ORIGINAL RESEARCH & REVIEWS

Pain Trajectories and Predictors: A 7-Year Longitudinal Study of Women With Vulvodynia

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ABSTRACT

Introduction: A significant proportion of women report a reduction of symptoms over time—even without treatment—yet the natural progression of vulvodynia and which factors may explain decrease vs persistence of pain remain unclear.

Aim: To identify subgroups of pain trajectories in women with vulvodynia and to predict these different trajectories by treatments undertaken, pain characteristics, and psychosocial factors.

Methods: Data on pain intensity, treatments undertaken, pain characteristics, and psychosocial factors were collected 3 times over a 7-year period from 173 women who screened positive for vulvodynia. Latent class growth analysis was conducted to identify homogeneous subgroups with distinct pain trajectories. A multivariate binomial logistic regression was used to examine whether treatments, pain characteristics, and psychosocial factors predicted these trajectories.

Main Outcome Measure: The main outcome was pain intensity (0—10), measured at 3 time points with the numerical rating scale.

Results: 2 pain trajectories were identified: 1 where pain persisted (28.9%), and 1 where pain decreased over time (71.1%). Whether a treatment had been undertaken was not predictive of the course of pain over time. Women who were older at first pain onset, had pain at another location than the entrance of the vagina, and reported more anxiety were more likely to have a persistent pain trajectory relative to the decreased pain trajectory.

Clinical Implications: Findings suggest that the evolution of pain differs among women with vulvodynia depending on pain characteristics and anxiety.

Strengths & Limitations: Strengths of the study include the 7-year longitudinal design to examine the natural history of provoked vestibulodynia and the inclusion of biopsychosocial factors as predictors of pain trajectories. However, women with major medical and psychiatric illnesses or deep dyspareunia were not included, and, thus, these factors could not be examined as predictors.

Conclusion: Assessing baseline characteristics associated with different pain trajectories during medical visits could have positive implications for the management of vulvodynia. **Pâquet M, Vaillancourt-Morel M-P, Jodouin J-F, et al. Pain Trajectories and Predictors: A 7-Year Longitudinal Study of Women With Vulvodynia. J Sex Med 2020;XX:XXX—XXX.**

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Key Words: Longitudinal Study; Pain Trajectories; Psychosocial Factors; Provoked Vestibulodynia; Vulvodynia; Dyspareunia

INTRODUCTION

Vulvodynia, an unexplained vulvar pain condition, is a major health concern that affects women across their lifespan. With a prevalence of 8—12% in the general population,[1] provoked vestibulodynia (PVD) is the most frequent subtype and is characterized by a burning pain elicited on pressure to the vulvar vestibule.[2] The cause of PVD is not well understood, although biomedical and psychosocial factors have been found to play a significant role.[3,4]

PVD is often considered as chronic, but a small number of prospective studies have indicated that a significant proportion of women report remission of symptoms.[5-8] In a longitudinal community-based study, Reed et al[5] found that half of women who screened positive for vulvodynia remitted without relapse. Davis et al[6] showed that 41% of women with PVD reported significant improvement over a 2-year period, even when they did not undergo any formal treatment. In addition, some randomized controlled trials have found equivalent pain reduction in treatment and placebo groups.[9,10] Taken together, these results suggest that trajectories of PVD are heterogeneous and may differ among women. Yet, there is a dearth of empirical evidence regarding the natural progression of PVD.

Specifically, factors that may explain long-term remission of symptoms remain to be identified. Despite the fact that many treatments currently exist for PVD, no single one has demonstrated efficacy above others for reducing pain during intercourse.[11,12] Although pain is the main symptom for which women seek treatment, it remains unclear how it evolves over time based on treatment undertaken, because most published randomized clinical trials do not include long-term follow-up. 2 studies have shown that the course of PVD might also depend on the characteristics of the pain, including duration, age at first onset, and the presence of comorbid pain at another localization on the vulva.[5,13] Moreover, because recent studies showed that women with persistent symptoms were more likely to be married or depressed,[5,13] it is thought that psychosocial factors may also play a role in pain trajectories. Identifying subgroups of pain trajectories and predictors of the evolution of pain over time may lead to a more accurate prognosis and better treatment recommendations for women with PVD. The objective of this prospective 7-year study was to identify subgroups of pain trajectories in a sample of women with PVD and to examine whether treatments undertaken, pain characteristics, and psychosocial factors predicted these trajectories.

MATERIALS AND METHODS

This study consisted of 3 separate measurement time points (T1, T2, T3) over a 7-year period. Participants were recruited during visits to gynecologists or other health care professionals, as well as through newspaper and website advertisements. Interested women were screened for eligibility over the phone to ensure that their symptoms were PVD-like. Inclusion criteria were (i) pain during intercourse that (a) caused subjective distress, (b) occurred on ≥75% of intercourse attempts, and (c) had lasted for ≥6 months and (ii) pain limited to intercourse and other activities that caused pressure to the vulvar vestibule. Women who received a formal diagnosis of PVD from the gynecologist had to report moderate to severe pain in ≥1 vestibular locations during the cotton swab test (operationalized as a minimum average woman pain rating of 4 on a scale of 0−10). Given that our study was part of a larger study on relationship factors in women with PVD, participants were also required to be in a romantic relationship for at least 6 months at T1. The exclusion criteria were (i) vulvar pain not clearly linked to intercourse or pressure to the vulvar vestibule; (ii) presence of major medical or psychiatric illness, active infection, deep dyspareunia, diagnosed vaginismus, dermatologic lesion, or pregnancy; and (iii) participants <18 years of age.

Eligible participants were asked to complete the questionnaires individually. 2 years later, a research assistant contacted each woman who had participated at T1. If they agreed to participate again, they were sent questionnaires by mail. 5 years after T2, women who participated at T2 were contacted to complete the questionnaires for a third time. The same instructions were used at every time point. As a compensation for their time, women who completed all questionnaires at T1 were offered a short telephone meeting with a sexologist focusing on general information about PVD and references to appropriate health care professionals in their geographical area. At T2 and T3, women were offered a $25 financial compensation. The study was approved by the Institutional Review Board of a large North American University and all participants gave their written informed consent before entering the study. Data from the baseline and T2 follow-up have previously been published and focused on different research questions and analyses.[6,14]

The main outcome variable was pain intensity measured at each time point with a Numerical Rating Scale, which consists of 1 single item. Participants were instructed to estimate their average vulvovaginal pain over the past 6 months on a scale from 0 (no pain)−10 (worst pain ever). The Numerical Rating Scale is widely used to assess intensity of pain in chronic pain conditions,[15] such as vulvovaginal pain.[16] This measure correlates significantly with other pain intensity instruments[17] and is sensitive to treatment effects in PVD.[18]

4 groups of class membership predictors were included. First, to examine the effect of treatment, each woman was asked whether she had engaged in treatment for her PVD over the past 2 years at T2 and over the past 5 years at T3. These 2 items were combined into a single binary variable, which identified whether the participant had undergone a treatment in the 7-year follow-up (0 = no treatment; 1 = treatment).

Second, 4 pain characteristics were examined. Pain duration was determined by asking women how long they had been experiencing pain during sexual intercourse. Age at first pain onset was computed by subtracting pain duration from actual women's age at T1. Primary PVD was determined by calculating whether pain began with first sexual intercourse or before (eg, first tampon use). Primary PVD was contrasted with secondary PVD, which was defined as PVD appearing after a period of pain-free vaginal intercourse (0 = secondary PVD; 1 = primary PVD). Other vulvar pain localization was determined by asking women at which genital area they usually felt pain during sexual intercourse: the entrance of the vagina, everywhere on the vulva, or inside the vagina (0= pain reported only at the entrance of the vagina; 1 = pain reported at another area).

Third, psychological factors were anxiety and depressive symptoms. The State-Trait Anxiety Inventory is a commonly used 40-item measure of trait and state anxiety.[19] Of these, the 20 items assessing trait anxiety were included in this study, which represents a predisposition to react with anxiety in stressful situations. Participants answered on a Likert-type scale ranging from 1 (almost never)−4 (almost always). Total scores ranged from 20−80, and higher scores indicate more anxiety. This measure has excellent psychometric properties.[20] The Cronbach α for the trait scale in this sample was 0.93. The Beck Depression Inventory−II is a widely used 21-item test that measures symptoms of depression in the last 2 weeks.[21] Participants answered on a Likert-type scale ranging from 0 (low intensity)−3 (high intensity). Total scores vary from 0−63, and higher scores indicate greater depressive symptoms. This measure has shown good psychometric qualities, including in a population with clinical levels of chronic pain.[22] Cronbach's α in this study = 0.90.

Fourth, the following relationship variables were measured: duration of the relationship, marital status, and the 3 subscales of the Revised Dyadic Adjustment Scale (RDAS).[23] The RDAS is a 14-item measure of relationship quality divided into 3 subscales: (i) dyadic consensus, ie, the degree to which the respondent agrees with their partner, including regarding emotional affection (6 items), (ii) dyadic satisfaction, that is, the degree to which the respondent feels satisfied with their partner (4 items), and (iii) dyadic cohesion, that is, the degree to which the respondent and partner participate in activities together (4 items). 1 item is rated on a 5-point scale, whereas the other 13 items are rated on a 6-point scales. Items are summed to provide subscale scores ranging from 0−30 for the consensus subscale, from 0−20 for the satisfaction subscale, and from 0−19 for the cohesion subscale, with higher scores indicating higher levels of consensus, satisfaction and cohesion, respectively. The RDAS has good psychometric properties.[23] Cronbach's α for these subscales in this study varied between 0.60−0.83.

Descriptive statistics were calculated with the Statistical Package for the Social Sciences (SPSS V. 19.0; SPSS Inc, Chicago, IL, USA), and all other analyses were performed with M*plus* version 8.0 using the robust maximum likelihood estimation.[24] Latent class growth analysis (LCGA) was conducted to identify homogeneous subgroups of trajectories based on pain intensity obtained at 3 time points (baseline = T1, 2 years = T2, 7 years = T3). LCGA is a type of growth mixture modeling in which the variance of intercepts and linear slopes are assumed to be invariant within class and allowed to vary only across classes. 1−5 class solutions were extracted with 500 random start values for each model, with the 50 best retained for the final optimization. To avoid local maxima, the final solution was replicated with 1,500 random starts values. The best-fitting classification model was determined by a combination of fit indexes, parsimony, size of classes, and interpretability.[25] The model fit indexes used were: the smallest Bayesian information

criteria value, a significant Lo-Mendell-Rubin likelihood ratio test, and a significant bootstrap likelihood ratio test (BLRT). Both likelihood ratio test values test the significance of the improvement in the model when an additional class is extracted.[25] The precision of individual classification was assessed using the entropy value ranging between 0−1, with a high entropy corresponding to a clear class separation. Missing data on the outcome, pain intensity, were treated using the full information maximum likelihood function.

Once the best number of classes was identified, the 3-step method[26] was used to investigate whether having undergone treatment, pain characteristics, and psychosocial factors at T1 predicted trajectory class membership. This method allows for the estimation of a second model without affecting the latent class membership of the previous model and permits more accurate examination of predictors by accounting for inaccuracies in class separation. Univariate binomial logistic analyses were performed for all predictors, and, if $P \leq .05$ and after a check for collinearity, they were included in a multivariate analysis. Because missing data on exogenous predictors are not allowed in LCGA, multiple imputation was used to replace missing values on all predictors. Each missing value was imputed 10 times, and the average result over the 10 datasets was used.[27]

RESULTS

Descriptive Statistics

A total of 356 women completed the questionnaires at T1, 274 at T2 (a 2-year retention rate of 77.0%), and 173 at T3 (a 5-year retention rate of 63.1%). The final sample included 173 women. There were no significant differences among sociodemographic variables, pain intensity, and pain duration, as measured at T1, between women who completed and women who did not complete T3.

Of the 173 women, 48.6% (n = 84) were diagnosed with PVD by the gynecologist, and the remainder (51.4%; n = 89) met Harlow's criteria[28] for screening positive for PVD based on the telephone interview. Women who were diagnosed by the gynecologist were significantly younger (28.34 years vs 33.89, $t[170] = 3.11$; $P = .001$). There were no significant differences on pain intensity at T1 between women who were diagnosed by the gynecologist (mean 7.15, SD 1.75) and women who were not (mean 7.15, SD 1.58, $t[166] = .01$, $P = .99$). There were no other significant differences on T1 sociodemographic variables and having been diagnosed by a gynecologist at T1 was not associated with a specific pain intensity trajectory. The mean age of women at T1 was 31.21 years (range 18−63 years, SD 11.02). All women were in a relationship at T1, with 66.5% (n = 115) cohabiting with their partner, 19.1% (n = 33) being married, 13.3% (n = 23) being in a relationship without cohabitation, and 0.01% (n = 2) with unknown status. The mean relationship duration was 6.89 (range 0.5−38.42 years, SD 7.50). Most (n = 156, 90.2%) identified culturally as French Canadian and

Table 1. Descriptive statistics of the sample (n = 173)

	Mean (range) or no.	SD or %
Age (y)	31.21 (18—63)	11.20
Education level (y)	16.9 (7—26)	2.92
Relationship status		
Cohabitating	115	66.47
Married	33	19.08
Not cohabitating	23	13.29
Unknown	2	1.16
Religion		
Catholic	148	85.55
Other	9	5.20
No religion	10	5.78
Unknown	6	3.47
Cultural background		
English Canadian	4	2.31
French Canadian	156	90.17
Other	13	7.51
Women household income		
More than $60,000	83	48
Less than $60,000	90	52

Percentage values are % of total sample.

were Catholic (n = 148, 85.5%). Women were well educated, with a mean of 16.09 years of education (range 7—26 years, SD 2.92), and 48.0% (n = 83) of the women had a household income >$60,000 per year. The mean pain duration at T1 was 6.05 years (range 0.5—43.83 years, SD 6.77), and the mean pain intensity at T1 was 7.15/10 (range 3—10, SD = 1.66). Descriptive characteristics of the sample are presented in Table 1. Means and SDs for pain intensity at all 3 time points, as well as means and SDs or percentages for the proportion of women who took part in PVD treatment, pain characteristics, and baseline psychosocial factors in the overall sample are presented in Table 2.

Identified Outcome Trajectories with Latent Class Growth Analysis

The model fit of the 5 estimated LCGA are reported in Table 3. Most fit indexes indicated that the 2-class solution was the best fitting model. Indeed, the 2-class solution had the lowest Bayesian information criteria with significant Lo-Mendell-Rubin likelihood ratio test and BLRT in combination with a non-significant BLRT at the 3-class model. The entropy was 0.84, which indicated that the 2-class model had good quality of classification. Hence, 2 trajectories were retained as the best fitting model. The pain intensity trajectories for the 2-class model are displayed in Figure 1.

Class 1 included 28.9% of women (n = 50) who presented a persistent pain trajectory or persistence of vulvodynia symptoms. In this class, pain intensity intercept was 7.06 (standard error [SE] 0.20, $P < .001$) with a stable slope of −0.06 (SE 0.04, $P = .117$) per year over the 7 years. Class 2 included

71.1% (n = 123) of women who presented a decreasing pain trajectory or a decrease of vulvodynia symptoms. In this class, pain intensity intercept was 6.64 (SE 0.18, $P < .001$), with a downward slope of −0.70 per year (SE 0.03, $P < .001$) over the 7 years. Means and SDs for pain intensity at all time points for the 2 class trajectories are reported in Table 2. Based on the Wald χ^2 test of mean equality, pain intensity at T1 did not differ significantly between the 2 class trajectories ($W_t[1] = 3.16$, $P = .075$), whereas pain intensity at T2 and T3 were significantly different (respectively, $W_t[1] = 15.21$, $P < .001$ and $W_t[1] = 495.80$, $P < .001$).

Predictors of Trajectory Class Membership Based on Treatment, Pain Characteristics, and Psychosocial Factors

Means and SDs for the treatment(s) undergone, pain characteristics, and baseline psychosocial factors for the 2 class trajectories are reported in Table 2. Univariate odds ratios (OR) of treatment, pain characteristics, and psychosocial factors in the binomial logistic regression model, as well as the included variables in the multivariate binomial logistic regression are reported in Table 4. Having undergone a treatment was not significantly associated with trajectory class membership. Being older at first pain onset and reporting pain at another localization than the entrance of the vagina increased the odds for the persistent pain trajectory, whereas reporting primary PVD decreased the odds for the persistent pain trajectory. For psychosocial factors, women who reported more anxiety were more likely to be in the persistent pain trajectory. Women who were married were more likely to be in the persistent pain trajectory group, whereas reporting more dyadic cohesion decreased the odds for the persistent pain trajectory. When these significant variables were combined into 1 model and regressed simultaneously onto latent class membership, 3 predictors contributed unique variance to the prediction of the persistent pain trajectory, or persistence of vulvodynia symptoms: older age at first pain onset, pain not limited to vulvar vestibule, and higher anxiety.

DISCUSSION

This prospective study identified 2 pain trajectories in women who screened positive for PVD: 1 that remained persistent and 1 that decreased over time, each associated with different psychosocial and pain characteristics. Our final model suggested 3 main predictors for the 2 pain trajectories. Women who were older at first pain onset, had pain at another location than the entrance of the vagina, and reported higher anxiety were more likely to have a persistent rather than a decreased pain trajectory. Having or not having taken part in a treatment was not predictive of the evolution of pain over time.

The finding regarding treatment not predicting pain trajectories is consistent with a prospective study from Davis et al,[6] in

Table 2. Means, standard errors and percentages for outcome and predictor variables of all women and of the identified 2 class trajectories

	Overall sample, Mean (SE) or %	Class 1 Persistent pain trajectory, Mean (SE) or %	Class 2 Decreased pain trajectory, Mean (SE) or %
Outcome variables			
T1 pain intensity	7.15 (0.13)	7.48 (0.20)	7.01 (0.17)
T2 pain intensity	4.16 (0.20)	5.50 (0.38)	3.61 (0.24)
T3 pain intensity	3.29 (0.20)	6.79 (0.19)	1.84 (0.12)
Predictor variables			
Treatment (0—1)*	71.1%	69.9%	71.6%
Pain duration (y)	6.13 (0.52)	6.55 (1.21)	5.96 (0.60)
Age at first pain	25.01 (0.75)	46.06 (2.54)	21.90 (0.43)
Primary pain (0—1)[†]	27.6%	15.0%	32.8%
Pain localization (0—1)[‡]	22.1%	40.8%	14.5%
Anxiety (STAI)	42.77 (0.85)	45.98 (1.79)	41.46 (1.01)
Depression (BDI)	11.77 (0.68)	12.87 (1.45)	11.32 (0.82)
Relationship duration	6.91 (0.57)	10.26 (1.85)	5.53 (0.88)
Married (0—1)[§]	19.1%	34.2%	12.9%
Dyadic consensus (RDAS)	22.96 (0.26)	22.82 (0.51)	23.02 (0.32)
Dyadic satisfaction (RDAS)	15.33 (0.22)	15.37 (0.39)	15.32 (0.27)
Dyadic cohesion (RDAS)	12.67 (0.26)	11.55 (0.52)	13.13 (0.29)

N = 50 in class 1 and N = 123 in class 2.
BDI = Beck Depression Inventory-II; RDAS = Revised Dyadic Adjustment Scale; SE = standard error; STAI = State-Trait Anxiety Inventory.
*0 = no treatment; 1 = treatment.
[†]0 = secondary PVD; 1 = primary PVD.
[‡]0 = pain reported only at the entrance of the vagina; 1 = pain reported at another area.
[§]0 = not married; 1 = married.

which no single treatment was found to be a superior predictor of pain improvement. Nevertheless, this study suggested a natural improvement in pain by showing that, even without treatment, on average, pain diminished over a 2-year period. The present finding nuances these results by suggesting that the evolution of pain in women with PVD is heterogeneous, with some women seeing a decrease in their pain intensity, whereas for others, pain persisted. Similarly, Reed et al[5] found that medications for vulvodynia (eg, estrogen-progesterone, antifungals, topical steroids) were not a predictor of pain remission. However, some randomized clinical trials of women with PVD indicated significant decreases in pain from baseline to post-treatment, although none followed up women for as long as 7 years.[12,18,29]

Findings for pain characteristics showed that women with persistent pain were older at the time of onset of symptoms. This result differs from those of other studies showing an association between greater pain duration and less pain improvement, but not with being older at first pain onset.[5] Several hypotheses may explain the association with later onset of symptoms and a poorer prognosis. First, older women may be in early or late menopausal transition, suggesting the implication of hormonal changes in the pain trajectory. In support of this, studies have shown that vulvar pain symptoms related to menopause are mainly manifested by vaginal dryness and vulvar atrophy, and are largely due to estrogen deprivation.[30] It is possible that when vulvodynia is of late

onset, it may be confused with vulvar pain symptoms associated with loss of estrogen, leading to inadequate treatment and less pain improvement over time. However, because menopausal status was not assessed at time of diagnosis, implication of hormonal changes should be interpreted with caution and warrant further investigation.

Aging is often associated with decreases in sexual activity, sexual desire, problems with arousal, difficulty to achieve orgasm, and feeling less physically and sexually attractive.[31,32] Traditional sexual scripts suggest that the importance given to sexuality among older women may be lower than in younger women, and, thus, later-onset vulvodynia may generate less pain-related distress and associated help-seeking attempts. Also, decreases in

Table 3. Fit indexes for solutions specifying 1—5 classes

	LL	BIC	LMR-LRT P value	BLRT P value	Entropy
1 class	−1170.73	2367.23	NA	NA	NA
2 class	−1145.49	2332.20	P < .001	P < .001	0.842
3 class	−1140.61	2337.90	P = .015	P = .064	0.761
4 class	−1136.99	2346.13	P = .557	P = .132	0.791
5 class	−1131.85	2351.31	P = .111	—*	0.747

BIC = Bayesian information criterion; BLRT = bootstrap likelihood ratio test; LL = Model log likelihood; LMR-LRT = Lo-Mendell-Rubin likelihood ratio test.
*Did not converge.
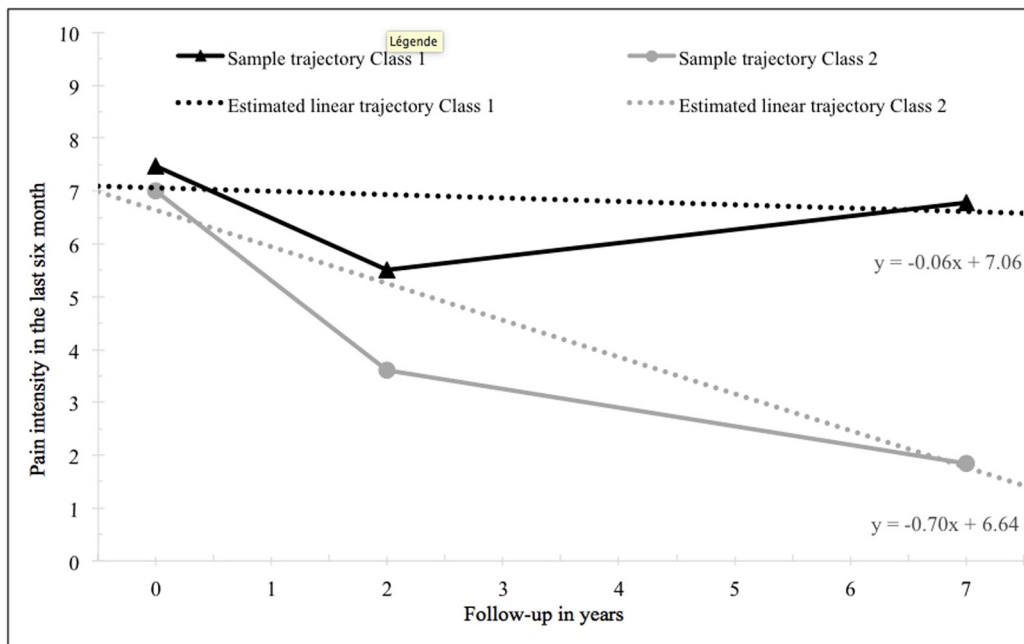
Figure 1. The 2 pain intensity trajectories over the 7-year follow-up.

sexual activity among older women may buffer them from being disturbed by the presence of pain. Given that women with vulvodynia are often left untreated and report feeling that physicians do not take their pain seriously,[33] it may be particularly important for health care professionals to provide aging women the opportunity to discuss their sexual concerns. In contrast, younger women tend to change sexual partners more often than older women, and it may be even more important for them to reduce pain to meet new partners' sexual expectations by being able to engage in non-painful sex.

In this study, vulvar pain at another location than the entrance of the vagina also predicted persistence of pain. This is consistent with previous studies suggesting that women with PVD have lower pain thresholds not only on pressure to the vestibule but also at other body regions. Because comorbidity with other chronic pain conditions is also common among women with PVD,[34,35] these results suggest that the vestibule is not the only region with a lowered pain threshold. Women with PVD may have generalized hypersensitivity to pain that could also be present in the vulva, rendering pain reduction more complex and

Table 4. Binomial logistic regression for univariate and multivariate associations of treatment, pain characteristics, and psychosocial factors with classification in the 2 trajectory classes

Predictor variables	Prediction of class 1 Persistent pain trajectory		OR (95% CI) Univariate	OR (95% CI) Multivariate model
	Estimate (SE)	P value		
Treatment (0−1)	−0.08 (0.41)	.839	0.92 (0.41−2.06)	
Pain duration (y)	0.01 (0.03)	.652	1.01 (0.96−1.07)	
Age at first pain	**0.09 (0.02)**	**<.001**	**1.09 (1.04−1.14)**	1.08 (1.03−1.14)
Primary pain (0−1)	**−1.05 (0.51)**	**.040**	**0.35 (0.13−0.95)**	0.75 (0.24−2.30)
Pain localization (0−1)	**1.33 (0.43)**	**.002**	**3.78 (1.62−8.81)**	2.52 (1.00−6.40)
Anxiety (STAI)	**0.04 (0.02)**	**.033**	**1.04 (1.00−1.07)**	1.04 (1.00−1.09)
Depression (BDI)	0.02 (0.02)	.353	1.02 (0.98−1.06)	
Relationship duration	0.07 (0.04)	.061	1.07 (0.99−1.16)	
Married (0−1)	**1.20 (0.45)**	**.008**	**3.31 (1.37−7.99)**	2.10 (0.74−5.94)
Dyadic consensus (RDAS)	−0.02 (0.06)	.745	0.98 (0.88−1.10)	
Dyadic satisfaction (RDAS)	0.01 (0.07)	.913	1.01 (0.88−1.15)	
Dyadic cohesion (RDAS)	**−0.17 (0.06)**	**.007**	**0.85 (0.75−0.96)**	0.95 (0.81−1.11)

Prediction of classification in the persistent pain trajectory with decreased pain trajectory as reference group (0 = decreased pain trajectory; 1 = persistent pain trajectory).
Significant predictors in bold.
BDI = Beck Depression Inventory-II; OR = odds ratio; RDAS = Revised Dyadic Adjustment Scale; SE = standard error; STAI = State-Trait Anxiety Inventory.

challenging. Indeed, Reed et al[36] showed that women with vulvodynia have more vulvar sensitivity than control women and that greater vulvar sensitivity was associated with persistent pain.

The finding that women who were more anxious were more likely to have a persistent pain trajectory supports biopsychosocial models of PVD by suggesting that predictors of pain are not only biomedical, but also psychological. This result is consistent with epidemiological research indicating that anxiety and depression are risk factors for the development of vulvodynia.[37] According to the Fear-Avoidance Model,[38] a behavior (eg, sexual intercourse) is avoided due to fear and anxiety related to it, which in turn causes even more pain. Hence, anxiety may contribute to more pain-related avoidance and less-effective coping responses. In addition, the Fear-Avoidance Model posits that anxiety could lead to more hypervigilance and pain catastrophizing, which are both associated with higher levels of pain during intercourse in women with PVD.[39]

This study has some limitations. First, almost half of the participants were not diagnosed with PVD by a physician but met Harlow's criteria [28] based on the telephone screening. Many women are often unaware of their vulvar anatomy, which could have biased their self-evaluation of pain symptomatology. Without a gynecologic examination, it is possible that some women also presented other important diagnostic elements that could have contributed to the evolution of the pain. However, it has been shown that women diagnosed with PVD by a gynecologist are not significantly different from those with PVD-like symptoms who did not receive a diagnosis in terms of pain intensity.[40] Moreover, the reliability and validity of self-reported symptoms to predict PVD are excellent.[28,41] Also, our data showed no difference in pain trajectories between women who were diagnosed and women who self-reported PVD. Second, this study used data collected from a larger study designed for a different purpose than following the natural history of PVD. Hence, some exclusion criteria, such as major medical and psychiatric illnesses or deep dyspareunia, could have been predictors of the evolution of pain, and, thus, it may be worthwhile to assess these in future research. In addition, because this was not a treatment study, the effect of specific treatments undertaken by women were not controlled for over the course of this study. Despite these limitations, the 3-time point, 7-year longitudinal design to examine the natural history of PVD represents a major strength of our study, because this design allowed for more sophisticated and powerful analyses, as well as high ecological validity. In addition, the inclusion of biopsychosocial factors as predictors of pain trajectories offers a more substantial and comprehensive conceptualization of vulvodynia, in line with current models of chronic pain.[42]

CONCLUSION

In conclusion, this prospective study identified 2 pain trajectories in women screened positive for PVD, 1 where pain persisted and 1 where pain decreased over time. Women who were older at first pain onset, had pain at another location than the

entrance of the vagina, and reported more anxiety were more likely to have a persistent pain trajectory. Findings emphasize the importance for health care professionals to address psychological factors, such as anxiety, that could limit pain improvement. In particular, unlike other predictors of pain trajectories, anxiety is a modifiable factor and seems to be important to target in psychological interventions aimed at improving PVD.[43] Assessing baseline characteristics associated with different pain trajectories during medical visits could have positive implications for pain management of women with vulvodynia. Specifically, clinicians who care for women with vulvodynia could inform their patients about the role of anxiety in the management of pain and make anxiety reduction a focus of their overall treatment plan, from time of diagnosis and beyond.

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Category 3

(a) Final Approval of the completed article
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