CHAPTER 2

Sexual arousal in women with superficial dyspareunia

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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, Weijenborg, & 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**

**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 Arousability 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 Arousability score, which is the sum of the 0 to 5 arousability 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 $\alpha$ 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 ($\varepsilon$) 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 $\alpha$ 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 $\alpha$-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

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) x 2 (Stimulus) x 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 x 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.
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

<table>
<thead>
<tr>
<th>Stimulus</th>
<th>Dyspareunia (n = 49)</th>
<th>Controls (n = 24)</th>
</tr>
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<tbody>
<tr>
<td>Oral sex</td>
<td>1.65 (1.21)</td>
<td>1.92 (1.79)</td>
</tr>
<tr>
<td>Coitus</td>
<td>2.61 (1.49)</td>
<td>2.03 (1.65)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Dyspareunia (n = 48)</th>
<th>Controls (n = 24)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oral sex</td>
<td>Coitus</td>
</tr>
<tr>
<td>Subjective reports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genital sensations</td>
<td>4.01 (1.37)</td>
<td>4.43 (1.43)</td>
</tr>
<tr>
<td>Positive affect</td>
<td>3.44 (1.02)</td>
<td>3.73 (1.23)</td>
</tr>
<tr>
<td>Negative affect</td>
<td>1.34 (0.58)</td>
<td>1.41 (0.68)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>1.15 (0.46)</td>
<td>1.27 (0.79)</td>
</tr>
</tbody>
</table>

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.