel, 1993; Laan, Everaerd, van Bellen, & Hanewald, 1994; Laan, Everaerd, van Berlo, & Rijs, 1995). For instance, when an erotic fantasy condition was compared to an erotic film condition in a study investigating the effects of performance demand on sexual arousal (Laan et al., 1993), the effects of the manipulation only became visible in the erotic fantasy condition. Hence, it is recommended to use less intense sexual stimuli, such as self-generated erotic fantasies or sexual scripts, in order to study the differential impact of experimental manipulations on genital arousal in women with versus without dyspareunia.

External validity

The dyspareunia and control samples consisted mainly of volunteers who self-selected to participate on basis of advertisements or media attention. Given that participants in sex research have been found to hold more liberal sexual attitudes, experience less sex guilt, evaluate explicit sexual stimulus materials more positively, and are more sexually active than nonparticipants (e.g., Catania, Gibson, Chitwood, & Coates, 1990; Wolchik, Braver, & Jensen, 1985), it is conceivable that volunteer bias, in both the dyspareunia and the control population, has threatened the external validity of the results. Although comparisons between our dyspareunia samples and a sample of dyspareunia patients visiting the outpatient clinic for sexology of the Leiden University Medical Center consistently revealed that both samples were similar with respect to demographic variables and sexual dysfunction, it is still possible that both samples differed on other characteristics. Potentially, severely distressed symptomatic women experiencing high levels of fear (of pain) may have failed to respond to advertisements for psychophysiological studies on sexual arousal responses. As a consequence, the participants sample may have been constituted of a less severely impaired group than a patient sample. It is unclear whether different research outcomes would have been obtained with a more severe sample of

symptomatic women.

Furthermore, it is also noteworthy that a considerable part of women participated in several studies presented in this thesis. More specifically, two psychophysiological studies (Chapter 2 and 4) reported on data obtained from the same study sample, and the observational study (Chapter 6) reported on data obtained from women who participated in the psychophysiological studies (Chapter 2, 3, and 4). This suggests that we may have relied on a selective group of women with dyspareunia. However, the majority of the study samples (approximately two-third) in both the psychophysiological study described in Chapter 3 and the study on automatic affective sex-related associations (Chapter 5) consisted of newly recruited women. When, for the purpose of the present discussion, analyses for each study were repeated for exclusively new participants, the same pattern of results was found for the study in Chapter 3. With respect to the study in Chapter 5, similar findings on the control-AST and the explicit ratings of sexual stimuli were obtained, but dissimilar findings on the sex-AST. That is, symptomatic women were now equally fast with saying "positive" or "negative" to sexual stimuli, whereas controls were, similar to the original sample, faster with saying positive than negative. Thus, in symptomatic women, it seems that there has been a shift in automatic sex-related associations from positive to ambivalent. Based on inspection of the pattern of data in the original study sample, we already suspected that positive associations were not as strong in women with dyspareunia as in controls, and therefore, we recommended a replication study to further investigate the strength of positive automatic associations in symptomatic women. At present, it is unclear whether the divergent results are due to differences in characteristics between women who have and women who have not participated in psychophysiological studies on sexual arousal or that other factors may explain these different findings. Hence, a replication study to gain more insight into automatic sex-related associations in dyspareunia is warranted. At the very least, these findings together do not suggest that women with dyspareunia are typified by particularly negative automatic sex-related associations.

Construct validity

We did not assess pelvic floor muscle function in response to sexual stimuli, although it occupies a central role in the model of dyspareunia of Spano & Lamont (1975).

According to this model, fear of pain not only results in diminished genital arousal, but also in increased pelvic floor muscle tension as part of a protective reaction. Lack of lubrication in combination with increased pelvic floor muscle tone may cause friction between penis and vulvar skin, which, in turn, results in genital pain. Aside from making vaginal entry more difficult, pelvic floor muscle tension may result in muscle pain and in reduced blood flow to the vulva and vagina, and consequently in reduced lubrication (Binik, Bergeron & Khalifé, 2000). The few studies that have measured pelvic floor muscle function point to pelvic floor pathology in women with VVS (Glazer, Jantos, Hartmann, & Swencionis, 1998; Reissing, Binik, Khalifé, Cohen, & Amsel, 2004; Reissing, Brown, Lord, Binik, & Khalifé, 2005; White, Jantos, & Glazer, 1997). Moreover, two experimental studies have shown that women react with increased pelvic floor muscle activity in threatening situations (van der Velde, & Everaerd, 2001; van der Velde, Laan, & Everaerd, 2001). As such, these combined findings certainly promote further study into the role of pelvic floor muscle function in women with dyspareunia.

Another issue worth of discussing in the context of construct validity pertains to the fact that we assessed vaginal vasocongestion (a pooling of blood) as a correlate of genital sexual arousal rather than vaginal lubrication itself, which is thought to be the result of the passage of blood plasma in the capillaries through the vaginal epithelium, due to the increased pressure inside the capillaries during vasocongestion (Levin, 1992). It is very difficult, however, to demonstrate the increase in vaginal lubrication during sexual arousal in laboratory studies, particularly because there are no reliable methods available to collect and quantify fluid volumes (i.e., on absorptive material that is weighted before and after), particularly of a squamous surface such as that of the vaginal epithelium (Levin, 1999). Other disadvantages of this weighing procedure are its relative intrusiveness and the possibly drying of the mucosa by the device used for fluid absorption (Levin, personal communication March 2008). Also pH levels have been assessed in order to determine the amount of vaginal lubrication, but it has been disapproved as a reliable index because the pH response to sexual arousal appeared to be heterogeneous (Levin, 2003). For these reasons, vaginal lubrication quantity was not used as a measure of sexual arousal in the present studies. Given that lubrication is assumed to represent transudate resulting from increased blood pressure in the capillaries of the vaginal wall, vaginal photoplethysmography may be the best measure we have to date for

vaginal lubrication. However, the strength of the relationship between vaginal blood flow and vaginal lubrication has not been investigated experimentally. Based on Spano and Lamont's assumption that lack of lubrication causes friction between penis and vulvar pain which subsequently results in painful intercourse, it would be important to develop a method to adequately assess the quantity of lubrication in order to obtain data of the amount of vaginal lubrication in rest and its increase during sexual arousal in women with dyspareunia versus women without sexual complaints.

RECOMMENDATIONS FOR FUTURE RESEARCH

The present studies have provided useful leads for further research into the interplay of the components that constitute Spano & Lamont's explanatory model of dyspareunia (1975).

In first instance, a few suggestions for future research directly follow from the limitations of the current studies. Some of them will be discussed here. As noted before, it is advised to use less intense sexual stimuli rather than strongly genital arousal eliciting visual erotic stimuli to be better able to detect potential differential effects of experimental manipulations on genital arousal in women with versus without dyspareunia. Another means of improving the ecological validity of laboratory research into the psychophysiological assessment of sexual arousal in women with dyspareunia might be to invite the partner in the laboratory in future studies. An experimentally induced prospect on sexual activity (with the partner) or just the presence of the partner in itself may elicit specific (performance-related) concerns present in women with dyspareunia, which may result in diminished genital response. Finally, in order to improve construct validity, it would be valuable to develop a reliable method for quantitative measurement of vaginal lubrication and to simultaneously assess genital arousal and pelvic floor muscle activity in response to erotic stimulation. Halfway the present research project a vaginal device was developed that enables simultaneous measurement of both variables. Although the first study on the validity of this new device in sexually functional women showed that accurate measurements were obtained for genital response as well as for voluntary pelvic floor activity, EMG responses during emotional states showed limited sensitivity of the device to small, involuntary, changes in pelvic floor activity (Both & Laan,

2007). Research validating an improved version of this so-called "combi-probe" is currently underway, and, hopefully, this one will provide a useful tool in future research on dyspareunia.

There are several other interesting areas of future research that focus on a better understanding of the interplay between the components that constitute Spano & Lamont's model of dyspareunia. For instance, a fruitful area of research pertains to the role of aversive conditioning in dyspareunia. Following Spano & Lamont's model of dyspareunia (1975), it is hypothesized that when sexual stimuli (e.g., a certain touch, a certain feeling, the partner) are associated repeatedly with (anticipated) pain, a learned aversive response may be acquired through classical conditioning, which subsequently may result in diminished genital and subjective sexual response and enhanced pelvic floor muscle tone to sexual stimuli as a protective reaction against imagined or real harm. To our knowledge, we recently started the first study to test the hypothesis of diminished sexual arousal to erotic stimuli as a consequence of aversive conditioning in both women with and without dyspareunia.

Another concept of Spano & Lamont's model (1975) that deserves further investigation, is fear of pain during penetration. Although Spano and Lamont assumed that women with dyspareunia are fearful of pain upon intercourse (1975), they did not specify what particular aspects of pain-related fear are assumed to be involved. Research on fear of pain in medically unexplained chronic pain conditions has indicated that several aspects of pain-related fear can be distinguished, including cognitive, motoric and physiological responses (see e.g., McCracken, Gross, Aikens, & Carnrike, 1996). Yet, it has not been investigated what specific aspects of pain-related fear are most prominent in women with dyspareunia when it comes to pain due to penetration. For instance, fear of pain may reflect the belief that penetration will result in damage of the vulva/vagina, the belief that pain is caused by underlying and serious medical problems (anatomical abnormalities resulting in being "too tight"), the belief of being (un)able to control the pain during penetration, or the belief of being an inadequate sexual partner when intercourse hurts. Recently, a self-report measure (questionnaire) has been developed to tap specific aspects of pain-related fear in relation to penetration. A validation study on this measure in a sample consisting of women with dyspareunia, primary vaginismus and sexually functional women is underway.

As one of our main findings is that women with dyspareunia appraise sexual stimuli

predominantly in a negative way, future research should be conducted to shed more light on the causal relationship between appraisal of sexual stimuli and dyspareunia complaints. In relation to this issue, it is imaginable that due to a negative appreciation of sexual stimuli, women with dyspareunia might refrain from seeking out competent sexual stimuli which are necessary to become or remain sexually aroused (genitally and subjectively). Following this, the interplay between the appraisal of sexual stimuli and the approach to and avoidance from sexual stimuli in women with versus without dyspareunia needs to be further studied, for example using behavioural tasks or facial EMG.

IMPLICATIONS FOR CLINICAL PRACTICE

The data presented in this thesis have implications for the treatment of women suffering from superficial dyspareunia. On the basis of our finding that women with dyspareunia consistently appraise sexual stimuli in a predominantly negative way, we argue that treatment must comprise techniques aimed at reappraisal of sexual stimuli in order to enhance subjective sexual arousal. This view is in agreement with cognitive theory of psychopathology, stating that modification of cognitions will impact on affect and subsequent behaviour because the meaning of the experience is being reconstructed (Beck, Emery & Greenberg, 1985).

To promote a more positive appraisal of sexual stimuli, women must be encouraged to search actively for attractive sexual stimuli (e.g., sexual fantasy, explicit erotic material, masturbation) to become or remain sexually aroused (genitally and subjectively) and expand the range of available sexual arousal eliciting stimuli. The present thesis' finding that symptomatic women are equally genitally responsive as women without sexual complaints in the presence of adequate sexual stimulation, may be used to stress the necessity to search for strong sexual stimuli in order to elicit sexual arousal. This may help women to overcome eventual abstention regarding self-exploration of sexual stimuli. As optimal personal, relational and environmental circumstances form a prerequisite to become and remain sexually aroused, women should be stimulated to create these circumstances. In this context, it is important to temporarily ban coitus or other sexual activities that induce pain, which often leads to relieve in symptomatic women and enables them to (re-) establish sexual arousal during exploration of other sexual activities. Meanwhile,

other forms of sexual activity (e.g., nonpenetrative sex or so-called outercourse) should be promoted, not as surrogates of coitus, but as worthy alternatives for coitus. Self-exploration of adequate sexual stimulation in private and, in a later stage, sensate focus practices (cf. Masters & Johnson, 1970) for the woman and her partner, may further be helpful in promoting sexual pleasure without coitus (or threat of coitus). In this way, positive, thus rewarding, sexual experiences may be (re-) established, whereby sexual stimuli have acquired a positive, lustful meaning. Rewarding experiences, in turn, may (re-)introduce a positive feedback cycle, such that further approach to sexual stimuli and sexual activity is reinforced (cf., Sbrocco & Barlow, 1990; van den Hout & Barlow, 2000).

Our finding that fear of pain leads to diminished genital and subjective sexual arousal advocates the use of techniques directly aimed at alleviating fear (of pain) in the sexual situation. For that purpose, gradual exposure under applied relaxation may be employed using a personal hierarchy of steps of increasing difficulty. As fear of pain in these women may be maintained by avoidance behaviours based on erroneous cognitions (e.g., "penetration will always cause pain and the pain becomes more terrible over time"), specific interventions aimed at reducing avoidance behaviour and increasing successful penetration experiences are needed so that erroneous cognitions can be disconfirmed. This could be realized, for example, by prolonged therapist-aided exposure in vivo therapy (cf. ter Kuile, Bulté, Weijnenborg, Beekman, Melles, & Onghena, 2008).

In fact, techniques aimed at reappraisal of sexual stimuli in order to enhance sexual arousal as well as reduction of fear of pain are main ingredients of regular cognitive-behavioural therapy for dyspareunia (e.g., Bergeron et al., 2001b; Bergeron & Lord, 2003; ter Kuile & Weijnenborg, 2006). The present findings underscore the relevance of addressing these issues in treatment and promote incorporation of the above described techniques into other treatment modalities. This is not to say that they should substitute other treatment interventions. In our view, optimal care for women with dyspareunia can only be offered within the context of a multidisciplinary approach, in which interventions are directed at pain alleviation, reappraisal of sexual stimuli, reduction of fear of pain during sexual activity, improvement of sexual function, relationship adjustment and individual well-being. Above all, the ultimate goal of treatment is that intercourse becomes an enjoyable sexual activity rather than a painful affair.

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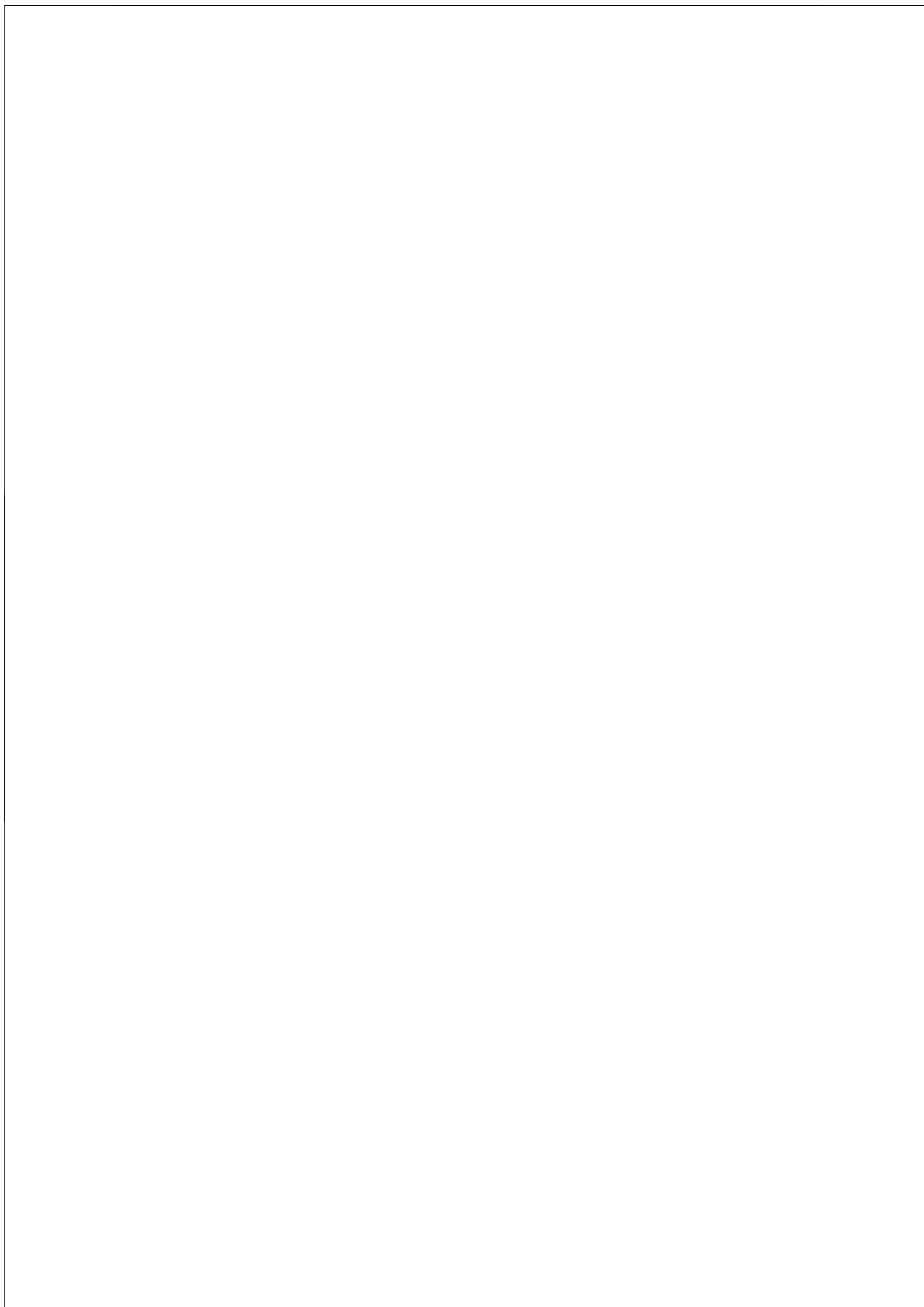
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S A M E N V A T T I N G

Summary in Dutch



ACHTERGROND

Dyspareunie wordt gedefinieerd als een terugkerende of aanhoudende pijn die optreedt tijdens en/of na de gemeenschap (Basson et al., 2003). Zowel vrouwen als mannen kunnen last hebben van dyspareunie, maar bij mannen komt deze klacht sporadisch voor. Dit proefschrift richt zich uitsluitend op dyspareunie bij vrouwen. Dyspareunie is een veel voorkomende klacht, met name bij premenopausale vrouwen tussen de twintig en dertig jaar. Geschat wordt dat 3 tot 18% van de vrouwen in de algemene bevolking dyspareunieklasten heeft (Simons & Carey, 2001; Harlow, Wise, & Stewart, 2001) en tussen de 15 en 20% van de vrouwen in de gynaecologische praktijk (Goetsch, 1991; van Lankveld, Brewaeys, ter Kuile, & Weijnenborg, 1995). De pijn is meestal gesitueerd rondom de introïtus, bij het naar binnengaan van de penis in de vagina. In dit geval spreekt men van oppervlakkige dyspareunie. Dit proefschrift richt zich alleen op vrouwen die last hebben van deze vorm van dyspareunie. Bij een aanzienlijk deel van de vrouwen met dyspareunie is er ook sprake van het zogenaamde vulvair vestibulitis syndroom (VVS). De diagnose VVS wordt door de gynaecoloog vastgesteld wanneer de huid rondom de ingang van de vagina uiterst gevoelig/pijnlijk is bij slechts lichte aanraking met een wattenstokje.

Waardoor dyspareunie veroorzaakt wordt, is tot op heden onbekend. Een breed spectrum aan factoren (met name medische) is reeds onderzocht, maar heeft weinig inzicht opgeleverd in de factoren die een rol spelen bij het ontstaan en in stand houden van dyspareunie. Dit is deels te wijten aan methodologische tekortkomingen in de diverse studies, die bovendien vaak een theoretisch kader ontbeerden.

Gebrek aan kennis over de oorzaken van dyspareunie maakt behandeling uitermate lastig. Op basis van veronderstelde, maar niet bewezen, etiologische factoren worden diverse behandelinterventies toegepast, bijvoorbeeld vestibulectomie (pijnlijke huid wordt operatief verwijderd), EMG biofeedback en cognitieve gedragstherapie. Uit het schaarse aantal gerandomiseerde studies blijkt dat er weinig verschil is in effectiviteit van behandeling (Bornstein, Livnat, Stolar, & Abramovici, 2000; Bergeron et al., 2001; Danielsson, Torstensson, Brodda-Jansen, & Bohm-Starke, 2006; Nyirjesy, Sobel, Weitz, Leaman, Small & Gelone, 2001). Ook al knapt een deel van de vrouwen op na behandeling, voor een aanzienlijk aantal

vrouwen bieden de huidige interventies geen soelaas. Het is dan ook belangrijk om behandelinterventies te verbeteren. Meer inzicht in de etiologische en onderhoudende factoren van dyspareunie kan hieraan bijdragen. Voor het verkrijgen van meer kennis over de factoren die een rol spelen bij het doen ontstaan en in stand houden van dyspareunie, dient onderzoek opgezet te worden aan de hand van een goed model of theorie op basis waarvan specifieke en testbare voorspellingen gegenereerd kunnen worden. Wij kozen voor het momenteel meest gehanteerde cognitief-gedragsmatig model voor dyspareunie, al meer dan 30 jaar geleden ontwikkeld door Spano & Lamont (1975).

Het uitgangspunt van dit cognitief-gedragsmatig model is dat pijn, of herinneringen aan pijn, kunnen leiden tot angst voor pijn in nieuwe coïtusituaties. De angst voor pijn leidt tot verminderde seksuele opwinding en daarmee tot vaginale droogheid. Een andere respons op angst voor pijn kan het aanspannen van de bekkenbodemspieren zijn. De combinatie van vaginale droogheid en bekkenbodemspierspanning zorgt voor wrijving tussen penis en vulvaire huid, hetgeen leidt tot pijn en mogelijk zelfs weefselbeschadiging (VVS). Deze beschadiging kan op zich zelf al weer pijn geven of kan reeds bestaande pijn verergeren. Volgens dit model kunnen verminderde seksuele opwinding en bekkenbodemspierspanning zowel oorzaak als gevolg zijn van dyspareuniekachten.

Alhoewel Spano & Lamonts model (1975) de huidige cognitieve gedragstherapeutische behandeling van dyspareunie sterk heeft beïnvloed (e.g., ter Kuile & Weijnenborg, 2006), is dit model nauwelijks empirisch getoetst. Spano & Lamonts (1975) model staat niet op zichzelf: angst en verminderde seksuele opwinding spelen niet alleen een belangrijke rol in dit specifieke model voor dyspareunie, maar staan ook centraal in andere modellen omtrent seksuele opwinding (Barlow, 1986; Janssen, Everaerd, Spiering, & Janssen, 2000). Het model van Spano & Lamont werd gekozen als leidraad voor de studies in dit proefschrift. De centrale vraag in dit proefschrift luidde: *"Spelen angst voor pijn en verminderde seksuele opwinding een centrale rol bij dyspareunie?"* Om antwoorden te vinden op deze vraag werden vijf studies uitgevoerd. In alle studies werden premenopausale vrouwen met klachten van oppervlakkige dyspareunie vergeleken met vrouwen zonder seksuele klachten. De uitkomsten van deze studies worden hierna besproken.

BEVINDINGEN

Hoofdstuk 2, 3 en 4 beschrijven psychofysiologische studies waarin seksuele opwinding opgewekt werd door het tonen van erotisch filmmateriaal. De genitale respons werd vastgesteld met vaginale fotoplethysmografie. Hierbij wordt de mate van vaginale doorbloeding (vasocongestie) gemeten, uitgedrukt in vaginale puls amplitude. Vaginale doorbloeding neemt toe bij seksuele opwinding en resulteert vervolgens in vaginale lubricatie. Subjectieve opwinding werd vastgesteld door vragen naar de aanwezigheid van genitale sensaties, en positieve en negatieve emoties.

In de eerste studie (hoofdstuk 2) onderzochten we genitale opwinding en subjectieve rapportages in reactie op twee verschillende erotische filmfragmenten. In het ene erotische fragment werd expliciet gemeenschap getoond tussen een man en een vrouw (coïtus film), terwijl in het andere erotische fragment allerlei seksuele handelingen werden getoond (zoenen, strelen, orale seks) behalve coïtus of andere vormen van vaginale penetratie (non-coïtus film). Zo konden we nagaan of er bij vrouwen met dyspareunie sprake is van een algemeen beperkte genitale responsiviteit of dat vrouwen met dyspareunie alleen met verminderde genitale opwinding reageren op een seksuele stimulus als deze angst induceert (coïtus). Tegenstrijdig met eerdere bevindingen van Wouda en collega's (1998), bleken vrouwen met dyspareunie niet te reageren met een verminderde genitale respons bij het zien van een coïtus scene. In plaats daarvan werd gevonden dat zowel vrouwen met als zonder dyspareunie dezelfde mate van genitale opwinding vertoonden tijdens het kijken naar de non-coïtus en de coïtus film. Als zodanig boden deze resultaten geen ondersteuning voor Spano & Lamonts hypothese (1975) dat angst voor pijn een daling in seksuele opwinding teweegbrengt. Alhoewel vrouwen met dyspareunie zoals verwacht minder positief affect rapporteerden in reactie op beide erotische stimuli dan controles, verschilden zij niet in de mate van gerapporteerde angst of andere negatieve emoties. Op basis van deze laatste onverwachte bevinding veronderstelden wij dat de coïtus film in onvoldoende mate een aversieve stimulus vormde voor de dyspareuniegroep, mogelijk omdat er geen duidelijke link was met pijn. Als gevolg daarvan trad er wellicht geen reductie in genitale opwinding op in reactie op de coïtus film.

Voortbordurend op deze studie werd in de volgende studie (hoofdstuk 3) angst voor pijn geïnduceerd tijdens blootstelling aan een erotische stimulus om op directe wijze de invloed van pijngerelateerde angst op seksuele opwinding te exploreren. Pijngerelateerde angst werd geïnduceerd door proefpersonen mede te delen dat er een kans van 60% bestond dat ze pijnprikkels zouden krijgen toegediend (aan de enkel) tijdens het bekijken van één van twee erotische fragmenten. Genitale opwinding en subjectieve rapportages werden gemeten in reactie op beide erotische stimuli. Verondersteld werd dat voor zowel vrouwen met als zonder dyspareunie pijngerelateerde angst een ongunstig effect zou hebben op genitale opwinding en subjectieve reacties. Echter, de reductie in genitale opwindingsreacties tijdens pijndreiging werd sterker geacht in de dyspareuniegroep. Deze verwachting was gebaseerd op recente aanwijzingen dat vrouwen met dyspareunie (met VVS) hypervigilantie vertonen voor aan pijn gerelateerde stimuli (Payne, Binik, Amsel, & Khalifé, 2005). Aangezien van mensen die hypervigilant zijn voor pijn stimuli gedacht wordt dat ze angstiger zijn voor pijn(dreiging) (Crombez, Van Damme, & Eccleston, 2005), verwachtten wij dat pijndreiging meer angst voor pijn zou opwekken in de dyspareuniegroep hetgeen ten koste zou gaan van aandacht voor seksuele stimuli. Dit, zo dachten wij, zou vervolgens leiden tot een sterkere reductie in genitale opwindingsreacties vergeleken met de controlegroep. Verder werd verwacht dat de dyspareuniegroep bij het zien van beide erotische fragmenten meer negatieve en minder positieve gevoelens zou rapporteren dan de controlegroep. Als manipulatiecheck werden huidgeleiding en ervaren dreiging gemeten. Uit de resultaten kwam naar voren dat deze variabelen significant toegenomen waren tijdens pijndreiging ten opzichte van de controleconditie en zo waren wij ervan verzekerd dat pijngerelateerde angst succesvol was gemanipuleerd. In lijn met de verwachtingen, leidde pijngerelateerde angst tot een afname in genitale opwindingsreacties bij vrouwen met en zonder dyspareunie. Maar onverwachts had pijngerelateerde angst geen sterkere reductie in genitale opwinding bij de dyspareuniegroep tot gevolg. In plaats daarvan reageerde de dyspareuniegroep met dezelfde mate van genitale opwinding als de controlegroep in zowel de experimentele conditie als in de controleconditie. Zoals voorspeld werd ook een negatieve invloed van pijngerelateerde angst gevonden op de subjectieve rapportages: bij dreiging rapporteerden proefpersonen significant minder positief en significant meer

negatief affect tijdens het kijken naar het erotische fragment vergeleken met de controleconditie. Verder rapporteerde de dyspareuniegroep zoals verwacht in beide condities significant sterkere negatieve gevoelens dan de controlegroep. Al met al verschaffen deze bevindingen ondersteuning voor Spano & Lamonts (1975) hypothese dat angst seksuele opwindings doet verminderen.

In de derde psychofysiologische studie, zoals beschreven in hoofdstuk 4, werd onderzocht of de wijze waarop een seksuele stimulus gewaardeerd wordt van invloed is op de mate van seksuele opwindings in reactie op die stimulus. Om dit na te gaan, werd de waardering ("appraisal") van een en hetzelfde erotische filmfragment gemanipuleerd door voorafgaand aan het erotische fragment proefpersonen te voorzien van ófwel informatie over het filmfragment gericht op genitale pijn tijdens gemeenschap ófwel op seksueel genot tijdens gemeenschap. Verondersteld werd dat de genitale pijninstructie voorafgaand aan het erotisch fragment overeen zou komen met de anticipatie op pijn tijdens gemeenschap zoals mogelijk optreedt bij vrouwen met dyspareunie voorafgaand aan een seksuele situatie (e.g., Payne, et al., 2005; Spano & Lamont, 1975; ter Kuile & Weijnenborg, 2006), terwijl de seksuele genotinstructie verondersteld werd de verwachting op het ervaren van een aangename coïtuservaring bij vrouwen zonder seksuele klachten na te bootsen. In de controleconditie werd een neutrale instructie gegeven. Overeenkomstig met het informatie-verwerkingsmodel omtrent seksuele opwindings (Janssen et al., 2000) verwachtten wij dat informatie gericht op genitale pijn zou leiden tot minder genitale opwindings, minder positief en meer negatief affect in reactie op het erotisch fragment vergeleken met informatie gericht op seksueel genot. Inderdaad werd een effect van instructie op genitale opwindings gevonden, hetzij marginaal significant. Uit post-hoc analyses bleek dat de deelnemers die de genitale pijninstructie hadden gekregen voorafgaand aan het erotisch fragment met marginaal significant minder genitale opwindings reageerden in vergelijking met deelnemers die de seksuele genotinstructie hadden ontvangen. De grootte van het verschil in genitale opwindingsreacties tussen de pijn en genotinstructie was middelgroot ($d = 0.67$) en duidt dus op een aanzienlijke invloed van de manier waarop de seksuele stimulus gewaardeerd werd op de mate van genitale opwindings in deze twee experimentele condities. Het is dan ook aannemelijk dat de verschillen in genitale reacties tussen de pijn- en genotinstructie conditie niet significant waren vanwege een gebrek aan power. Het

vergroten van de steekproef zou mogelijk hebben geleid tot significante verschillen. Net als in hoofdstuk 2 en 3 werden geen verschillen in genitale responsiviteit gevonden tussen vrouwen met en zonder dyspareunie. Conform de verwachting werd een significant hoofdeffect van instructie gevonden voor de rapportage van negatief affect: proefpersonen die de genitale pijn instructie hadden ontvangen, rapporteerden meer negatief affect in reactie op het erotisch filmfragment dan proefpersonen die de seksuele genotsinstructie hadden ontvangen. Vooral in de controlegroep hadden de instructies het verwachte effect op de mate van positief affect, waarbij de mate van positief affect het hoogst was in de seksuele genotinstruc-tie conditie ten opzichte van beide andere condities. In vergelijking tot de controlegroep rapporteerde de dyspareuniegroep alleen in de seksuele genotinstruc-tie significant minder positief affect, maar rapporteerde zoals verwacht marginaal significant meer negatief affect in alle instructiecondities. Deze bevindingen tonen aan dat de waardering van een seksuele stimulus van invloed is op de mate van genitale opwinding en affect in reactie op de desbetreffende stimulus bij zowel vrouwen met als zonder seksuele klachten. Als zodanig bieden deze uitkomsten ondersteuning voor het informatieverwerkingsmodel omtrent seksuele opwinding (Janssen et al., 2000).

Kortom, alle drie psychofysiologische studies toonden aan dat vrouwen met dyspareunie niet verschillen van vrouwen zonder seksuele klachten in de mate waarin zij genitaal opgewonden raken tijdens blootstelling aan verschillende visuele seksuele stimuli. De afwezigheid van verschillen in genitale opwindingsreacties tussen vrouwen met en zonder dyspareunie stemt overeen met eerder onderzoek, waarin eveneens gevonden werd dat vrouwen met dyspareunie (Payne, Binik, Pukall, Thaler, Amsel, & Khalifé, 2007), maar ook vrouwen met seksuele opwindingsproblemen (e.g., Brotto, Basson, & Gorzalka, 2004; Laan, van Driel, & van Lunsen, in press; Meston & Gorzalka, 1996; Middleton, Kuffel, & Heiman, in press; Morokoff & Heiman, 1980; Salemink & van Lankveld, 2006) niet verschilden van vrouwen zonder seksuele klachten. Wél verschillen vrouwen met dyspareunie van controles als het gaat om de subjectieve beleving tijdens blootstelling aan seksuele stimuli: vrouwen met dyspareunie ervaren consistent meer negatief en/of minder positief affect dan controles. Ook deze bevindingen sluiten aan bij andere studies naar vrouwen met dyspareunie (Payne et al., 2007) of andere seksuele disfuncties (e.g.,

Laan et al., 2008; Meston, 2006; Morokoff & Heiman, 1980).

In de studie die in hoofdstuk 5 is gerapporteerd, werd onderzocht of er bij vrouwen met dyspareunie sprake is van automatische (in de zin van snel, niet-intentioneel) aan angst gerelateerde associaties met seksuele stimuli. Op basis van de aanname dat automatische associaties het best voorspeld kunnen worden met behulp van indirecte maten (e.g., Egloff & Schmuckle, 2002), was het doel van dit experiment om een indirect meetinstrument te ontwikkelen en toe te passen in een dyspareuniepopulatie. Indirecte meetinstrumenten hebben reeds aangetoond dat ze in staat zijn om voor de stoornis relevante automatische associaties te meten bij uiteenlopende psychologische klachten, inclusief onverklaarde pijn (Vancleef, Peters, Gilissen, & de Jong, 2007) en specifieke angsten (e.g., Teachman, Gregg, & Woody, 2001). Voor het meten van automatische associaties bij seksuele disfuncties echter zijn er tot op heden geen indirecte meetinstrumenten ontwikkeld en/of toegepast. Wij kozen voor een aangepaste, pictorale versie van de Affective Simon Task (AST; De Houwer & Eelen, 1998). Bij deze reactietijdentaak worden proefpersonen geïnstrueerd om telkens zo snel mogelijk te kiezen tussen een positieve en negatieve respons (het roepen van "positief" of "negatief") bij het zien van een reeks op elkaar volgende stimuli (in dit geval erotische foto's), waarbij de respons gegeven dient te worden op basis van de vorm waarin de stimuli worden afgebeeld (liggend of staand formaat) en niet op basis van de inhoud van de stimuli zelf. Ook al is de valentie van de stimuli dus zelf niet van belang, toch interfereert de inhoud wel degelijk met de respons: uit eerdere studies is namelijk gebleken dat reactietijden (RT) korter zijn wanneer de valentie van de vereiste respons overeenkomt met de valentie van de stimulus. Zo wordt op indirecte wijze inzicht verkregen in de valentie die de stimuli hebben voor de desbetreffende proefpersoon (De Houwer, Crombez, Baeyens, & Hermans, 2001; De Houwer & Eelen, 1998). Onze sex-AST bestond uit zowel erotische afbeeldingen (penetratie stimuli) van vaginale penetratie als afbeeldingen van seksuele handelingen zonder enige vorm van vaginale penetratie (non-penetratie stimuli). Hiermee konden we nagaan of vrouwen met dyspareunie specifiek negatieve automatische associaties met penetratie hebben of dat deze vrouwen negatieve automatische associaties met seks in het algemeen hebben. In aanvulling op automatische associaties met seksuele stimuli werden ook zelfgerapporteerde negatieve en positieve gevoelens in reactie op de stimuli verzameld als

een index voor meer bewuste (in de zin van overwogen, intentioneel) associaties met seks. Tegengesteld aan de verwachtingen, bleek dat voor zowel vrouwen met als zonder dyspareunie de reactietijden korter waren als ze "positief" hadden moeten zeggen in reactie op de seksuele stimuli dan wanneer ze "negatief" hadden moeten zeggen. Dit gold, onverwachts, voor penetratie en non-penetratie stimuli in dezelfde mate. Deze resultaten suggereren dat vrouwen met dyspareunie niet gekenmerkt worden door negatieve automatische associaties met seks. Gezien de verwachte bevinding dat de dyspareuniegroep ook in deze studie bij de zelfrapportage minder positieve en meer negatieve associaties met seks rapporteerde dan de controlegroep, concludeerden we dat de bewuste waardering van seksuele stimuli en dus meer weloverwogen in plaats van automatische cognitieve processen een rol spelen bij dyspareuniekachten.

In hoofdstuk 6 wordt een observationele studie beschreven, waarin variabelen met betrekking tot seksualiteit (seksueel functioneren, persoonlijk ervaren hinder door seksueel (dis)functioneren, attitudes omtrent seks, en ervaren affect tijdens de laatste seksuele ervaring), chronische pijn (catastroferen, pijnintensiteit), psychopathologie (depressie, angstklachten, en somatisatie), en relationeel welbevinden werden gemeten met behulp van gevalideerde vragenlijsten. Alhoewel de dyspareuniegroep op alle variabelen verschilde van de controlegroep in de voorspelde richtingen, waren seksgerelateerde maten (i.e., seksueel functioneren, persoonlijk ervaren hinder door seksueel (dis)functioneren en negatief en positief affect zoals ervaren tijdens de laatste seksuele situatie) de beste predictoren van groepslidmaatschap (dyspareunie/controle). Verder bleken dyspareuniesubgroepen op basis van de aan- of afwezigheid van de diagnose VVS zich enkel te onderscheiden op pijnintensiteit. Onze bevinding dat de belangrijkste variabelen waarop vrouwen met en zonder dyspareunie zich van elkaar onderscheidden seksgerelateerde variabelen betrof, onderstreept het belang van psychoseksuele aspecten van dyspareuniekachten.

CONCLUSIES

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Welke conclusies kunnen nu getrokken worden wanneer we de belangrijkste bevindingen evalueren in het licht van de centrale vraag van dit proefschrift? Deze luidde: *"Spelen angst voor pijn en verminderde seksuele opwindning een centrale rol*

bij dyspareunie?" In hoofdstuk 7 wordt een overzicht gegeven van de belangrijkste bevindingen en conclusies van dit proefschrift. Zo wordt op basis van de uitkomsten van de psychofysiologische studies zoals beschreven in hoofdstuk 3 en 4 ten eerste geconcludeerd dat angst voor en anticipatie op pijn inderdaad de mate van genitale opwinding en subjectieve reacties belemmeren. Deze resultaten bieden als zodanig evidente ondersteuning van Spano & Lamonts model (1975).

Aangezien zowel vrouwen met als zonder dyspareunie reageerden met eenzelfde daling in genitale opwinding op de experimentele manipulaties in alle drie psychofysiologische studies, luidt de tweede conclusie dat vrouwen over het algemeen, dus ongeacht of ze dyspareunie hebben of niet, reageren met verminderde genitale opwinding wanneer ze bang zijn voor pijn tijdens seksueel contact of erop anticiperen. Met andere woorden: deze reactie is niet typerend voor vrouwen met dyspareunie.

Op basis van de bevinding dat er tevens geen groepsverschillen zijn gevonden in genitale reacties tijdens niet-gemanipuleerde condities, kan gesteld worden dat de mogelijkheid van lichamelijk gezonde vrouwen met dyspareunie om genitaal opgewonden te raken tijdens blootstelling aan expliciete seksuele stimuli niet geschaad is. Er bestaat dus niet zoiets als een defect van het genitale systeem waardoor adequaat (met voldoende lubricatie) reageren op seksuele prikkels niet mogelijk is. Dit sluit echter niet uit dat verschillen in genitale responsiviteit tussen vrouwen met en zonder dyspareunie tot uiting zouden kunnen komen in de thuissituatie. Het is mogelijk dat vrouwen met dyspareunie thuis, vanwege het vooruitzicht op en/of angst voor pijn, minder sterk genitaal opgewonden raken tijdens seksuele activiteit, terwijl dit niet het geval is bij vrouwen zonder seksuele klachten omdat zij niet gehinderd worden door angstige gedachten.

Alhoewel er momenteel geen sluitend antwoord gegeven kan worden met betrekking tot de rol van (verminderde) genitale opwinding bij dyspareunieklaarten, hebben de huidige bevindingen overtuigend aangetoond dat er sprake is van subjectieve opwindingsproblematiek bij vrouwen met dyspareunie, in die zin dat deze vrouwen minder positieve en/of meer negatieve gevoelens rapporteren in reactie op seksuele stimuli in het laboratorium (hoofdstuk 2, 3, 4 en 5) of thuis (hoofdstuk 6). Deze bevindingen sluiten aan bij de recent herziene conceptualisatie van seksuele problematiek bij vrouwen, waarbij het belang van subjectieve seksuele opwind-

ingsproblemen benadrukt is (Basson et al., 2003; Everaerd, Laan, Both, & van der Velde, 2000; Laan, Everaerd, & Both, 2005).

Samenvattend kan gesteld worden dat de huidige resultaten niet alleen ondersteuning verschaffen voor Spano en Lamonts specifieke model voor dyspareunie (1975), maar ook voor de meer algemene modellen omtrent seksuele opwinding (Barlow, 1986; Janssen et al., 2000).

IMPLICATIES VOOR ONDERZOEK EN BEHANDELING

De huidige bevindingen alsmede methodologische tekortkomingen van de hier gepresenteerde studies bieden verschillende aanknopingspunten voor vervolgonderzoek om de validiteit van Spano & Lamonts model nader te bepalen. Zo wordt onder andere aangeraden om een betrouwbare methode te ontwikkelen voor het gelijktijdig meten van genitale opwinding en bekkenbodemspierspanning in reactie op seksuele stimuli. Immers, het model van Spano en Lamont (1975) veronderstelt dat naast verminderde genitale opwinding ook verhoogde bekkenbodemspierspanning verantwoordelijk is voor het ervaren van pijn tijdens de gemeenschap. Ander onderzoek zou zich bijvoorbeeld kunnen richten op de mate waarin aversieve conditionering een rol speelt bij dyspareuniekachten. Volgens Spano en Lamonts model kan verwacht worden dat wanneer seksuele stimuli en pijn herhaaldelijk met elkaar geassocieerd worden er een aangeleerde aversieve reactie optreedt, hetgeen vervolgens resulteert in verminderde genitale en subjectieve opwindingsreacties.

Tot slot wordt in hoofdstuk 7 ingegaan op de implicaties van de huidige resultaten voor de behandeling van vrouwen met dyspareunie. Op basis van de bevinding dat vrouwen met dyspareunie seksuele stimuli voornamelijk negatief evalueren, dienen in de behandeling technieken aangewend te worden die gericht zijn op herwaardering ("reappraisal") van seksuele stimuli om zo de mate van subjectieve seksuele opwinding te vergroten. Verder ondersteunt de bevinding dat angst voor pijn tot verminderde genitale en subjectieve opwinding leidt, de al in gebruik zijnde technieken die gericht zijn op het verminderen van angst (voor pijn) in de seksuele situatie (met name graduele exposure). Het uiteindelijke doel van behandeling dient in elk geval te zijn dat gemeenschap niet langer een pijnlijke kwestie is, maar in plaats daarvan, een activiteit is die geassocieerd wordt met genot en plezier.

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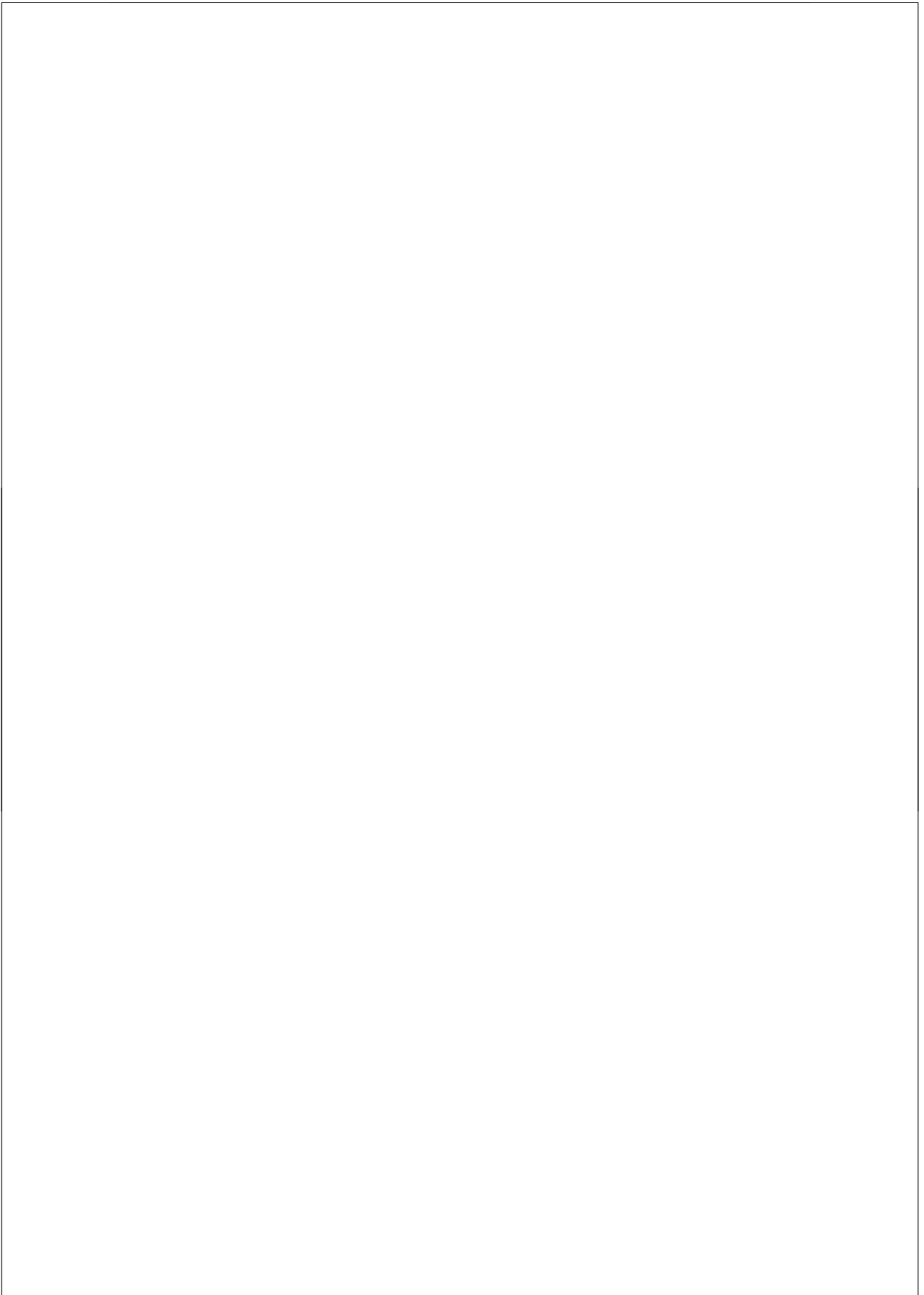
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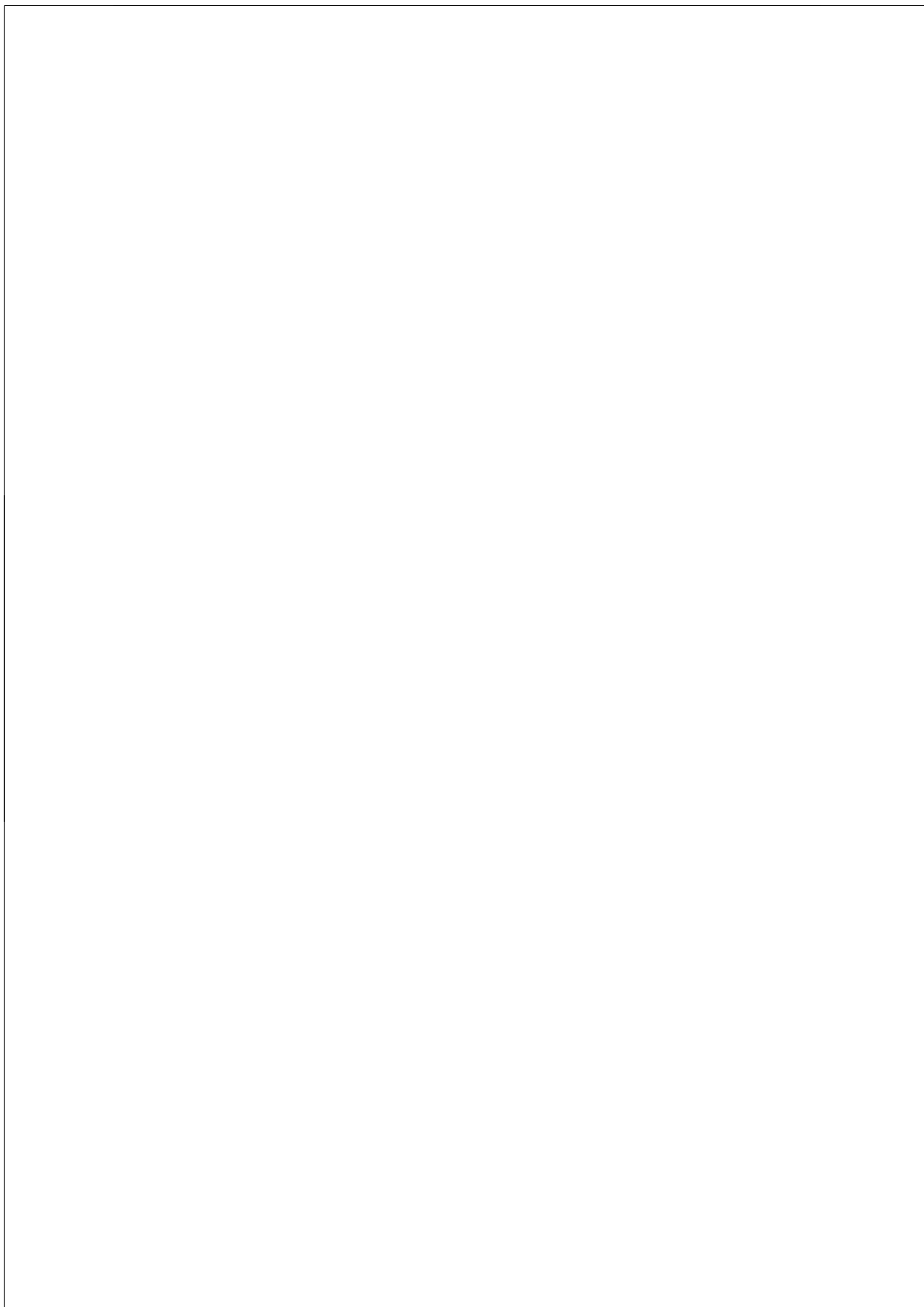
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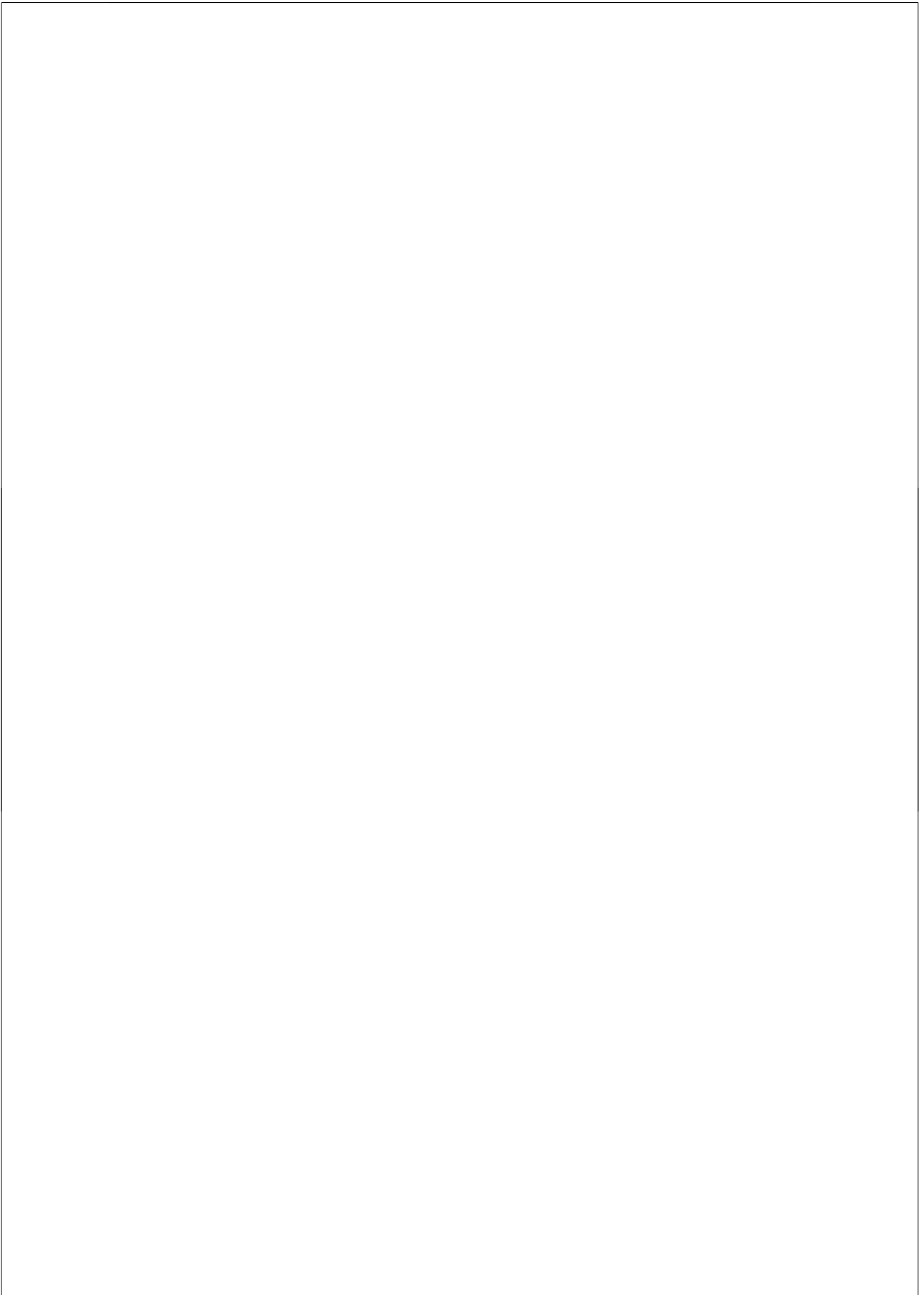
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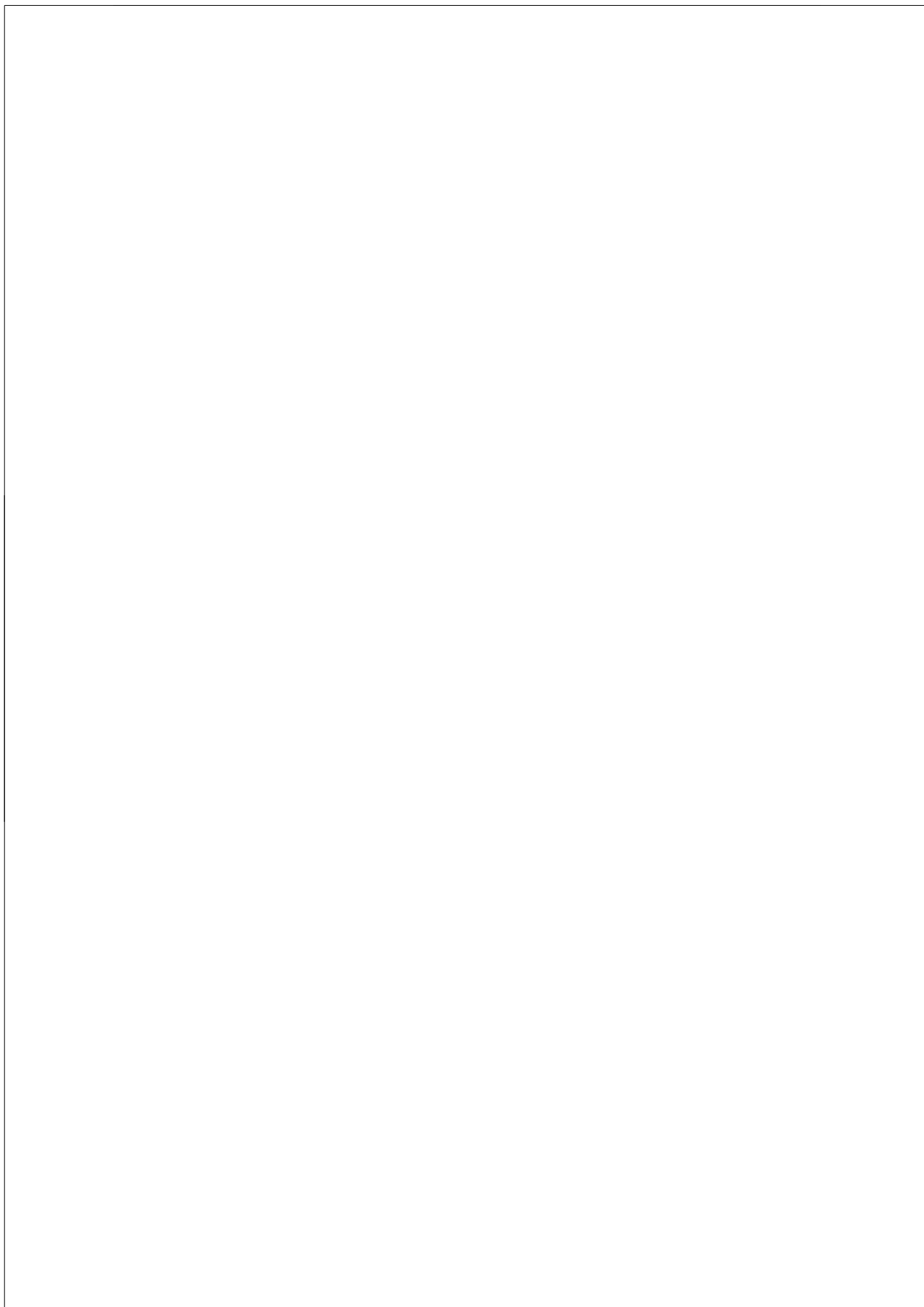
C U R R I C U L U M V I T A E



Marieke Brauer werd geboren op 30 november 1976 te Heerlen. Zij behaalde het VWO diploma aan het Grotius College te Heerlen in 1995. In datzelfde jaar begon ze met haar studie psychologie aan de Universiteit Maastricht en vervolgde deze een jaar later aan de Universiteit van Amsterdam. In september 2001 studeerde ze af met genoegen in de richting Klinische Psychologie. Van december 2001 tot juni 2006 werd zij op de afdeling Psychosomatische Gynaecologie en Seksuologie van het Leids Universitair Medisch Centrum aangesteld als aio op het onderzoeksproject zoals beschreven in dit proefschrift. Na die tijd is zij tot december 2007 op dezelfde afdeling als onderzoeker blijven werken. Daarnaast, sinds januari 2007, is zij als onderzoeker verbonden aan de afdeling Seksuologie en Psychosomatische Gynaecologie en Obstetrie op het Academisch Medisch Centrum te Amsterdam. Daar werkt zij nu nog steeds. Haar proefschrift heeft zij in de tussentijd afgerond.



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