

Vaginal Spasm, Pain, and Behavior: An Empirical Investigation of the Diagnosis of Vaginismus

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This study investigated the roles of vaginal spasm, pain, and behavior in vaginismus and the ability of psychologists, gynecologists, and physical therapists to agree on a diagnosis of vaginismus. Eighty-seven women, matched on age, relationship status, and parity, were assigned to one of three groups: vaginismus, dyspareunia resulting from vulvar vestibulitis syndrome (VVS), and no pain with intercourse. Diagnostic agreement was poor for vaginismus; vaginal spasm and pain measures did not differentiate between women in the vaginismus and dyspareunia/VVS groups; however, women in the vaginismus group demonstrated significantly higher vaginal/pelvic muscle tone and lower muscle strength. Women in the vaginismus group also displayed a significantly higher frequency of defensive/avoidant distress behaviors during pelvic examinations and recalled past attempts at intercourse with more affective distress. These data suggest that the spasm-based definition of vaginismus is not adequate as a diagnostic marker for vaginismus. Pain and fear of pain, pelvic floor dysfunction, and behavioral avoidance need to be included in a multidimensional reconceptualization of vaginismus.

KEY WORDS: vaginismus; dyspareunia; vulvar vestibulitis syndrome; vaginal spasm; sexual pain; hypertonicity.

INTRODUCTION

Vaginal spasm has rarely been questioned as the defining characteristic for the diagnosis of vaginismus since Sims (1861) first coined the term to describe vaginal penetration difficulties. All current nosologies use variants of the spasm diagnostic criterion. For example, the Diagnostic and Statistical Manual of Mental Disorders, 4th ed, text revision (*DSM-IV-TR*) classifies vaginismus as a sexual dysfunction and uses the following three diagnostic criteria: (a) recurrent or persistent involuntary spasm of

the musculature of the outer third of the vagina that interferes with intercourse; (b) the disturbance causes marked distress or interpersonal difficulty; (c) the disturbance is not better accounted for by another Axis I disorder and is not due exclusively to the direct physiological effects of a general medical condition (American Psychiatric Association [APA], 2000). The *DSM* also divides vaginismus into subtypes (lifelong/acquired, generalized/situational, due to psychological/mixed factors). Diagnostic criteria (b) and (c) and the subtypes listed above are used for all *DSM* sexual dysfunctions. Thus, the only unique diagnostic criterion for vaginismus is a vaginal spasm that interferes with intercourse.

Recently, the International Consensus Development Conference on Female Sexual Dysfunction again endorsed the use of vaginal spasm as the defining criterion for vaginismus (Basson et al., 2000). This 150-year consensus is remarkable and it is equally remarkable that the validity of the spasm-based criterion for vaginismus has never been evaluated (Reissing, Binik, & Khalifé, 1999). There are several potential reasons for this. First, there is no

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generally accepted definition of the term spasm and no consensus concerning how to differentiate severe muscle contractions from cramps, chronic muscle tension, or spasm (Mense, Simons, & Russell, 2001). Second, there is no consensus concerning which vaginal/pelvic muscles are involved in the putative spasm of vaginismus. Existing reports range from vague descriptors, such as the “outer third of the vagina” to specific muscles and muscle groups such as the bulbocavernosus and the levator ani (e.g., Reissing et al., 1999). Third, health professionals usually involved in the assessment of vaginismus rarely have sufficient expertise to diagnose vaginal muscle spasm. Myologists and physical therapists who typically assess and treat muscle problems/spasm have rarely been consulted concerning vaginismus and this problem has never been mentioned in the myology literature. Although gynecologists have some relevant training, there has never been a gynecological diagnostic reliability study. Although a gynecological exam is often recommended, it is not required for the diagnosis. Moreover, a gynecological exam is presumably inconclusive in the case of situational vaginismus, where a woman is able to have pelvic examinations, but is unable to have intercourse. Often, gynecological confirmation of spasm is waived to avoid causing unnecessary pain (e.g., Biswas & Ratnam, 1995) or discomfort (e.g., Drenth, 1988). Fourth, the interrelationship of muscle spasm, pain, and interference with intercourse has never been adequately described. It is not clear whether the spasm is a reaction to pain or whether pain occurs as a result of the spasm or both (e.g., Ng, 1993). Although vaginismus is currently subclassified in the *DSM-IV-TR* as a sexual pain disorder, there is no diagnostic requirement for the report of pain and no empirical information concerning the occurrence of pain associated with vaginismus is available.

In view of these conceptual difficulties and the lack of an empirical framework to guide research, it is not surprising that systematic investigations of vaginismus are lacking. Recently, however, four studies have directly investigated vaginal/pelvic muscle activity in women with vaginismus (de Kruiff, ter Kuile, Weijnenborg, & van Lankveld, 2000; van der Velde & Everaerd, 1999, 2001; van der Velde, Laan, & Everaerd, 2001). van der Velde and Everaerd (1999) compared vaginal/pelvic floor activity in women who were diagnosed with vaginismus to that of control subjects. Muscle activity during a series of vaginal/pelvic floor contractions (Kegel exercises) was monitored via vaginal surface EMG in 67 women with vaginismus and 43 control participants. No group differences were found in voluntary control (i.e., ability to contract or relax) of the vaginal/pelvic muscles. In a second study, 22 women with vaginismus and 7 controls were exposed to

film segments with physically or sexually threatening content, film segments considered neutral in terms of sexual content, or film segments with a positive content. During the viewing time of the film segment, the vaginal/pelvic muscle reactivity of participants was monitored via EMG. No group differences in pelvic floor tension or reactivity were found either on baseline measures or during the films (van der Velde & Everaerd, 2001). Finally, van der Velde et al. (2001) measured vaginal spasm as well as trapezius muscle activity in 45 women with vaginismus and 32 controls during exposure to threatening, sexually threatening, sexually neutral, and positive film segments. For both women with vaginismus and the control group, muscle activity in both pelvic and trapezius muscles increased during threatening and sexual threatening film segments. It was concluded that involuntary pelvic floor muscle activity may be part of a general defense in response to a threatening situation.

These studies were not aimed at directly investigating the vaginal muscle spasm as a diagnostic criterion for vaginismus, but they demonstrated that women with vaginismus were essentially not different from controls in their ability to contract and release pelvic floor muscles. In addition, women with vaginismus did not differ in pelvic floor reactivity when viewing material with sexually or physically threatening content. Interestingly, although inclusion criteria for vaginismus in both studies were based on meeting *DSM* diagnostic criteria, none of the women with vaginismus experienced spasm with the vaginal insertion of the sensor during the testing sessions. Although it is possible that only women with less severe penetration difficulties self-selected for these studies, it is also possible that vaginal spasm and pelvic muscle reactivity are less important than previously assumed, may not specifically characterize women with vaginismus, and may not be the primary sources of interference with intercourse.

The fourth study examining vaginal/pelvic muscle activity was exploratory in nature and aimed at identifying similarities and differences in clinical presentation between 30 patients with vaginismus and dyspareunia. In this study, de Kruiff et al. (2000) assessed vaginal/pelvic muscle tone, pain ratings with attempted intercourse and gynecological examination, and anxiety. Although women with vaginismus avoided vaginal intercourse more, no differences in vaginal/pelvic muscle tone, ability to insert a finger, and pain during attempted intercourse were found compared to women with dyspareunia. Interestingly, vaginal spasm was not mentioned as a diagnostic tool, a possible clinical differentiator, or as actually reported as present during the gynecological examinations. It was concluded that the diagnostic differentiation between vaginismus and dyspareunia “is difficult or nearly impossible.”

The primary goal of this study was an attempt to systematically investigate the validity of vaginal spasm as a diagnostic criterion for vaginismus. Different methods were employed for assessing spasm, including gynecological and physical therapist assessments, vaginal surface EMG, and patient self-report. Pelvic floor assessments by physical therapists were included because, in our clinical experience, they are typically more skilled than the average gynecologist in the evaluation of vaginal/pelvic musculature. A second aim of the study was to assess pain in women suffering from vaginismus. Probandes were compared to two matched control groups: women suffering from dyspareunia resulting from vulvar vestibulitis syndrome (VVS) and women with no-pain history with intercourse. VVS is thought to be the most common form of pre-menopausal 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 (Binik, Meana, Berkley, & Khalifé, 1999; Friedrich, 1987). The inclusion of the dyspareunia/VVS group is particularly important as a control for the women's repeated experience or expectation of pain during intercourse. It also provides a useful diagnostic comparison group because there have been numerous suggestions that this syndrome is difficult to differentiate from vaginismus (Abramov, Wolman, & David, 1994; Basson & Riley, 1994; Kaneko, 2001; Ohkawa, 2001; Pukall, Reissing, Binik, Khalifé, & Abbott, 2000; van Lankveld, Brewaeys, ter Kuile, & Weijnenborg, 1995).

We hypothesized that women with vaginismus would report elevated levels of pain during attempted intercourse and during gynecological and physical therapist examinations. We also hypothesized that women suffering from vaginismus would exhibit a higher frequency of defensive behaviors during pelvic examinations compared to women in the dyspareunia/VVS or no-pain control groups. We expected women in the vaginismus and dyspareunia/VVS groups would demonstrate elevated vaginal hypertonicity and decreased vaginal muscle strength compared to women with no pain with intercourse. However, we expected that vaginal/pelvic spasm would not characterize women with vaginismus and diagnostic reliability for the category of vaginismus would not be sufficiently high to justify its current use.

One crucial theoretical and practical issue in studying vaginal/pelvic spasm as the essential diagnostic criterion in vaginismus was that an empirical investigation of the validity of this criterion could not require its a priori existence. This required a behavioral definition of vaginismus that could not include vaginal spasm. The behavioral criterion used below relies on a history of interference with

vaginal penetration, which is part of the *DSM-IV-TR* criterion A (see earlier) and is typically what clinicians focus upon in practice. Finally, the terminology of "vaginal" versus "pelvic" muscles is inconsistently used in the different relevant literatures. In fact, it is not clear whether one can functionally differentiate vaginal from pelvic muscles. As a result, we use the term "vaginal/pelvic" throughout the text except in reference to *DSM-IV-TR* that specifies "vaginal spasm."

METHOD

Participants

Participants for this study were recruited through advertisement, media attention, and gynecologist referrals. Advertisements were aimed at women who were "unable to have vaginal intercourse," or women who had "pain with vaginal intercourse," or women who experienced "no pain with intercourse." Potential participants were interviewed over the telephone by the first author, and study procedures, including the physical examinations, were explained. Interview questions included a short history of the potential participants' penetration and/or pain problems with intercourse and whether vaginal penetration had occurred. If not, the opportunity to have attempted intercourse was confirmed. If appropriate, an initial appointment was scheduled. Only three women with suspected vaginismus declined a first appointment because they did not wish to attempt any of the physical examinations.

A total of 110 women came for the first appointment. Women with vaginismus were matched with women with dyspareunia/VVS and no-pain controls according to age (± 3 years), relationship status (single/dating, common law/married), and parity (childbirth/no childbirth). Four women were excluded from the study because they could not be matched and six because of hymeneal abnormalities (e.g., hymeneal band) which would interfere with the physiological examinations. Eleven women with no intercourse-related problems and two women from the vaginismus group dropped out of the study. The data from 87 women were therefore included in the analyses below.

Sociodemographic characteristics are summarized in Table I. No differences between study groups on background variables were noted, apart from the finding that individuals in the no-pain control group were more educated than their counterparts in the vaginismus and dyspareunia/VVS groups ($p < .05$). This reflected differential recruitment strategies at a university campus for the former versus community advertisements for the latter

Table I. Participants' Sociodemographic Characteristics

Age	<i>M</i> age = 27.45; <i>SD</i> = 5.02; range = 18–43
Education ^a	Vaginismus group: <i>M</i> = 14.79 years; <i>SD</i> = 2.76; Dyspareunia/VVS group: <i>M</i> = 15.17 years; <i>SD</i> = 2.12; No-pain control group: <i>M</i> = 16.82 years; <i>SD</i> = 2.69
Annual income (Cdn)	<\$30,000: 53%; <59,000: 30%; >60,000: 16%
Relationship status	Married: 23%; Cohabiting: 25%; Dating: 32%; Single: 20%
Cultural origin	North America: 75%; European: 13%; Other origin: 12%
Language	Francophone: 53%; Anglophone: 31%; Other first language: 16%
Religious background	Catholic: 61%; Protestant: 15%; Other religion: 13%; No religion: 11%

^aNo-pain control group was significantly different from the vaginismus and dyspareunia/VVS groups ($p < .05$).

two groups. However, the difference in education did not correlate with any of the dependent variables.

For vaginismus, the inclusion criteria were (1) never having been able to experience vaginal intercourse, despite attempts on at least 10 separate occasions; or (2) never having been able to experience vaginal intercourse despite attempts on *at least* two separate occasions and other interference with vaginal penetration (see later); and (3) a current inability to experience vaginal intercourse and other interference with vaginal penetration for at least one year, although vaginal penetration was experienced at least once before this period. Other interference with vaginal penetration was defined as an average of less than one attempt at vaginal intercourse every 2 months over the past year despite adequate opportunity or being involved in a relationship, and also meeting one of the following two criteria: (a) never having seen a health professional for or never having successfully completed a pelvic exam; (b) never having used tampons.

The inclusion criteria for dyspareunia/VVS were (1) ability to experience vaginal penetration, but such penetration was painful on at least 50% of all attempts; (2) the pain was reported to be located at the entrance of the vagina and starts with vaginal penetration; (3) the pain was described as burning and/or cutting, and (4) the pain was personally distressing and was present for at least 1 year.

The inclusion criteria for the no-pain control group were (1) ability to experience vaginal penetration without difficulty; and (2) no history of chronic or recurrent vulvar/vaginal/pelvic pain or penetration difficulty during intercourse, gynecological examinations, or tampon insertion.

Procedure

During the first session, study procedures were re-explained and informed consent was obtained. This was followed by the administration of a structured interview

aimed at collecting sociodemographic background as well as dyspareunia- and vaginismus-related history. Following this, the first gynecological examination and EMG evaluation were completed. The dyspareunia/VVS group required a positive pain report confirming the presence of VVS during the first gynecological exam. The initial session lasted approximately 2–3 hr. The physical therapists' evaluations took place on the second and third visits, which lasted about 30 min each. At the final visit, participants underwent their second gynecological exam and EMG testing; they were also provided with diagnostic information, and were referred appropriately if necessary. Participants were given \$60 to defray transportation and incidental costs; they were tested between November 1998 and February 2000. Throughout the study, previous diagnoses, study group assignment, and results of the physical examinations were not known by gynecologists, physical therapists, and psychologists.

Measures

Self-Report Measures

A structured interview was used to collect information on sociodemographic background and history of gynecological problems. This interview had been previously used in studies evaluating women with dyspareunia and was adjusted to also assess women with vaginismus (Meana, Binik, Khalife, & Cohen, 1997b). The questionnaire included a detailed assessment of intercourse/penetration-related pain and focused on the presence, onset, location, intensity, and quality of pain with intercourse or attempted intercourse. A series of structured questions evaluated the onset of penetration difficulties, the level of interference with intercourse and causal attributions for pain/penetration problem. Standardized measures included the McGill Pain Questionnaire (Melzack & Katz, 1992), a self-report measure of sensory and affective dimensions of pain, and the Pain Catastrophizing Scale

(Sullivan, Bishop, & Pivik, 1995), a self-report measure of cognitive and emotional coping statements reflecting levels of catastrophizing style of coping with pain.

Health Professional and Vaginal EMG Evaluation

Gynecological Examination. The American College of Obstetricians and Gynecologists (ACOG, 1995) does not provide guidelines for the confirmation of the presence of vaginal spasm in vaginismus. In addition, no specific recommendations are provided for the examination of women with dyspareunia. Therefore, a standardized examination protocol, based on previous work (Bergeron, Binik, Khalifé, Pagidas, & Glazer, 2001; Meana et al., 1997b) was developed. The protocol consisted of three parts: (a) visual and digital examination of the vulva; (b) internal digital and speculum examination of the vagina and reproductive organs; and (c) a cotton swab test (Friedrich, 1987) at four vestibular sites (3, 5, 7, and 9 o'clock, sequence of testing was randomized). At each step of the exam, the gynecologists were asked to report whether a vaginal spasm was present or not, using their working definition of spasm ("An involuntary contraction of some or all of the pelvic floor muscles which prevents examination"). Gynecologists also globally rated vaginal/pelvic muscle tone on a 5-point rating scale, with 0 indicating *normal tone* and 5 indicating *perineal and levator ani contractions* (Lamont, 1978). Finally, they also rated defensive distress reactions, which were defined as behaviors interfering with, delaying or terminating the examination and rated on a 4-point scale with 0 indicating *no problematic reaction during the exam* and 4 indicating that the *participant terminated the exam*. During each step of the examination, patients were asked to report their level of pain ranging from 0 (*no pain*) to 10 (*worst pain ever*); the first author or a research assistant noted all ratings. The order of gynecologists conducting the first examination was counterbalanced.

After the examination, gynecologists chose a diagnosis from the following list of three primary choices: vaginismus, vulvar vestibulitis syndrome (VVS), and no-pain-related diagnosis. The gynecologists also had the option of including gynecological problems (e.g., infection, bladder sensitivity/complications, and cervical inflammation) in their diagnostic decision. If more than one diagnosis was made, gynecologists were asked to rank order the diagnoses. Gynecologists endorsed only four of the above-listed choices (vaginismus, VVS, infection, no diagnosis); consequently, the remaining diagnostic options were excluded from the statistical analysis. For analyses of reliability, only diagnoses ranked first were included; this

excluded "infection" as it was considered as a secondary diagnosis only. The participating gynecologists, one male and one female, have been formally involved in research and clinical work concerning the sexual pain disorders for the last 10 years (e.g., Bergeron et al., 2001; Meana, Binik, & Khalifé, 1997a).

Physical Therapist's Evaluation. In cooperation with the two participating female pelvic floor physical therapists, a standardized protocol for the evaluation of the vaginal and pelvic floor muscles was developed. The examination involved external, vaginal palpation, and internal vaginal and anal palpation of the superficial and deep pelvic muscle layers in a clock-wise fashion, palpating four different sites (3, 5, 7, 9 o'clock). Muscle tone (tonicity) was rated on a 7-point scale, ranging from -3 (*very hypotonic*) to +3 (*very hypertonic*) with 0 representing a normal, healthy vaginal/pelvic muscle tone. Participants were also asked to contract their vaginal/pelvic muscles and physiotherapists evaluated muscle strength via 1-digit and 2-digit palpation on a 0 (*no muscle contraction*) to 5-point scale (*maximum muscle contraction*). Participants also reported their level of pain at each step of the examinations on a scale from 0 (*no pain*) to 10 (*worst pain ever*). The first author or a trained clinical research assistant recorded the patient's pain ratings and the physical therapist's rating of muscle tonicity and strength of contraction.

At each step of the examination, the physical therapists were also asked to report whether vaginal spasm was present using their working definition of spasm ("a prolonged muscle contraction not relieved by reassurance"). Defensive muscular reactions (muscle twitches and contractions) and behaviors (closing knees, moving away, crying) were reported by the physical therapists and noted by the assistant. Physical therapists were asked to choose between the following diagnoses: "vaginismus," "dyspareunia," and "normal." Since the physical therapists are not trained to perform the cotton swab test for VVS, their diagnostic formulation was restricted to dyspareunia.

The order of physical therapists conducting the first examination was counterbalanced. The two physical therapists participating in this study have over 8 years of experience treating sexual pain disorders. Their approach to the assessment and treatment of the pelvic floor dysfunction have been described in the physical therapy literature (e.g., Brown, 1999; Lord, 1999) and presented at numerous conferences and workshops.

Psychologist Diagnosis. A transcript of responses to the sections of the structured interview pertaining to penetration difficulties and to pain with intercourse was provided for review to the psychologists. The two psychologists were asked to determine a *DSM-IV* diagnosis

of sexual dysfunction or another *DSM-IV* diagnosis (e.g., somatization disorder). The participating clinicians were PhD level psychologists who had completed doctoral internships with a specialization in sexual dysfunction.

Electromyographic Evaluation (EMG). To measure vaginal/pelvic muscle activity independent of clinical judgment, an EMG protocol was adapted from Glazer, Rodke, Swencionis, Hertz, and Young (1995), consisting of a 6-min automated test sequence (MyoTrac 3 Incontinence Software, version 1.2, designed by Thought Technology Inc., Montreal, Canada). Gynecologists inserted the single-user plug vaginal sensors (Thought Technology Inc., Montreal, Model T6050) after the gynecological examination had been completed. Women were asked to assume a supine position with stretched legs parallel to each other; a support cushion was placed under their knees to assure optimal pelvic floor relaxation. EMG recording was initiated and terminated with a 60-s relaxation baseline period during which participants were asked to relax their vaginal/pelvic muscles completely. Between the two baseline measures, participants were requested to execute the following: (1) six maximum intensity rapid contractions (flick contractions); (2) one 10-s maximum contraction; (3) five alternate cycles of 5-s contraction/relaxation; and (4) one 40-s maintained contraction. Vaginal spasm during EMG testing was defined as a sustained contraction lasting at least 1 min which could not be relieved voluntarily and was accompanied by at least a 15 mv increase above the participant's baseline EMG reading. Participants were given instructions on the specific exercise required prior to each new step of the protocol. The directions were visible on the computer screen and read aloud by the first author or research assistant. Each woman received both auditory and visual feedback concerning her performance during

the testing sequence. At the conclusion of the session, participants removed the vaginal sensor themselves. The data were recorded on a Pentium 166 Hz laptop computer.

RESULTS

Vaginal Penetration History

Significant group differences observed on penetration history were expected (see Table II). In view of the heterogeneity in variance, continuous variables were analyzed using the Kruskal–Wallis one-way analysis of variance by ranks. Significant results were followed up by pair-wise comparisons using the Mann–Whitney *U* test. Dichotomous variables were analyzed via chi square. Participants differed significantly in frequency of sexual intercourse, $\chi^2(2, N = 87) = 59.09, p < .001$. Follow-up comparisons revealed that women in the vaginismus group reported a significantly lower frequency of intercourse compared to women in the dyspareunia/VVS group $z = -5.69, p < .001$, and women in the no-pain group, $z = -6.64, p < .001$. Women in the dyspareunia/VVS group also demonstrated lower frequency compared to women in the no-pain group, $z = -4.48, p < .001$.

Participants differed in the likelihood of having received a previous diagnosis of vaginismus, $\chi^2(2, N = 87) = 29.22, p < .001$, and VVS, $\chi^2(2, N = 87) = 11.75, p < .01$. Compared to the dyspareunia/VVS group, more women in the vaginismus group had received a previous diagnosis of vaginismus, $\chi^2(1, N = 58) = 13.23, p < .001$, and VVS, $\chi^2(1, N = 58) = 4.35, p < .05$. Women in the no-pain control group had not received previous diagnoses of sexual pain disorders.

Table II. Vaginal Penetration History and Previous Diagnoses

Vaginal penetration and diagnostic history	Vaginismus (<i>n</i> = 29)		Dyspareunia/VVS (<i>n</i> = 29)		No pain (<i>n</i> = 29)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Intercourse attempts in last 6 months	1 ^a	7.42	22 ^b	39.83	60	42.93
Previously diagnosed with						
Vaginismus	55% ^c		10%		0%	
Vulvar Vestibulitis Syndrome	7% ^a		28%		0%	
Never having experienced						
Vaginal penetration	70% ^c		0%		0%	
Tampon insertion	83% ^a		45% ^d		17%	
A gynecological examination	72% ^c		24%		7%	

^aVaginismus group was significantly different from the dyspareunia/VVS and control groups ($ps < .01$).

^bDyspareunia/VVS group was significantly different from no-pain control group ($p < .001$).

^cVaginismus group was significantly different from the dyspareunia/VVS and control groups ($ps < .001$).

^dDyspareunia/VVS group was significantly different from no-pain control group ($p < .05$).

Participants also differed with regard to their experiences with vaginal penetration related to the experience of intercourse, $\chi^2(4, N = 87) = 51.94, p < .001$, tampon insertion, $\chi^2(2, N = 87) = 25.13, p < .001$, and gynecological examinations, $\chi^2(4, N = 87) = 34.04, p < .001$. While all women in the dyspareunia/VVS and no-pain groups had experienced vaginal intercourse, over 70% of the women in the vaginismus group reported never having experienced vaginal penetration. Significant differences in tampon use were noted across groups with women in the vaginismus group using less tampons compared to women in the dyspareunia/VVS, $\chi^2(1, N = 58) = 9.03, p < .01$, and no-pain groups, $\chi^2(1, N = 58) = 24.90, p < .001$. The differences in tampon use between women in the dyspareunia/VVS and no-pain control group were also significant, $\chi^2(2, N = 58) = 5.16, p < .05$. Women in the vaginismus group were also significantly less likely to have had a gynecological examination as compared to the women in the dyspareunia/VVS, $\chi^2(2, N = 58) = 15.80, p < .001$, and no-pain groups, $\chi^2(2, N = 58) = 26.85, p < .001$.

Diagnosis of Vaginal Spasm

Group differences in the occurrence of a vaginal spasm during the gynecological examinations were significant, $\chi^2(2, N = 81) = 14.46, p < .001$. Pair-wise comparisons revealed that women in the vaginismus group demonstrated greater frequency of vaginal spasm than women in the dyspareunia/VVS, $\chi^2(1, N = 52) = 6.50, p < .05$, and no-pain groups, $\chi^2(1, N = 53) = 9.75, p < .01$. No significant differences between the dyspareunia/VVS and no-pain group were found, $\chi^2(1, N = 57) = 1.05, ns$. However, only 28% of women in the vaginismus group showed the presence of this diagnostic criterion. Moreover, none of the women in the vaginismus group who experienced a spasm during one gynecological examination also experienced a spasm during the other gynecology examination.

The incidence of vaginal spasm during the physical therapists' examinations differed significantly between groups, $\chi^2(2, N = 87) = 15.55, p < .001$. Women in the no-pain control group experienced significantly less spasm compared to women in the vaginismus, $\chi^2(1, N = 58) = 8.61, p < .01$, and dyspareunia/VVS groups, $\chi^2(1, N = 58) = 10.88, p < .01$. No differences between vaginismus and dyspareunia/VVS groups were noted, $\chi^2(1, N = 58) = .22, ns$. One or both of the physical therapists reported a vaginal muscle spasm in 86% of women in the vaginismus group, in 93% of the women in the dyspareunia/VVS group, and in 54% of the women in the no-pain group.

Only women in the vaginismus group were asked whether they experienced vaginal spasm with attempted intercourse, 24% of these women did report vaginal spasm. Vaginal surface EMG testing revealed no vaginal spasms during insertion of the sensor by the gynecologists or during testing in any of the participants.

Diagnostic Agreement

Diagnostic agreements for gynecologists, physical therapists, and psychologists are summarized in Table III. Diagnostic agreement for each pair of diagnosticians for the three diagnoses was evaluated using the kappa statistic. Gynecologists and psychologists agreed moderately with kappa values of .60 and .58, respectively. Physical therapists demonstrated substantial agreement with a kappa value of .64 (Landis & Koch, 1977).

Vaginal/Pelvic Muscle Tone and Strength

Only one of the participating gynecologists used the scale evaluating vaginal/pelvic muscle tone consistently; consequently, the analysis of the results was based on her ratings only. Women in the no-pain control group did not demonstrate vaginal muscle tension during gynecological examination. However, women in the vaginismus group showed higher levels of vaginal tension than the women in the dyspareunia/VVS group, $t(56) = 3.84, p < .001$.

Physical therapists indicated ratings of muscle tone for each muscle group palpated. Tonicity rating intercorrelations at the eight spots palpated for the two physical

Table III. Diagnostic Agreement Between Gynecologists, Physical Therapists, and Psychologists

	Gynecologist 1			
	Vaginismus	Dyspareunia/VVS	No pain	Infection
Gynecologist 2				
Vaginismus	3	9	0	0
Dyspareunia/VVS	0	39	4	0
No pain	0	1	23	0
Infection	0	2	1	0
	Physical therapist 1			
Physical therapist 2				
Vaginismus	22	7	0	n/a
Dyspareunia/VVS	7	16	2	n/a
No pain	0	4	27	n/a
	Psychologist 1			
Psychologist 2				
Vaginismus	20	24	0	n/a
Dyspareunia/VVS	1	13	0	n/a
No pain	0	0	29	n/a

therapists ranged from an average of .61 for palpation of the superficial vaginal/pelvic floor muscles to .69 for deep vaginal/pelvic floor muscles and were all significant at $p < .01$. Separate analyses for each physical therapist demonstrated the same pattern of significant differences. Hence, the mean tonicity ratings for both therapists for all sites of vaginal/pelvic muscle palpation were included in the analysis. There was an overall group effect for muscle tone, $F(2, 84) = 52.63$, $p < .001$. Tukey HSD post-hoc comparisons revealed that women in the vaginismus group had significantly higher vaginal/pelvic hypertonicity than both, women in the dyspareunia/VVS and no-pain groups ($ps < .05$). In addition, women in the dyspareunia/VVS also demonstrated increased hypertonicity compared to the women with no pain ($p < .05$).

Correlations for the two measures of vaginal/pelvic muscle strength ranged from .62 for one-digit palpation to .66 for two-digit palpation; all correlations were significant at $p < .01$. Separate analyses for each physical therapist demonstrated the same pattern of significant differences. Hence, the mean tonicity ratings for both therapists for one and two-digit palpations were included in the analysis. A significant difference was noted for muscle strength evaluated with one-digit palpation, $F(2, 82) = 12.17$, $p < .001$. Tukey's HSD post hoc comparisons showed women in the vaginismus group demonstrated lower vaginal/pelvic muscle strength than both women in the dyspareunia/VVS and no-pain control groups ($ps < .05$). When palpated with two digits, differences in muscle strength were also significant, $F(2, 74) = 17.38$, $p < .001$. Tukey's HSD post hoc comparisons demonstrated significant differences between women in the vaginismus group compared to the dyspareunia/VVS and control groups ($ps < .05$). However, women in the dyspareunia/VVS group also demonstrated less vaginal muscle strength compared to women in the no-pain group ($ps < .05$).

Vaginal Surface EMG

Forty-six percent of the women in the vaginismus group refused to undergo both EMG evaluations and 27% refused to have more than one test performed. None of the women in the dyspareunia/VVS or no-pain group refused to undergo the EMG evaluations. Analysis of the remaining data revealed no significant group differences on measures of vaginal/pelvic muscle tone prior to contraction exercises and following muscle contractions. However, a MANOVA on measures of vaginal/pelvic muscle strength revealed significant differences between groups, $F(8, 124) = 3.42$, $p < .001$. Follow up ANOVAs showed significant differences for average strength of 10-second contraction, $F(2, 70) = 9.53$, $p < .001$; aver-

age strength of contraction during work/rest cycles, $F(2, 70) = 9.65$, $p < .001$; and average strength during 40-seconds endurance contraction, $F(2, 70) = 10.93$, $p < .001$, but not for peak strength during flick contractions, $F(2, 67) = 2.80$, $p = .07$. Tukey's HSD post hoc comparisons showed that vaginismus and dyspareunia/VVS groups differed significantly from the no-pain control group ($ps < .025$).

Defensive Reactions

Gynecologists

The total number of defensive reactions during the gynecological examinations were compared resulting in significant difference among groups, $F(2, 85) = 28.37$, $p < .001$. Tukey's HSD post hoc comparisons revealed that women in the vaginismus group displayed significantly more avoidance and defensive reactions than both women in the dyspareunia/VVS and no-pain groups ($ps < .05$).

Physical Therapists

The number of defensive reactions noted during the physical therapist's evaluation also showed a significant difference among groups, $F(2, 85) = 23.47$, $p < .001$. Tukey's HSD post hoc comparisons showed that women in the vaginismus group reacted with significantly more defensive reactions than women in the dyspareunia/VVS and the no-pain groups ($ps < .05$).

Pain Measures

Retrospective Pain Reports

During the initial structured interview, each participant reported the severity of pain and associated affective distress (0–10) with intercourse or attempted intercourse. Women in the no-pain control did not report past experiences of intercourse which were painful or distressing. Women in the vaginismus and dyspareunia/VVS groups did not differ in their pain reports, $t(47) = -1.53$, $p = .13$ (see Table IV). However, women in the vaginismus group reported more distress compared to women in the dyspareunia/VVS group, $t(47) = -2.49$, $p < .05$.

Pain During Physical Examinations

Pain ratings (0–10) were noted for each step of the gynecological examinations and the physical therapists'

Table IV. Self-Report of Sensory, Affective, and Cognitive Aspects of Pain Experience

Dependent measures of pain experience	Vaginismus		Dyspareunia/VVS		No pain	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Retrospective report (0–10)						
Pain intensity during (attempted) intercourse	6.05	3.24	7.24	2.23	no pain reported	
Affective distress associated with pain during (attempted) intercourse	8.65	1.98	6.65 ^a	3.63	no distress reported	
Pain ratings (0–10)						
Gynecologists' exam	2.40	1.26	2.42	1.12	.27 ^b	.50
Physical therapists' exam	1.53	.99	1.19	1.00	.10 ^b	.23
Cotton swab test	5.41	2.27	5.63	1.97	.58 ^b	1.01
Self-report						
McGill Pain Questionnaire (PRI)	26.41	17.47	30.27	11.44	n/a	
Pain Catastrophizing Scale (for pain in general)	18.57	12.61	18.46	9.59	15.37	8.98
Pain Catastrophizing Scale (for pain with attempted intercourse)	30.07	9.98	29.89	8.93	n/a	

^aThe vaginismus group was significantly different from the dyspareunia/VVS group ($p < .001$).

^bThe no pain control group was significantly different from the vaginismus and dyspareunia/VVS groups ($ps < .001$).

evaluation. Significant differences were found between groups for mean pain ratings during the gynecological examinations, $F(2, 85) = 43.1, p < .001$ (see Table IV). Tukey's HSD post hoc comparisons revealed that women in the vaginismus and dyspareunia/VVS groups reported more pain during gynecological examinations than women in the no-pain group ($ps < .05$).

Mean pain ratings (0–10) during physical therapists' evaluations yielded a significant group difference, $F(2, 85) = 23.5, p < .001$ (see Table IV). Tukey's HSD post hoc comparisons demonstrated that women in the vaginismus and dyspareunia/VVS groups reported more pain during physical therapists' evaluations than women in the no-pain group ($ps < .001$).

Pain Ratings on Cotton Swab Test

Ratings were given for each of the four vestibular palpation sites (0–10) and the mean was used for analysis. A one-way ANOVA revealed significant differences between groups, $F(2, 85) = 70.4, p < .001$ (see Table IV). Tukey's HSD post hoc comparisons, however, revealed that both, women in the vaginismus and dyspareunia/VVS groups, reported significantly more pain during vestibular palpation than women in the no-pain group ($ps < .001$).

McGill Pain Questionnaire (MPQ)

The MPQ for pain with intercourse or attempted intercourse was administered only to women in the vaginismus and dyspareunia/VVS groups.

Pain ratings below 20 are typically reported by people experiencing toothaches or sprains. Ratings between 20 and 30 are given with non-terminal cancer pain or chronic lower back pain; ratings above 30 are given for labor pain. Women with vaginismus reported mean pain ratings of 26.41 ($SD = 17.47$), while women in the dyspareunia/VVS group reported 30.27 ($SD = 11.44$) (see Table IV). No significant differences were noted between groups on the overall pain-rating index (PRI), $t(54) < 1, ns$.

Pain-Catastrophizing Scale (PCS)

Mean PCS scores for a sample of patients with persistent pain problems is 22 with a median of 20 (Sullivan, Tripp, & French, 2001). Mean scores on the PCS for non-genital pain were 18.57 ($SD = 12.61$) for the women in the vaginismus group, 18.46 ($SD = 9.59$) for the women in the dyspareunia/VVS group, and 15.37 ($SD = 8.98$) for women in the control group (see Table IV). A one-way ANOVA revealed no significant differences between groups $F(2, 84) < 1, ns$.

The PCS for pain with intercourse or attempted intercourse was administered only to women in the vaginismus and dyspareunia/VVS groups. Mean scores on the PCS for vulvar/vaginal pain with intercourse or attempted intercourse were 30.07 ($SD = 9.98$) for the women in the vaginismus group and 29.89 ($SD = 8.93$) for the women in the dyspareunia/VVS group. No significant differences between vaginismus and dyspareunia/VVS groups were found, $t(54) < 1, ns$.

DISCUSSION

Vaginal/pelvic spasm does not appear to be either a necessary or sufficient condition for a diagnosis of vaginismus. Gynecological examinations confirmed a vaginal/pelvic spasm in less than a third of the women in the vaginismus group. In addition, only a quarter of the women in the vaginismus group reported actually experiencing spasm with attempted intercourse. By contrast, physical therapists reported a high incidence of spasm during examinations for *both* women in the vaginismus and dyspareunia/VVS groups. In addition, as many as half of the women in the no-pain control group experienced vaginal spasm with the physical therapists' exams. It is possible that the invasive nature of the examinations and the specific palpations of tender muscle sites in control subjects resulted in protective guarding responses, very much like those in women who experience and/or expect pain with vaginal penetration. However, these guarding responses were limited to exposure to painful palpations during the physical therapists' evaluations. These results strongly confirm our hypothesis that the assessment of vaginal spasm is not well defined or reliable, and basing the diagnosis of vaginismus on this criterion is not currently warranted.

There is at least one parallel to this diagnostic situation in another disorder. It had been assumed for many years that pericranial muscle spasm was the diagnostic marker for tension headache and that relieving this spasm would relieve the headache pain. When this idea was finally tested empirically, it was not supported and therapies directed at this mechanism have waned in popularity (Mense et al., 2001).

Despite the lack of confirmation of vaginal/pelvic spasm as a diagnostic marker for women with vaginismus, other characteristics of vaginal/pelvic muscle function did differentiate the study groups. Gynecologists and physical therapists reported increased vaginal/pelvic muscle tone in women with vaginismus. However, EMG recordings did not reflect this finding. In view of the significant number of women in the vaginismus group who did not participate in the EMG evaluation, it is possible that only those with less severe pelvic floor tension participated in this aspect of the study, and/or statistical analyses did not detect an effect due to the small group size. Physical therapists and EMG recordings confirmed decreased vaginal/pelvic muscle strength. Gynecologists did not evaluate pelvic muscle strength because they did not have the relevant training. Differences in hypertonicity (elevated vaginal/pelvic muscle tone) and decreased vaginal muscle strength appear to be quantitative rather than qualitative differences (e.g., presence of spasm versus *degree* of vaginal/pelvic floor hypertonicity/muscle strength). It will be necessary

to further clarify these quantitative differences in future research and to evaluate their usefulness as a diagnostic taxon defining vaginismus, and as a means for differentiating it from dyspareunia/VVS.

Diagnostic agreement overall was moderate but the reliability of different professional groups in distinguishing different patient groups varied. All diagnosticians performed well in differentiating the no-pain from the vaginismus and dyspareunia/VVS groups, but they were less successful in differentiating vaginismus from dyspareunia/VVS. Diagnostic disagreements, however, were not random; gynecologists agreed more frequently on a diagnosis of VVS, whereas physical therapists agreed more frequently on a diagnosis of vaginismus. This may be accounted for by differences in working definitions of vaginal spasm and different foci and methods of examination. For example, gynecologists tended to diagnose VVS when participants reported pain with the cotton swab test. For a diagnosis of vaginismus, gynecologists looked for a vaginal spasm preventing the continuation of the exam; because the incidence of spasm during the gynecological examination was low, so was the number of positive diagnoses. However, some women in the vaginismus group also had positive pain ratings by both gynecologists on the cotton-swab test but were nevertheless diagnosed with vaginismus. It is possible that diagnostic decision making by the gynecologists was influenced by behavioral differences during the examinations and less so by spasm, muscle tension, or pain. An implication of this finding could be that women who display more pain/fear *behaviors* are less likely to receive a pain-related diagnosis (e.g., VVS).

Physical therapists were likely to attend more to the increased hypertonicity of the vaginal/pelvic muscles and differentiated groups accordingly; however, women with VVS who demonstrated significant hypertonicity were not diagnosed with vaginismus. Physical therapists may, therefore also have relied on the presence of defensive distress reactions when diagnosing women with vaginismus. Noteworthy is the fact that psychologists, who did not meet face to face with the participants and based their diagnostic decision-making on a review of excerpts of the structured interview only. Yet they achieved diagnostic reliability comparable to that of gynecologists and physical therapists who observed defensive behaviors and noted levels of pain and distress during the exams. Psychologists based their diagnostic decision-making on the reported levels of interference with intercourse and self-reported pain and distress about this pain with intercourse or attempted intercourse. In sum, it appears that the degree of distress displayed by the patient during physical examinations and the level of interference and fear behaviors

with intercourse (or examination) are more central to differentially diagnosing vaginismus than are physiological findings of muscle tension and/or spasm.

At present, pain is not listed as a primary feature of vaginismus in the *DSM-IV-TR* (APA, 2000). Yet, the data collected in this study strongly suggest that pain is an integral part of the experience of vaginismus (see also Basson, 1996; de Kruiff et al., 2000). Women with vaginismus did not differ from women with dyspareunia/VVS in either the reported intensity of pain or the cognitive, sensory, and affective qualities of their pain experiences. Furthermore, participants did not differ on measures of general pain catastrophizing. With respect to nongenital pain, such as headaches, all participants tended to cope in adaptive, noncatastrophizing ways. When experiencing pain with intercourse or attempted penetration, however, women in the vaginismus and dyspareunia/VVS groups demonstrated levels of catastrophizing that were equal to those typical of individuals suffering from chronic pain conditions (Sullivan et al., 2001).

These similar pain reports and the overlap in vaginal/pelvic muscle tension and strength may explain the previously reported diagnostic confusion between dyspareunia/VVS and vaginismus (e.g., Abramov et al., 1994; Basson & Riley, 1994; Kaneko, 2001; van Lankveld et al., 1995). The results of this study suggest that pain associated with attempted penetration rather than pain associated with the putative vaginal spasm, interferes with intercourse in women diagnosed with vaginismus. In this conceptualization, women with vaginismus differ from women with dyspareunia in that they are more fearful of pain and/or perhaps more unwilling to bear the pain associated with penetration.

The data collected in this study which most clearly differentiated women in the vaginismus group from both the dyspareunia/VVS and the control groups were a significantly higher number of distress and avoidance behaviors and an overall 73% refusal rate to participate in both EMG sessions. None of the participants in either the dyspareunia/VVS or no-pain control groups refused even one EMG session. The behavioral reactions of these women were not unlike the behavior of phobic individuals when confronted with their feared stimuli. If this interpretation is correct, vaginismus could be considered a type of specific phobia characterized by clinically significant anxiety or, in some cases, panic provoked by exposure to a specific feared object or situation (vaginal penetration), typically resulting in avoidance behaviors (APA, 2000). This fear/phobic reaction might be understood as conditioned fear to the real or expected experience of pain or may have other sources that we do not yet understand. In turn, increased vaginal/pelvic muscle tone and reduced vaginal muscle

strength might be interpreted in part as a conditioned reaction to the repeated experience/expectation of fear and/or pain. Continued avoidance of intercourse in women with vaginismus, prevents exposure to potentially disconfirming information and experiences, thus maintaining the disorder (Reissing, Binik, Khalife, Cohen, & Amsel, 2003).

A number of limitations of this study should be noted. First, evaluating a diagnostic criterion (i.e., spasm) necessitates its elimination as an inclusion criterion. Our subsequent reliance on a history of interference with and a low frequency of intercourse attempts as the inclusion criteria for the vaginismus group may be challenged. We believe, however, that the diagnostic and vaginal penetration data presented in Table I support that women in our vaginismus group resemble those typically described in the literature. Since the vaginal spasm criterion has been almost universally accepted, there is no theoretical or empirical basis at the moment for alternative inclusion criteria. Second, volunteers for this study were aware of the necessity to attempt several examinations involving vaginal penetration; it is possible that women with the most severe fears of such examinations did not participate. There is no obvious way of overcoming this problem except by breaking up future studies into smaller ones necessitating fewer "vaginal penetrations." In addition, there is, unfortunately no data to indicate whether "inability to use a tampon" or "inability to have a gynecological exam" is a good predictor of the "inability to have intercourse." It is quite possible that the most severely affected women suffering from vaginismus never come to research/clinical attention. Third, although the vaginal EMG data were consistent with the physical therapist findings with respect to decreased muscle strength, they must be interpreted with caution considering the high dropout rate for this part of the study. Fourth, although we standardized assessments within a discipline, we did not "force" clinicians between disciplines (gynecologists and physical therapists) to standardize their assessments of spasm and muscle tone and strength. Such standardization would have required lengthy training on the part of the gynecologists and would not reflect their typical training when asked to make a diagnosis of vaginismus. Finally, although each diagnostician was blind to group inclusion criteria (vaginismus, dyspareunia/VVS, no-pain), the differentiation between women in the no-pain group and those in the other two groups was almost immediately obvious to any health professional doing a pelvic examination and thus may have affected their diagnostic decision-making.

Our data have potentially significant treatment implications. If the majority of women currently diagnosed with vaginismus also have comorbid dyspareunia that is not accounted for by vaginal spasm, then pain management

techniques need to be part of the standard treatment plan. Increased vaginal/pelvic tone and lack of vaginal muscle strength, rather than spasm, need to be addressed. Yet, the traditional progressive dilation exercises prescribed by the therapist and implemented by the client may not efficient. One patient recently described this approach to us as the “blind leading the blind.” By contrast, the direct, hands-on approach of pelvic floor physical therapists involves an individualized assessment and treatment of the muscular problems and also achieves the goal of desensitizing the client to vaginal penetration (Bergeron et al., 2002). In addition, if the “vaginal penetration phobia” interpretation is correct, then increased attention should be paid to the avoidance/fear component of the problem and relevant psychotherapeutic and/or pharmacological interventions should be considered (e.g., Plaut & Rach Beisel, 1997) in addition to pain management.

In summary, we believe that the widely held categorical definition of vaginismus based on vaginal spasm needs to be critically reevaluated. With renewed scientific interest, however, it may be possible to develop reliable diagnostic algorithms and to differentiate vaginismus from dyspareunia/VVS. This differentiation will need to be based on a multidimensional diagnostic framework including fear/avoidance of vaginal penetration, vaginal/pelvic pain with attempts at penetration, as well as altered vaginal/pelvic muscle tone and strength.

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