ORIGINAL PAPER

Predictors of Genital Pain in Young Women

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Abstract Despite the high prevalence of genital pain in healthy young adult women, limited research has addressed genital pain during intercourse using contemporary models of multidimensional sexual function. The objectives of this study were threefold: (1) to identify differences in sexual functioning in women who experience genital pain compared to pain free women; (2) to identify predictors of sexual functioning in women with and without genital pain; and (3) to identify predictors of sexual satisfaction in women with and without genital pain. Sexually active female undergraduates ($n = 651$) were administered the Female Sexual Function Index and the Derogatis Sexual Functioning Inventory. We evaluated the sexual factors that impact the sexual function of women with any pain (including high and low pain groups) versus women with no history of pain. Women with genital pain reported greater rates of sexual dysfunction as compared to pain-free women; however, sexual functioning in the high versus low pain groups was distinguished primarily by vaginal lubrication. Women in the high pain group showed negative correlations between domains of sexual satisfaction and genital pain frequency and intensity that were not found in the low pain group. For pain-free women, intercourse played a strong role in sexual satisfaction, whereas non-intercourse sexual behavior was central to sexual satisfaction in women who reported pain. The evaluation of levels of genital pain may provide insight into the mechanisms underlying the impairment of sexual function, sexual behavior, and sexual satisfaction.

Keywords Genital pain · Dyspareunia · Female sexual dysfunction · Sexual satisfaction · Sexual communication

Introduction

Contemporary models of female sexual response reflect the intercept of multiple dimensions of sexuality (Basson, 2001). Whereas sexual desire and arousal have often been the focus of these revised conceptualizations of sexual function, little attention has been given to the impact of different levels of genital pain (but see Abarbanel, 1978). This omission is surprising in light of the 15–20% of the female population aged 18–29 who experience dyspareunia (Laumann, Paik, & Rosen, 1999; Mercer et al., 2003). Dyspareunia is defined as the experience of pain during sexual intercourse and/or nonsexual pain with vaginal penetration (Binik, 2005). The symptom of pain in dyspareunia may be caused by multiple disease states, including underlying infection, allergies, muscle tension, hormone deregulation, genital abnormalities, endometriosis or tissue damage following pelvic injury or surgery (Basson et al., 2004). Although women with dyspareunia may have pain with localized or generalized genital contact, the most common type of dyspareunia is Vulvar Vestibulitis Syndrome (VVS, also known as vestibulodynia), or pain concentrated at the vaginal vestibule (Friedman, 1995).

In addition to the physical pain, dyspareunia may result in a cascade of psychological, sexual, and interpersonal disturbances that impair a woman's quality of life and diminish satisfaction in primary intimate relationships (Bergeron, Binik, Khalifé, & Pagidas, 1997; Meana, Binik,

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Khalifé, & Cohen, 1997). The majority of our current knowledge about psychological factors in dyspareunia is based on premenopausal women with a mean age of 30 or above (reviewed in Basson et al., 2004). Most evidence on dyspareunia in young adult women has been limited to samples of women with VVS (e.g., Bergeron et al., 2001; Danielsson, Sjoberg, & Wikman, 2000; Granot, 2005). Although VVS is thought to account for many cases of dyspareunia, it is unclear how these findings generalize to women with other types of dyspareunic pain. Subsequently, little is known about the experience of different levels of genital pain during early adulthood when dyspareunia is most prevalent (Laumann et al., 1999).

To date, the literature shows contradictory and inconclusive support for the contribution of psychological factors to the development and/or maintenance of dyspareunia. Aside from psychoanalysis, the literature on dyspareunia has often lacked theoretical direction and this may account for the disjointed psychological research. However, there is reason to expect a strong psychological component in the experience of genital pain. Psychological factors have been shown to impact the subjective experience of pain in a variety of pain populations (e.g., Vlaeyen & Linton, 2000). Because the experience of pain includes sensory and affective aspects, a woman's cognitive and emotional responses may exacerbate pain by increasing pelvic muscle tension and attention toward painful stimuli (Payne, Binik, Amsel, & Khalifé, 2004).

An abundance of empirical studies and case reports have proposed a range of potential psychological risk factors for the development and maintenance of genital pain. Variables that have discriminated between healthy controls and women with dyspareunia include vulnerability factors, such as the personality trait neuroticism (e.g., Van Lankveld, Brewaeys, ter Kuile, & Weijenborg, 1995), mood disruptions (e.g., Gates & Galask, 2001), underlying psychopathology, such as obsessive-compulsive traits and phobias (e.g., Meana et al., 1997; Van Lankveld et al., 1995), and individual difference factors like catastrophizing and hypervigilance (Payne et al., 2004; Pukall, Binik, Khalifé, Amsel, & Abbott, 2002). However, many of these studies are limited by a lack of control groups and only a few psychological factors have been consistently addressed in the literature (e.g., depression, anxiety). Furthermore, many studies show conflicting support for these psychological contributions and it is unclear whether the psychological factors preceded pain or developed after the pain began (Basson et al., 2004).

Some women with dyspareunia report fear and disgust in reaction to sexual intercourse (Kaneko, 2001). Importantly, affective responses, such as fear, can mediate the psychological response to pain, thereby resulting in increased attention to pain and thus greater perceived pain (Meagher,

Arnau, & Rhudy, 2001). This fear may be due to a number of factors, including the anticipation of pain based on past painful sexual experiences, past sexual trauma, dysfunctional sexual schema (the mental framework with which one understands sexuality), or negative sexual attitudes. It is also possible that this fear predated the genital pain or has been maintained by persistent pain during sexual activity. When painful sexual experiences perpetuate fear and expectations of pain during sexual activity, a woman may choose to avoid sexual behavior altogether.

Evidence supports many of these interpretations. Women with dyspareunia have self-reported more negative feelings surrounding sexual activity (Nunns & Mandal, 1997; Wouda et al., 1998), less sexual pleasure (Reissing, Binik, Khalifé, Cohen, & Amsel, 2003), more feelings of depression about sexuality (Gates & Galask, 2001), and negative sexual attitudes (Meana et al., 1997). Furthermore, one's sexual schema can be influenced by a number of sexual experiences, including age of sexual intercourse debut (Haavio-Mannila & Kontula, 1997; Sprecher, Barbee, & Schwartz, 1995), early non-intercourse sexual experience (Davis & Lay-Yee, 1999), number of sexual partners, exclusivity within a sexual relationship (Waite & Joyner, 2001), and importance of sex (Byers, 2005). Attitudes about gender-typical sexual behavior may also impact future sexual activity (Milhausen & Herold, 1999). Finally, it has been thought that women with dyspareunia are more likely to have experienced sexual abuse, although retrospective reports fail to support this assertion (see Dunne & Najman, 2005). In summary, little is known about what types of sexual experience may have contributed to the fear reported by women with dyspareunia.

In addition to psychological factors and fear of pain, the interpersonal impact of dyspareunia may be related to the quality of a woman's relationship with her partner and the accompanying sexual satisfaction. Existing evidence suggests that sexual satisfaction of women with dyspareunia is lower in comparison with control women (Danielsson et al., 2000; Wouda et al., 1998). Sexual satisfaction in healthy women is positively associated with young age, liberal attitudes toward sexuality, frequency of sexual intercourse (Renaud & Byers, 1997), relationship satisfaction (Lawrance & Byers, 1995; Sprecher, 2002), low discrepancy in sexual desire between partners (Davies, Katz, & Jackson, 1999), minimal cognitive distraction during sexual activity (Dove & Wiederman, 2000), self-disclosure, and masturbation (Byers & Demmons, 1999; Haavio-Mannila & Kontula, 1997; Sprecher & McKinney, 1993). Sexual satisfaction is strongly positive correlated with sexual communication, even when a woman's sexual pleasure is reduced (Bridges, Lease, & Ellison, 2004; Byers & Demmons, 1999). Women who are sexually dissatisfied may seek sexual expression through means independent of

intercourse with a primary partner, such as self-stimulation or extra-pair sexual activity (Bridges et al., 2004; Davidson & Moore, 1994). Because women with dyspareunia tend to be younger (Laumann et al., 1999), engage in less sexual intercourse (Danielsson et al., 2000; Meana et al., 1997), report low sexual desire (Meana et al., 1997), and describe more fear associated with sexual activity (Kaneko, 2001), their understanding of sexual satisfaction may differ from women who do not experience pain during sexual intercourse. Due to the lack of evidence about how genital pain affects the experience of sexual satisfaction, it would be useful to evaluate how the factors that predict levels of sexual satisfaction in women with dyspareunia differ from those found in pain-free women.

Another consequence of the psychological impact of dyspareunia is the potential for coexisting sexual dysfunction. Importantly, inhibited desire, arousal, and lubrication are thought to disrupt the psychological and physiological progression of the sexual response cycle and may result in greater genital pain (Basson, 2001). This disruption may occur through the anticipation of pain, which may lead to cognitive responses that suppress sexual response. For instance, the expectation of pain may result in self-monitoring during sexual activity, and self-monitoring is known to inhibit the sexual response (Dove & Wiederman, 2000; Van den Hout & Barlow, 2000). Indeed, women with dyspareunia may experience lower sexual desire (Meana et al., 1997; Reissing et al., 2003), arousal (e.g., Reissing et al., 2003; Wouda et al., 1998), and lubrication (Nunns & Mandal, 1997; Van Lankveld, Weijenborg, ter Kuile, 1996). In a sample of women with vulvar pain, the impaired sexual functioning paralleled that of women with female sexual arousal disorder, with the addition of increased pain and lower lubrication (Masheb, Lozano-Blanco, Kohorn, Minkin, & Kerns, 2004). An inverse relationship between genital pain and lubrication has since been reported (Wiegel, Meston, & Rosen, 2005). However, the extent of sexual dysfunction in this population is a point of contention. Two independent studies measuring genital arousal in response to erotic video stimuli found that women with dyspareunia did not differ from controls in levels of vaginal blood flow or in subjective reports of genital arousal (Brauer, Laan, & ter Kuile, 2006; Wouda et al., 1998). Similarly, Van Lankveld et al. (1996) reported no significant differences in self-reported subjective arousal, lubrication, and genital pain during masturbation in a sample of women with VVS. In contrast to masturbation, self-reported sexual problems and distress during sexual intercourse were significantly greater in these women. The ability of some women with dyspareunia to achieve a normal sexual response in some contexts suggests that sexual dysfunction is not a necessary or sufficient requirement for genital pain. It is possible that women with dyspareunia are capable of a normal sexual response—during masturbation and in the laboratory—and the act of sexual intercourse may be the primary aversive stimulus that drives inhibited sexual function. A re-evaluation of the global sexual functioning of women with dyspareunia may clarify past work and offer insight into how different levels of pain impact overall sexual response.

In order to evaluate the importance of psychological factors, sexual behavior, sexual satisfaction, and sexual dysfunction in young women with different levels of genital pain, the current research was designed to accomplish three aims:

1. Identify differences in sexual function, satisfaction, behavior, and attitudes in women with no, low, and high pain during sexual intercourse.
2. Identify the factors that statistically predict the sexual function of sexually active young adult women who have and have not reported genital pain.
3. Identify the statistical predictors of sexual satisfaction in sexually active young women who have and have not reported genital pain.

In line with past research, we hypothesized that women with any genital pain were more likely to report poor sexual function, more conservative sexual attitudes, and less sexual satisfaction when compared with pain-free women. Due to past findings that women with dyspareunia have exhibited normal sexual arousal during masturbation and in the laboratory setting, we predicted that women with high levels of pain would report equal levels of non-intercourse sexual behavior (including masturbation, petting, and oral sex) and lower levels of intercourse as compared to women without pain.

Method

Participants

Female undergraduates ($n = 871$) from a large public university participated in exchange for course credit between 2001–2004. Cohorts included participants from spring and fall semesters and varied in size (2001, $n = 248$; 2002, $n = 165$; 2003, $n = 236$; 2004, $n = 222$). Primary inclusion criteria was sexual activity within one month of participation, and the revised sample ($n = 651$) was used for final analyses.

All participants were between 18–25 years old (M age = 18.72). A high percentage of this sexually active sample had previously experienced sexual intercourse (93%), and a slightly smaller percentage (70%) reported involvement in a long-term relationship in the 12 months before participation. The sample consisted of predominately Caucasian participants, with 64% Caucasian ($n = 486$), 17%

Hispanic ($n = 125$), 13% Asian American ($n = 100$), 4% African American ($n = 27$), 3% "other" ethnic ($n = 21$) participants. Represented religious groups include Atheist/Agnostic (13%), Buddhist (2%), Hindu (4%), Jewish (5%), Protestant (16%), Catholic (26%), Fundamentalist Christian (33%), and Muslim (1%) participants.

Pain groups were categorized using an index score that reflected frequency and intensity of genital pain during and after intercourse (see *Sexual Functioning* for a detailed description of this index). Sixty three percent of sexually active women reported any history of genital pain during intercourse. Of sexually active women, 40% of women ($n = 217$) reported genital pain "occasionally" or "sometimes" and 23% of women ($n = 126$) reported experiencing pain during sexual intercourse "always" or "most of the time." No significant demographic differences were found between women who reported no history of genital pain and women who reported a history of genital pain.

Measures

Sexual functioning

Sexual functioning was assessed using the Female Sexual Functioning Index (FSFI; Rosen et al., 2000). The FSFI is a brief, 19-item scale, which measures extent of difficulty in six domains of sexual function: drive (two items), arousal (four items), lubrication (four items), orgasm (two items), sexual satisfaction (three items), and pain (three items). Items used a response format based on the response range of one (almost never or never) to five (almost always or always). Higher FSFI scores are associated with more healthy sexual functioning. Psychometrically, the FSFI has robust reliability and validity across populations of sexually healthy and dysfunctional women, including women with vulvodynia and women with symptoms of dyspareunia (Masheb et al., 2004; Meston, 2003; Wiegel et al., 2005). The scale has shown appropriate internal reliability ($r = .89–.97$) and test-retest reliabilities (Cronbach's alpha = .79–.88). In the current sample, reliability coefficients were within an acceptable range for the domains of desire (Cronbach's alpha = .86), arousal (Cronbach's alpha = .94), lubrication (Cronbach's alpha = .95), orgasm (Cronbach's alpha = .92), and satisfaction (Cronbach's alpha = .84). A summed FSFI total score, which did not include the pain domain, was used to measure sexual function. In addition to assessment of sexual function, the FSFI was used to classify participants into currently sexually active and inactive groups.

The FSFI pain domain score was used to create no, low, and high groups for primary analyses. The pain domain included three questions: "How often do you experience pain during penetration" included responses from one (almost always or always) to four (almost never or never);

"How often do you experience pain after penetration?" included a response format of one (most times) to five (almost never or never); and "Rate your level of pain during or following penetration" included a response format of one (very high) to five (very low or none). Lower scores indicated greater pain during sexual intercourse. Scores were used to classify women into three groups: no pain, low pain, and high pain. Women who reported pain "always" or "almost always" were coded as the high pain group (FSFI pain subscore ≤ 3.20). Women who "occasionally" or "sometimes" experienced pain were coded as the low pain group (pain subscores between 3.60 and 5.20). Finally, women who reported "never" having experienced pain during intercourse were classified as having no history of pain (pain subscores over 5.20). The pain domain showed excellent reliability coefficients in the current sample (Cronbach's alpha = .97).

Sexual satisfaction

Sexual satisfaction was evaluated with the Sexual Satisfaction Scale for Women (SSS-W: Meston & Trapnell, 2005), which consists of 30 Likert-type items that describe five domains of sexual satisfaction: Personal Concern (e.g., "I'm so distressed about my sexual difficulties that it affects the way I feel about myself"), Interpersonal Concern (e.g., "I feel like I've disappointed my partner by having sexual difficulties"), Compatibility (e.g., "I sometimes think my partner and I are mismatched in needs and desires concerning sexual intimacy"), Communication (e.g., "I usually feel completely comfortable discussing sex whenever my partner wants to"), and Contentment (e.g., "I feel content with the way my present sex life is"). Response options ranged from one (strongly disagree) to five (strongly agree), and questions with negative phrasing were reverse scored so that higher numbers reflect greater sexual satisfaction. For the current sample, reliability coefficients were adequate (Cronbach's alpha = .89).

Unrestricted sexual behavior

Items from the Sociosexual Orientation Inventory (SOI; Simpson & Gangestad, 1991) assessed sociosexual behavior and attitudes. The SOI was designed to measure individual differences in the endorsement of restricted sexual behaviors and attitudes (i.e., restricting sexuality to intimate and committed contexts) or unrestricted sexual behavior and attitudes (i.e., sexuality is not restricted to intimacy and commitment and may be more casual in nature). Unrestricted sexual behavior includes the number of sexual intercourse partners within the past year, number of one-time instances of sexual intercourse ("one night

stands"), and anticipated number of sexual partners in the following 5 years. In addition to SOI questions, the authors included two related unrestricted sexuality items. Participants endorsed the number of individuals with whom they had engaged in foreplay within the past year and the lifetime number of individuals with whom they had engaged in sexual intercourse. The sample reliability for the five items was acceptable (Cronbach's alpha = .83).

Sexual attitudes and behavior

The Sexual Attitude and Sexual Experience subscales of the Derogatis Sexual Functioning Inventory (DSFI; Derogatis & Melisaratos, 1979) were used to assess a variety of sexual functioning domains. The DSFI Sexual Attitude Scale consists of statements reflecting a continuum of conservative to liberal sexual attitudes. endorsed attitudinal statements using a scale of strongly agree (one) to strongly disagree (five). Items were coded so that higher numbers reflected more conservative sexual attitudes.

The DSFI Experience Scale was used to assess the following sexual experience domains: petting (six items), oral sex (five items), intercourse (four items), and masturbation (one item). Using a yes/no response format, participants indicated if they had ever engaged in the specified sexual activity. Coding procedures assigned yes (1) or no (0) values to each domain, and group averages were obtained. The Experience Scale has shown high internal consistency (.97) and test-retest reliability (.92).

Procedure

Female researchers administered questionnaires to groups of 5–10 participants. Testing took place in unoccupied computer laboratories and classrooms, and participants were separated by a minimum of 5 feet to maximize privacy. All participants were aware of the sensitive nature of the questionnaire material before testing. The study procedure was explained and participants were encouraged to ask questions or raise concerns before giving informed consent. It was emphasized that if participants experienced discomfort or distress during testing, then they were encouraged to pause or stop participation. The researcher informed the testing group that participation was completely voluntary, that anonymity and confidentiality of data would be maintained, and that no future relationship with the institution would be adversely impacted by refusal to participate. No participants chose to stop participation. Data were locked in a filing cabinet accessible only to the primary investigators. Electronic data files were password protected.

Results

Differences between the pain groups and healthy controls are reported in columns 2–4 of Tables 1, 3, and 4. In order to test our hypotheses, analyses were conducted on two subgroups: women who reported no pain and women who reported pain, and women who reported no, low, and high pain. When significant main effects were found, the Games-Howell post-hoc test for unequal group sizes and unequal variances was performed on the no, low, and high groups. To minimize the risk of Type I error in multiple comparisons, Bonferroni corrections indicate statistically reliable differences and are noted at the bottom of each table.

Main effects of no, low, and high pain groups were found for sexual function variables ($p < .05/5$). The pain groups reported more difficulties with drive, $F(2, 545) = 4.52$, $p < .01$, arousal, $F(2, 545) = 8.14$, $p < .01$, lubrication, $F(2, 545) = 184.60$, $p < .01$, orgasm, $F(2, 545) = 13.77$, $p < .01$, and satisfaction, $F(2, 545) = 5.60$, $p < .01$. As indicated by the subscripts in Table 1, the Games-Howell post-hoc analyses indicated that the no pain group reported significantly better sexual function than the low and high pain groups. Additionally, the low pain group reported higher lubrication and overall sexual function scores as compared to the high pain group. No other significant sexual function differences were found between the low and high pain groups. Results indicated that the pain groups reported higher rates of sexual dysfunction within the previous month than the no pain group, and the high pain group reported significantly greater overall dysfunction and less lubrication than the low pain group.

No significant main effect was found for the SSS-W sexual satisfaction summed score (Table 1). The significant intercorrelations between sexual satisfaction variables were expected because they represent closely related constructs. However, the correlations between sexual satisfaction variables (contentment, communication, compatibility, interpersonal concern, and personal concern) and individual pain items were different for the low versus high pain groups (Table 2). In the low pain group, the only significant correlations found were between frequency of pain after penetration and communication ($r = .15$, $p = .03$) and between level of pain during/after penetration and frequency of pain during penetration ($r = .18$, $p = .01$). In contrast, in the high pain group the frequency of pain during penetration was negatively correlated with communication ($r = -.29$, $p < .01$), compatibility ($r = -.22$, $p = .02$), and personal concern ($r = -.24$, $p = .01$). Frequency of pain after penetration was positively correlated with frequency of pain during penetration ($r = .20$, $p = .02$). Level of pain during/after penetration was negatively associated with contentment ($r = -.20$, $p = .02$), compatibility ($r = -.24$,

Table 1 Differences in sexual function and satisfaction between women with no pain, low pain, and high genital pain

Items	Women reporting pain								F value
	No pain		Any pain[c]		Low pain		High pain		
	M	SD	M	SD	M	SD	M	SD	
FSFI subscales									
Drive	4.48[de]	1.02	4.21	1.02	4.24[d]	1.00	4.17[e]	1.06	4.52*
Arousal	5.13[fg]	.98	4.78	.99	4.75[f]	.96	4.82[g]	1.10	8.14*
Lubrication	5.47[hi]	.74	4.55	1.33	5.17[hj]	.87	3.49[ij]	1.33	184.60*
Orgasm	4.40[kl]	1.55	3.80	1.36	3.92[k]	1.43	3.58[l]	1.21	13.77*
Satisfaction	4.95[mn]	1.25	4.59	1.26	4.64[m]	1.18	4.52[n]	1.40	5.60*
FSFI total score[a]	24.44[op]	4.08	21.94	3.88	22.72[oq]	3.77	20.59[pq]	3.70	38.74*
Sexual satisfaction total score[b]	109.36	21.99	106.29	20.93	106.18	20.13	106.45	22.09	0.93
	n = 140–205		n = 200–293		n = 100–137		n = 65–79		

*p < .01 based on a one-way ANOVA comparison between no pain, low pain, and high pain groups

[a] FSFI total excludes pain subscale and values range from 5 (poor sexual function) to 30 (high sexual function)

[b] SSS-W contains contentment, communication, compatibility, interpersonal concern, and personal concern subscales rated on a scale of 1 (strongly agree) to 5 (strongly disagree)

[c] The any pain group is further divided into the low and high pain groups

[d–q] Means with the same subscript differ significantly at p < .05

Table 2 Correlations between sexual satisfaction variables, frequency of genital pain, and level of genital pain

	1	2	3	4	5	6	7	8
1. Contentment	–							
2. Communication	.53**	–						
	.57**							
3. Compatibility	.67**	.53**	–					
	.72**	.59**						
4. Interpersonal concern	.47**	.48**	.57**	–				
	.65**	.45**	.70**					
5. Personal concern	.48**	.40**	.52**	.63**	–			
	.70**	.42**	.68**	.78**				
6. Frequency of pain during penetration	.03	.00	.07	.05	–.05	–		
	–.15	–.28**	–.22**	–.14	–.24*			
7. Frequency of pain after penetration	.04	.15*	–.06	.02	–.05	–.09	–	
	–.04	–.14	–.06	–.14	–.08	.20*		
8. Level of pain during or following penetration	–.01	.04	–.08	.07	–.11	.18**	.13	–
	–.20*	–.17	–.24**	–.21*	–.31**	.50**	.35**	

*p < .05, **p < .01, the low pain group coefficients are listed above the high pain group coefficients

SSS-W items have response format of 1 (strongly disagree) to 5 (strongly agree). Questions are scored so that higher numbers reflect greater sexual satisfaction

p = .01), interpersonal concern (r = –.21, p = .03), and personal concern (r = –.31, p = .001) and positively correlated with frequency of pain during (r = .50, p < .01) and after (r = .35, p < .01) penetration. These findings suggest that pain variables in the low pain group were minimally related to sexual satisfaction, whereas the pain variables in the high pain group were often related to sexual satisfaction.

No significant main effects were found for sexual experience variables (masturbation, petting, oral sex, and intercourse) or for unrestricted sexuality variables (p < .05/9). The majority of women from the pain and no pain groups reported experience with multiple types of sexual behavior (see Table 3 for percentages and behavior means).

Sexual attitudes were evaluated in Table 4 (p < .05/14). Women with a history of pain endorsed significantly more

Table 3 Differences in sexual experience and unrestricted sexual behavior between women with no, low, and high genital pain

Items	Women reporting pain								F value
	No pain % Yes		Any pain[c] % Yes		Low pain % Yes		High pain % Yes		
Petting experience[a]	98		98		97		100		0.93
Oral sex experience[a]	94		96		96		97		0.46
Intercourse experience[a]	82		87		86		91		2.29
Masturbation experience[a]	75		73		74		71		0.24
	M	SD	M	SD	M	SD	M	SD	
No. foreplay partners in past year[b]	3.66	3.62	4.07	4.06	3.93	4.00	4.31	4.16	1.10
No. intercourse/oral sex partners in past year[b]	1.94	1.87	2.27	2.25	2.20	2.36	2.38	2.33	1.70
No. intercourse/oral sex partners just once[b]	1.37	2.28	1.51	2.01	1.37	1.86	1.75	2.23	1.48
No. intercourse/oral sex partners lifetime[b]	4.33	4.47	4.67	5.16	4.56	4.89	4.86	5.61	0.44
No. anticipated intercourse/oral sex partners[b]	3.26	3.75	3.79	4.42	3.51	3.87	4.27	5.19	2.30
	n = 107–293		n = 212–339		n = 93–214		n = 64–125		

[a] Sexual experience items based on a yes/no response format

[b] Values represent the number of sexual partners endorsed by participants

[c] The any pain group was further divided into the low and high pain groups

conservative attitudes about whether it is unnatural for a woman to initiate sexual relations. In contrast, the pain group reported more liberal attitudes about whether anything is wrong with mate swapping.

Hierarchical multiple regressions

Two sets of hierarchical multiple regression analyses were conducted to statistically predict sexual function and sexual satisfaction in sexually active women who reported no history of genital pain and any history of genital pain during sexual intercourse. In the first set of regressions, a summed FSFI score (excluding the pain domain) was entered as the dependent variable, and the summed SSS-W sexual satisfaction score was entered as the dependent variable in the second set of regressions. In all regressions, a hypothesized model of variables linked to dyspareunia in past research was entered as independent variables in each regression (including sexual function, sexual behavior, sexual history, and sexual satisfaction). The order in which variables were entered was based on the assumption that developmental, behavioral, sexual functioning, and psychological variables uniquely contribute to variance in current sexual function. Therefore, Step 1 of the hierarchical regressions included age and sexual function, Step 2 included sexual behavior and sexual experience, and Step 3 included sexual satisfaction and psychological variables. For each sample, correlations were calculated between the dependent variable and the hypothesized model of predictors, and only variables that were significantly correlated with the dependent variable were entered into subsequent regressions. For each regression, multicollinearity diag-

nostics were calculated to ensure that predictor variables did not account for redundant variance in the dependent variable. The variance inflation factors (VIFs) for each variable were below three, which suggests that the beta coefficients were stable in each of the regression models.

The first set of regressions was computed to identify the predictors of sexual functioning in sexually active women with and without a history of genital pain. Sexual functioning served as the dependent variable and was measured with a total FSFI score that did not include the pain domain so that individual pain variables could be evaluated. In women without a history of pain, the total FSFI score was only significantly correlated with the SSS-W sexual satisfaction summed total ($r = .34$, $p < .01$). Sexual satisfaction was entered into a regression to predict sexual functioning, and the resulting model, $F(1, 138) = 18.30$, $p < .01$, accounted for 12% of the variance in sexual functioning (data not shown). Therefore, in women without a history of pain during intercourse, women with healthy sexual functioning were more likely to report higher sexual satisfaction.

In women with any history of pain, the FSFI total score was significantly correlated with frequency of pain during penetration ($r = .35$, $p < .01$), frequency of pain after penetration ($r = .25$, $p < .01$), level of pain during or following penetration ($r = .33$, $p < .01$), the sexual satisfaction summed total ($r = .31$, $p < .01$), likelihood of cheating on a primary partner if one is not totally committed ($r = -.19$, $p < .01$), likelihood of cheating on a primary partner if one is totally committed ($r = -.28$, $p < .01$), and agreement with traditional gender role attitudes ($r = -.11$, $p < .05$). Genital pain variables were entered into the first step of the regression, and the remaining variables were entered into

Table 4 Differences in sexual attitudes between women with and without genital pain

Items	Women reporting pain								F value
	No pain		Any pain[a]		Low pain		High pain		
	M	SD	M	SD	M	SD	M	SD	
Sex without love is okay (R).	3.47	1.45	3.44	1.45	3.47	1.42	3.38	1.52	.08
Premarital intercourse is beneficial for later marital adjustment (R).	2.71	1.26	2.64	1.20	2.65	1.15	2.62	1.30	.52
Homosexuality is perverse and unhealthy.	2.34	1.30	2.43	1.43	2.43	1.38	2.43	1.51	.53
Oral sex can be as pleasurable as intercourse (R).	2.11	1.21	2.15	1.19	2.19	1.24	2.09	1.11	.15
It is unnatural for the woman to be the initiator of sexual relations.	1.66[b]	0.90	1.89[b]	1.11	1.91	1.09	1.86	1.15	6.32*
Masturbation is normal and healthy (R).	1.93	1.17	2.00	1.15	2.08	1.19	1.87	1.08	.49
Extramarital sex inevitabily leads to marital problems.	4.17	1.22	4.05	1.26	3.94	1.30	4.25	1.17	1.13
Viewing erotic films is enjoyable and stimulating behavior (R).	2.39	1.18	2.57	1.28	2.52	1.25	2.63	1.32	2.57
There is nothing wrong with mating swapping (R).	4.36[c]	1.07	4.13[c]	1.17	4.12	1.12	4.14	1.25	5.51*
Males lose respect for females who have premarital sex.	2.42	1.30	2.33	1.20	2.30	1.21	2.36	1.19	.82
Group sex is bizarre and disgusting.	3.40	1.44	3.49	1.41	3.41	1.40	3.64	1.42	.57
Extramarital affairs can make people better partners (R).	4.50	0.91	4.36	1.00	4.37	0.94	4.35	1.09	2.75
I can imagine feeling comfortable with casual sex (R).	4.01	1.29	3.75	1.34	3.77	1.33	3.71	1.36	4.97
Homosexuality is not good or bad (R).	2.21	1.36	2.20	1.39	2.18	1.35	2.24	1.45	.00
	n = 203–205		n = 342–344		n = 216–217		n = 126–127		

*$p < .05$, **$p < .01$. Based on a response format of 1 (completely disagree) to 5 (completely agree) such that higher numbers indicate more conservative sexual attitudes. Reversed (R) items reflected a response format of 5 (completely agree) to 1 (completely disagree)

[a] The any pain group is further divided into the low and high pain groups

[b–c] Means with the same subscript differ significantly at $p < .01$

the second step. The hypothesized model, $F(3, 143) = 4.65$, $p < .01$, indicated that 19% of the variance in sexual functioning was explained by levels of pain frequency during penetration, pain frequency following penetration, level of pain during or after penetration, likelihood of cheating if totally committed, likelihood of cheating if not totally committed, overall sexual satisfaction, and traditional gender role attitudes. Unique contributions were provided by overall sexual satisfaction ($\beta = .27$, $t = 3.39$, $p < .01$) and likelihood of cheating if totally committed ($\beta = -.34$, $t = -2.61$, $p < .01$). The model indicated that in women with any history of genital pain during intercourse, women with high levels of sexual functioning are more likely to report greater sexual satisfaction and were less likely to report they would cheat if totally committed to a partner. All beta values are summarized in Table 5.

A second set of regressions was then computed to predict sexual satisfaction in sexually active women with and without a history of pain. In women with no history of pain, sexual satisfaction was significantly correlated with the FSFI arousal domain ($r = .35$, $p < .01$), the FSFI lubrication domain ($r = .21$, $p < .05$), the FSFI orgasm domain ($r = .28$, $p < .01$), oral sex experience subscore ($r = .21$, $p < .01$), intercourse experience subscore ($r = .40$, $p < .01$), number of sexual foreplay partners in the previous year ($r = -.29$, $p < .01$), anticipated number of sexual partners in the next 5 years ($r = -.25$, $p < .01$), and masturbation atti-

tudes ($r = .23$, $p < .01$). These significant correlates of sexual satisfaction were entered into a regression, with sexual function variables entered into the first step, sexual behavior variables entered into the second step, and masturbation attitudes entered into the third step. The resulting model, $F(3, 132) = 9.09$, $p < .01$, accounted for 33% of the variance in levels of sexual satisfaction in women who reported no history of genital pain. Unique contributions to the model were made by the FSFI arousal domain ($\beta = .25$, $t = 2.10$, $p < .05$) and the intercourse subscore ($\beta = .34$, $t = 4.12$, $p < .01$). The model suggested that in women who report no history of genital pain during intercourse, women who have high sexual satisfaction are more likely to report high levels of sexual arousal and are more likely to have experience with sexual intercourse (see Table 6).

In women with any history of pain, an additional regression was calculated to predict sexual satisfaction (Table 7). Variables significantly correlated with sexual satisfaction in sexually active women with any history of pain included the FSFI arousal domain ($r = .21$, $p < .01$), the FSFI orgasm domain ($r = .26$, $p < .01$), the petting subscore ($r = .19$, $p < .01$), the oral sex subscore ($r = .27$, $p < .01$), number of sexual foreplay partners in the previous year ($r = -.16$, $p < .05$), number of sexual intercourse partners in the previous year ($r = -.15$, $p < .05$), anticipated number of sexual partners in the next 5 years ($r = -.25$, $p < .01$), lifetime number of sexual partners ($r = -.16$,

Table 5 Regressions to predict sexual function in women who report genital pain

Predictor Variables	R^2	F	β	t	p
Model for total sample	.19	4.65**			
Frequency of pain during penetration			.14	1.16	ns
Frequency of pain after penetration			−.19	−1.48	ns
Pain level during/after sexual intercourse			.13	.91	ns
Sexual satisfaction			.27	3.39	.001
Likelihood of cheating if not totally committed to partner			.05	.41	ns
Likelihood of cheating if totally committed to partner			−.34	−2.61	.01
Gender role attitudes			−.02	−.19	ns

**p < .01, sexual function measured with FSFI total score without pain domain

Table 6 Regressions to predict sexual satisfaction in women who report no genital pain

Predictor Variables	Adj. R^2	F	β	t	p
Model for total sample	.33	9.09**			
Arousal			.25	2.10	.037
Lubrication			−.04	−.38	ns
Orgasm			.07	.73	ns
Oral sex experience			.07	.86	ns
Intercourse experience			.34	4.12	.001
No. foreplay partners			−.17	−1.88	ns
No. anticipated partners in next 5 years			−.15	−1.61	ns

**p < .01, sexual satisfaction measured with the SSS–W

$p < .05$), number of one-time sexual partners ($r = -.21$, $p < .01$), and masturbation attitudes ($r = .16$, $p < .05$). Sexual function variables were entered into the first step of the regression, sexual behavior variables were entered into the second step, and the third step included masturbation attitudes. The model, $F(2, 168) = 6.04$, $p < .01$, explained 25% of the variance in sexual satisfaction, and unique contributions to the model were made by the FSFI orgasm domain ($\beta = .26$, $t = 3.08$, $p < .01$), oral sex experience subscale ($\beta = .27$, $t = 2.46$, $p < .05$), and anticipated number of sexual partners over the next 5 years ($\beta = -.17$, $t = -2.00$, $p < .05$). Of sexually active women with a history of genital pain, women with high sexual satisfaction were more likely to report high orgasm functioning, more

likely to have experience with oral sex, and expected a lower number of sexual partners within the next 5 years.

Discussion

The aims of this study included the identification of sexual, behavioral, and attitudinal differences among women with no, low, and high genital pain. Additionally, the study evaluated statistical predictors of sexual functioning and sexual satisfaction in women with and without pain. As expected, women who reported any genital pain reported significantly greater impairments in sexual function compared to women with no pain. The low and high pain groups

Table 7 Regressions to predict sexual satisfaction in women who report genital pain

Predictor Variables	Adj. R^2	F	β	t	p
Model for total sample	.25	6.04**			
Arousal			.04	.50	ns
Orgasm			.26	3.08	.002
Petting experience			.07	.61	ns
Oral sex experience			.27	2.46	.015
No. foreplay partners			−.06	−.63	ns
No. intercourse partners			−.01	−.06	ns
No. anticipated intercourse partners			−.17	−2.00	.047
No. lifetime sexual partners			−.05	−.36	ns
No. one–time sexual partners			−.10	−.88	ns

**p < .01, sexual satisfaction measured with the SSS-W

reported equally impaired desire, arousal, orgasm, and sexual satisfaction. Interestingly, women with low pain experienced significantly more lubrication during sexual activity and reported higher global sexual functioning than women with high pain. These findings were consistent with past work showing a negative association between genital pain and lubrication, although it is unclear whether lubrication increases pain, pain reduces lubrication, or whether a third variable is driving the relationship (Wiegel et al., 2005).

It is interesting that the low pain group has retained some ability to maintain physiological sexual arousal, despite reporting otherwise equivalent deficits in sexual function compared to the high pain group. Three interpretations may explain this phenomenon. One interpretation is that the presence of genital pain is correlated with a general impairment in sexual function. However, if the mere presence of pain during sexual activity is correlated with sexual dysfunction, then there would be little reason to believe a woman who experiences pain occasionally versus always would differ in function. An increase in the frequency and/or intensity of pain may then be associated with a proportional increase in dysfunction. However, this increased dysfunction appears to be specific to lubrication. A second interpretation is that lubrication is the defining functional deficit that distinguishes between high and low genital pain. Lack of lubrication can be both a cause and a consequence of painful intercourse (Binik, 2005; Wiegel et al., 2005). In the future, it would be useful to assess differences in lubrication between vaginal penetration and solitary self-stimulation by means other than self-report so that baseline lubrication can be compared to levels achieved during intercourse (Van Lankveld et al., 1996). The third interpretation is that the low and high pain groups differ in etiology and their different patterns of sexual problems reflect this difference. If this difference in sexual response is indicative of a difference in the quality or type of pain experienced by the two groups, it is feasible that in this sample the mechanisms underlying genital pain are different for the low and high pain groups.

Meana, Binik, Khalifé, and Cohen (1999) found that perceived differences in etiology were related to self-reported levels of pain. Women who believed their genital pain to be of psychosocial origin reported greater sensory pain and more intense experiences of pain as compared to women who attributed their dyspareunia to physical causes. The women who made psychosocial attributions were also more likely to report sexual problems, including more sexual aversion and less self-reported sexual arousal in hypothetical situations. In the current study, it is possible that the high pain group may preferentially represent women who make psychosocial attributions. Such an explanation could account for the correlation between personal and interpersonal concern and pain during sexual activity. Unfortunately, there were no additional data on the duration, location, or type of pain experienced by women in the current sample. Additional information about the pain could help in the interpretation of sexual function differences between the low and high pain groups.

As predicted, the pain and no pain groups reported comparable levels of non-intercourse sexual behavior, including masturbation, petting, and oral sex. This finding is not unique to the current study (Nunns & Mandal, 1997). In contrast, past reports have indicated that women with dyspareunia show less varied sexual behavior compared to healthy controls, including lower levels of intercourse (Wouda et al., 1998). However, the way in which sexual experience was operationalized in the current study was based on whether the women had ever engaged in the behavior, not the frequency of the behavior. Other measures of sexual behavior corroborate this finding. When participants were asked about their frequency of foreplay and intercourse in the previous year, the pain groups did not differ from pain-free women in either of these behaviors.

In contrast to past work, in the current sample women with pain did not consistently report more conservative sexual attitudes compared to pain-free women. Women who reported pain endorsed less accepting attitudes toward female sexual initiation. It is plausible that women who have experienced genital pain are less likely to initiate sexual activity due to expectations of pain. It is often assumed in the literature that women who report painful sexual intercourse will refrain from sexual activity. Yet, sexual intercourse does not necessarily reflect female sexual motivation to engage in sex. Indeed, women with genital pain have reported engaging in sexual intercourse without wanting to do so (Danielsson et al., 2000). Sexually experienced women are motivated to engage in intercourse for a variety of reasons, including being highly aroused, achieving orgasm, receiving sexual gratification, experiencing increased self-esteem from having multiple partners, pursuing sexual experimentation, and desiring the novelty of a new partner (Greiling & Buss, 2000). It would be useful to understand what motivations underlie the sexual activity reported by women with genital pain (Hill & Preston, 1996). Regardless of sexual motivation, it is clear that the experience of pain does not appear to prevent young adult women from engaging in sexual activity.

In contrast to past research (e.g., Gates & Galask, 2001), sexual satisfaction did not differ between women with pain and healthy women. Women with high pain reported a significant negative association between pain frequency during intercourse and sexual satisfaction with a partner. It seems that for women with high levels of genital pain, the significance of intercourse may be difficult to escape when it comes to sexual satisfaction. In contrast, the pain expe-

rience was not a salient component of sexual satisfaction in women with low levels of pain. This finding is reminiscent of Meana et al.'s (1998) finding that levels of marital adjustment predicted pain ratings in women with dyspareunia, such that women who endorsed high levels of pain were more likely to report poorer marital adjustment in the Locke-Wallis Marital Adjustment Scale. Notably, this measure of marital adjustment included sexual satisfaction.

For women who reported genital pain, sexual satisfaction was predicted by improved quality of orgasm, greater oral sex experience, and fewer projected future sexual partners. These findings are intriguing for two reasons. First, women with low and high pain reported impairments in multiple domains of sexual function, yet the majority of these sexual problems did not play a significant role in their perceptions of sexual satisfaction. Indeed, the finding that high sexual function was predicted by greater sexual satisfaction in women with pain suggests that a woman's comfort with the interpersonal dynamics of sexual activity—rather than the mere presence of pain—is closely related to her ability to subjectively and physiologically respond to sexual stimuli in sexual situations. Second, rates of sexual intercourse were not related to sexual satisfaction in women who had experienced genital pain, whereas intercourse was a core predictor of sexual satisfaction for women without pain. Instead, the sexual satisfaction of women with pain was predicted by oral sex experience, a non-intercourse behavior. These findings suggest that optimal levels of sexual satisfaction are independent of intercourse behavior in women with genital pain. Ironically, the frequency of intercourse has been the primary measure of sexual disturbance in women with dyspareunia and has been the target of most interventions. It is possible that intercourse frequency has much less to do with the quality of a woman's sexual life than the practice of other sexual activity that is usually relegated to the realm of foreplay.

The prevalence of frequent genital pain during intercourse in the current sample was surprisingly high, particularly when women were not recruited based on sexual functioning variables. Additional information is needed in order to understand what factors may contribute to this high prevalence, including use of medications that alter sexual function (e.g., antidepressants), use of oral contraceptives, and contextual factors (type of stimulation received, activities that evoke pain, whether the pain is partner-specific). Partner characteristics, such as limited knowledge/use of sexual technique or premature ejaculation, may also influence a woman's experience of genital pain. The impairment in sexual function reported by women with pain suggests that these women experience difficulties with multiple aspects of the sexual response cycle. The reported pain could then be secondary to a variety of desire or arousal disorders.

Limitations that should be considered with this report include the generalizability of the current convenience sample, which may be biased toward middle class, Caucasian, educated women from homogenous ethnic backgrounds. The cross-sectional design seriously limits the scope of the conclusions because the study design cannot address causation or the direction of correlational relationships. Volunteer bias may skew the sample toward more positive sexual attitudes and more sexual experience, and the use of retrospective self-report from questionnaires may reduce the accuracy of responses. A major limitation of this study was a lack of information regarding what type of genital pain women experienced (e.g., vulvar pain, deep pain, etc.). The study would have benefited from additional information, including the quality, location, and duration of pain, incorporation of pain rating scales for the estimation of pain intensity, and partner information to better understand the interpersonal effects of genital pain. Finally, the regression analyses employed can support statistical prediction but they are inappropriate for prospective prediction. Regression analyses can provide no information on causality or the direction of the relationship between sexual function, sexual satisfaction, and the predictor variables. Despite these concerns, the current study has provided insight into the impact of different levels of genital pain in young adult women. The sexual, behavioral, and attitudinal profiles that emerged from this study suggest that the evaluation of levels of genital pain, rather than the presence or absence of pain, may be more useful in explaining the sexual repercussions of painful intercourse.

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