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The Impact of Multidisciplinary Treatment on Psychological Functioning and Sexual Penetration among Women with Provoked Vestibulodynia

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Abstract

Background: Provoked vestibulodynia is a chronic vulvar pain condition with sexual, relational, and psychological effects. A multidisciplinary treatment approach has been recommended in the literature for provoked vestibulodynia, and there is evidence that such an approach improves women's sexual functioning and dyspareunia. However, limited research has examined the impact of multidisciplinary treatment on women's psychological functioning.

Objectives: To examine the impact of a multidisciplinary treatment program for provoked vestibulodynia on women's general and pain-specific psychological functioning, specifically, anxiety, depressive mood symptoms, negative cognitions about pain (catastrophizing), pain hypervigilance, and self-efficacy. We also examined whether treatment impacted women's ability to engage in sexual penetration.

Study Design: Participants were 104 women (mean age = 27.7) who were diagnosed with provoked vestibulodynia (29.8% primary subtype) and completed investigator-derived and validated questionnaires before, immediately following, and two months following completion of a 10- to 12-week multidisciplinary treatment program. The program was hospital-based and included educational seminars, gynecological appointments, three group sessions of cognitive behavioral and mindfulness-based skills, and three individual sessions of pelvic floor physiotherapy.

Results: Immediately following participation in the program, women reported a significant improvement in anxiety and mood symptoms, pain catastrophizing, and self-efficacy (ps≤.01). Follow-up analyses examining impact across all three timepoints also found a significant decrease in pain hypervigilance (p = 0.01) and all gains were maintained at two months post-treatment (ps>.05). Fewer women at immediate post-treatment compared to before treatment reported having times when sexual penetration was not possible (p<.001).

Conclusion: A multidisciplinary treatment approach appears to positively impact both general and pain-specific psychological functioning in women with provoked vestibulodynia, as well as ability to have sexual penetration.

Keywords: Provoked Vestibulodynia; Anxiety; Depressive Symptoms; Multidisciplinary Treatment

Introduction

Vulvodynia, or chronic vulvar pain without obvious etiology, impacts approximately 8.3% of women [1]. Women report uncomfortable sensations such as burning, irritation, stabbing or rawness in the genital area. The pain may be generalized to the whole vulva or localized to a specific area (eg. clitoris, or vestibule). Provoked vestibulodynia (PVD), characterized by pain upon vestibular touch, is the most common type of vulvodynia and is associated with a wide range of quality of life concerns, including psychological, relational, and sexual difficulties [2-4]. PVD can be present from first attempts at vaginal penetration (primary/lifelong) or acquired after a time of pain-free functioning (secondary).

It is estimated that the annual economic burden of vulvodynia is $31-72 billion in the United States [5]. Contributing to this burden is the cost of direct healthcare: women with PVD often visit multiple healthcare providers and almost 40% of women with vulvar pain in a population-based study reported remaining undiagnosed after seeking treatment from one or more doctors [6]. Typically, when women are properly diagnosed, various unimodal treatments are tried with variable, but largely modest, rates of efficacy [7,8]. Research regarding the medical treatment of vulvodynia has failed to find a convincing pharmaceutical intervention and a recent systematic review found evidence of a strong placebo effect [9]. While limited, research regarding behavioral interventions for vulvodynia (eg. psychological, physical therapy) have reported positive results. For example, a recent systematic review of 43 studies concluded that physical therapy interventions (For example, biofeedback, dilators, electrostimulation etc.)

were effective in reducing sexual pain in women with PVD [10]. In addition, two recent RCT studies [11,12], found mindfulness-based group cognitive behavior therapy was effective for treating sexual pain due to PVD.

Thus, given the complex nature of PVD, it has been speculated that a multidisciplinary, biopsychosocial treatment approach may provide the greatest benefit [13-15]. Our multidisciplinary treatment program for PVD, combining medical, psychological, and physiotherapy care and started in 2008, has been shown to be effective for improving women's dyspareunia and sexual function [16]. Qualitative interviews with a subset of patients revealed that women enter our program with high levels of psychological distress and report improved psychological well-being as a result of treatment. However, quantitative research is limited regarding whether multidisciplinary treatment for PVD impacts women's psychological functioning [17,18].

The main objectives of this study were thus to assess general and pain-specific psychological functioning among women who participated in our multidisciplinary treatment. Firstly, we measured anxiety and mood symptoms, pain catastrophizing (exaggerated negative thoughts related to pain), hypervigilance, and self-efficacy (belief in one's ability to achieve specific outcomes) at pre-treatment and immediate post-treatment; these latter three variables are relevant for predicting post-treatment pain intensity among women with PVD. We subsequently examined whether any treatment gains were maintained at two-month follow-up [19]. Finally, while improvement in dyspareunia has been shown after participation in our program, we examined whether treatment made it more possible for women to engage in sexual penetration [16].

Materials and Methods

Participants were women with PVD who were referred by a physician for treatment of chronic vulvar pain and enrolled in our "Multidisciplinary Vulvodynia Program" (MVP; described below). Eligible women were required to be 18 years of age or older and of reproductive age, to have experienced vulvar pain for at least 6 months, and willing and able to participate in the MVP. Women with vulvar pain due to conditions other than PVD (e.g., lichen sclerosus, vulvar Crohn's disease), postmenopausal women, and post-partum women who had not resumed regular menses were not eligible, nor were women whose participation in the MVP would have been hampered by other factors (e.g., lack of English fluency; geographical restrictions). Given the scarcity of resources, the clinical program focused on women with PVD during this study period. (Women with generalized and or spontaneous (unprovoked) vulvar pain were not formally enrolled in the program till 2016.) We did not exclude women on the basis of any other medical or psychological factors.

A detailed description of the MVP has been previously reported [16-18]. In brief, the MVP is a single program that offers integrated medical therapy, psychological skills training, pelvic floor physiotherapy, and educational seminars for women with PVD (see Table 1 for program overview). Referrals to the MVP were triaged by a program gynecologist with expertise in vulvo-vaginal disease and sexual medicine. Potential MVP participants then underwent a comprehensive assessment with one of two program gynecologists that included a biopsychosocial interview and a vulvar/pelvic examination to confirm the diagnosis of PVD. The diagnostic examination included inspection of the external genitals, speculum and bimanual examination when tolerated, and cotton-swab test palpation of the vulva/vestibule. During this assessment, gynecologists also provided women with general skin care recommendations and started women on medical therapy (e.g., either topical estradiol or lidocaine) if appropriate.

Week	Appointment Type	Provider	Number of Appointments	Appointment Overview
1	Group Orientation Seminar	Gynecologist	1	Introduced participants to the MVP and provided educational information about PVD (e.g., pathophysiology, review of various treatment options)
2	Group sexual health seminar	Gynecologist or Psychologist	1	Reviewed sexual response cycle and the impact of PVD on sexual response
2-4	Individual treatment planning session	Gynecologist	1	Reviewed the woman's goals for treatment
4-9	Individual pelvic floor physiotherapy sessions	Physiotherapist	3	Taught pelvic floor relaxation exercises. Included specific learning tools such as biofeedback and vaginal inserts. Homework exercises were assigned
4-8	Group psychological skills sessions with psychologist	Psychologist or therapist	3	Taught cognitive behavioral therapy (CBT) and mindfulness-based skills for pain management. Homework exercises were assigned
10	Group education seminar for partners	Gynecologist	1	This couples-only seminar provided partners with information about PVD, and delivered similar content to that of the group orientation seminar provided to all women in week 1
10-12	Individual discharge appointment	Gynecologist	1	Reviewed woman's program participation and recommendations for continued pain management post-MVP

Table 1: Outline of Multidisciplinary Vulvodynia Program (MVP) for provoked vestibulodynia (PVD)

Following the initial assessment, eligible women who agreed to participate in the MVP were assigned to specific cohorts that advanced through the program at the same time. Women attended both individual and group appointments over approximately 10 to 12 weeks with collaborating program care providers (treatment duration varied depending on scheduling factors and clinician availability). The final step involved an individual treatment planning appointment with a gynecologist to discuss a woman's progress and skills acquisition during the MVP and to plan for continued use of the skills after discharge. This final appointment also identified any need for continued therapy and provided the woman with community resources if needed. A comprehensive letter was sent to each woman's referring physician to summarize her MVP participation and to provide recommendations for continued chronic pain management.

Women who were eligible for the MVP and participated in this research were asked to complete a battery of questionnaires, including standardized measures to assess general and pain-related psychological functioning at the following time points: 1) prior to starting MVP (pre-treatment); 2) immediately following MVP participation (post-treatment); and 3) two months following discharge from the MVP (two-month follow-up). Women provided informed consent and/or charts were reviewed in order to obtain data. Study procedures were approved by the clinical research ethics boards of the University of British Columbia and the Vancouver Coastal Health Research Institute.

Measures

Participant demographics, pain, and, sexual history questionnaire: A demographics questionnaire was completed as part of women's pre-treatment assessment. This questionnaire also contained investigator-derived items to assess women's vulvar pain history (e.g., Symptom length), relationship status and length, satisfaction with the level of closeness in their relationship (if applicable), presence of current anxiety and mood symptoms, psychiatric diagnosis, and treatment history.

Investigator-derived items also assessed women's use of various therapies for their vulvar pain. These pain treatment history items were administered at: 1) pre-treatment to assess therapies tried prior to the MVP; 2) post-treatment to assess therapies tried since women's first visit with the MVP; and 3) two-month follow-up to assess therapies tried since women's last visit with the MVP. At each timepoint we also asked participants: "Are there times when penetration is not possible?"

Beck Depression Inventory (BDI): The BDI contains 21-items to assess severity of depressive symptoms over the past week [20]. Items are rated on a 4-point scale ranging from 0 to 3; higher scores indicate more severe symptoms of depression. The BDI demonstrates high internal consistency and good concurrent validity [21]. At pre-treatment, Cronbach's alpha for the current sample was high at .87.

State-Trait Anxiety Inventory (STAI): State anxiety was measured using the 20-item respective subscale of the STAI [22]. The state subscale asks respondents to indicate how they currently feel, with items rated on a 4-point scale from 1 (not at all) to 4 (very much so); higher scores on this subscale is indicative of higher levels of anxiety. The state subscale of the STAI has high internal consistency [22]. Cronbach's alpha at pre-treatment was high in the current sample at 0.90.

Pain Catastrophizing Scale (PCS): The PCS is a 13-item self-report measure that asks participants to indicate the degree to which they have certain thoughts or feelings when experiencing pain and includes the following three subscales: rumination (e.g., inability to keep pain out of mind), magnification (e.g., fear pain will worsen), and helplessness (e.g., feeling overwhelmed by pain) [23]. We specifically asked participants to complete the PCS in relation to their vulvar pain. Items were rated on a scale from 0 (not at all) to 4 (all the time), with higher scores indicating higher levels of catastrophizing. Internal consistency for the PCS is high and there is good evidence to support its validity among community and outpatient pain samples [24]. In the current sample, Cronbach's alpha was high at pre-treatment at .90.

Painful Intercourse Self-Efficacy Scale (PISES): The PISES is a 20-item self-report measure that was adapted from the Arthritis Self-Efficacy Scale [25]. It assesses women's perceived ability to participate in sexual and penetrative activity and to reach certain pain management goals. The PISES assesses three dimensions of self-efficacy associated with pain during intercourse: 1) self-efficacy for reducing such pain and its sexual/relational impact; 2) self-efficacy for performing certain sexual activities and other activities involving penetration; and 3) self-efficacy for controlling other symptoms associated with intercourse pain (e.g., frustration). In this study, items were rated on a 10-point scale ranging from 1 (very uncertain), 5 (moderately uncertain) to 10 (very certain), and the total score of the PISES, calculated by taking the mean of the three subscale scores, was used for analyses. Cronbach's alpha in the current sample at pre-treatment was high at .90.

Pain Vigilance and Awareness Questionnaire (PVAQ): The PVAQ is a self-report measure of attention to pain that assesses pain awareness, consciousness, vigilance, and observation [26]. Respondents are asked to consider their pain experiences, if applicable, over the previous two weeks and to indicate the frequency with which each item describes their response to pain. The PVAQ contains 16 items rated on a 0 (never) to 5 (always) scale, with higher scores indicating higher levels of attention to pain. The PVAQ demonstrates good internal consistency and evidence of validity [26]. In the current sample, Cronbach's alpha was .85 at the pre-treatment assessment.

Statistical Methods

In order to assess women's level of general psychological functioning, we examined women's pre-treatment scores in relation to suggested clinical cut-off scores for the BDI and STAI. Mixed 2 (PVD subtype: primary or secondary) by 2 (time: pre-treatment; post-treatment) repeated measures analyses of variance (ANOVAs) were then conducted to evaluate whether women's general and pain-related psychological functioning was impacted by the MVP. We compared women with primary and secondary PVD in our analyses due to indication in the literature that these groups may differ with regard to some aspects of psychological functioning. Previous research has found, for example, that women with primary PVD reported higher levels of trait anxiety [27] and more anxiety about exposing their bodies during sexual activity [28].

We subsequently carried out mixed 2 (PVD subtype; primary or secondary) by 3 (time; pre-treatment, post-treatment, two-month follow-up) repeated measures ANOVAs that included the two-month follow-up time point. Significant ANOVAs were followed by paired sample t-tests between the post-treatment time points. Greenhouse-Geisser adjustments for ANOVAS were utilized when the assumption of sphericity was violated.

Finally, descriptive statistics were used to indicate the percentage of women who reported having times when penetration was not possible. We used McNemar tests to examine whether there was a significant difference between the proportions of women who reported that penetration was not possible at pre- compared to post-treatment and at post-treatment vs follow-up.

Results

Participants were 104 reproductive-aged women with PVD (29.8% with primary PVD; 70.2% with secondary PVD) who participated in the MVP between February 2009 and September 2011 and had complete data for the psychological outcomes at pre-and post-treatment. Pre-treatment demographic and pain characteristics of the sample, including self-reported rates of diagnosed anxiety and depression, are presented in Table 2. The self-reported therapies that women had tried prior to MVP participation are shown in Table 3, as are the therapies women reported trying at post-treatment and follow-up (since their first and last visit with the MVP, respectively).

Variable	Mean (SD) or %
Age (years)	27.68 (5.75)
Relationship status (%)	
Single	46.2
Partnered	51.9
Separated/Divorced	1.9
Duration of relationship (years)	4.46 (3.80)
Satisfied with level of closeness in relationship (%)	
Yes	50.0
No	39.4
Sexual orientation (%)	
Heterosexual	93.3
Bisexual	1.9
Lesbian	1.0
Ethnicity (%)	
Caucasian	80.8
East Asian	7.7
Indo-Canadian	6.7
Other	3.9
Education (%)	
High School Only	4.8
At least some college	74.1
Post-Graduate Education	21.2
Type of provoked vestibulodynia (%)	
Primary (lifelong)	29.8
Secondary (acquired)	70.2
Length of symptoms (months)	55.35 (52.05)
Length of symptoms before diagnosis (months)	30.35 (44.06)

Variable	Mean (SD) or %
Pain of usual symptoms (0-10)	5.64 (2.59)
Pain of worst symptoms (0-10)	8.63 (1.28)
Experiencing symptoms of anxiety (%)	55.8
Diagnosed with anxiety disorder (%)	13.5
Experiencing bothersome symptoms of low/depressed mood (%)	45.2
Diagnosed with Major Depressive Disorder (%)	8.7
Experiencing high levels of stress that seems uncontrollable (%)	35.6
Receiving treatment for psychological concerns (%)	14.4

Note: Percentages may not add up to 100 due to missing data

Table 2: Sample pre-treatment demographic and pain characteristics (n = 104). Data are shown as percentages or means and standard deviation

Treatments	Pre-MVP*		Intra-MVP*		2 Month Post-MVP*	
	N	%	N	%	N	%
Medication						
Antibiotic Medication (oral and/or vaginal)	28	26.9	6	7.0	1	1.0
Estrogen Creams	26	25.0	46	53.5	23	22.1
Progesterone Creams	3	2.9	3	3.5	1	1.0
Steroid Creams	37	35.6	13	15.1	1	1.0
Testosterone Creams	1	1.0	2	2.3	0	0
Oral Anticonvulsant Pills	8	7.7	5	5.8	6	5.8
Over The Counter Pain Medication	17	16.3	4	4.7	0	0.0
Prescription Pain Medication	5	4.8	1	1.2	1	1.0
Antidepressant Pills	30	28.8	18	20.9	12	11.5
Anti-herpes Oral Medication	2	1.9	2	2.3	1	1.0
Anti-yeast Medication (oral and/or vaginal)	72	69.3	16	18.6	8	7.7
Topical Xylocaine Gel	44	42.3	21	24.4	20	19.2
Barrier Creams	14	13.5	10	11.6	5	4.8
Botox Injections	0	0.0	0	0.0	0	0.0
Psychological Treatment						
Counseling	15	14.4	28	32.6	12	11.5
Group CBT	0	0	76	88.4	13	12.5
Relationship Therapy	7	6.7	7	8.1	3	2.9
Sexual Counseling	6	5.8	4	4.7	2	1.9
Stress/Relaxation Therapy	10	9.6	26	30.2	17	16.3
Dietary Change	24	23.1	7	8.1	6	5.8
Education Regarding Pain Signals	28	26.9	60	69.8	21	20.2
Herbs and Vitamins	7	6.7	4	4.7	2	1.9
Physiotherapy	24	23.1	77	89.5	27	26.0
Surgery	7	6.7	2	2.3	0	0.0
Other†	25	24.0	6	7.0	14	13.5

Note: Percentages may not add up to 100 as a result of missing data or due to ability to indicate more than one response option. The question was asked as follows: "please CHECK any of the following therapies you have tried and indicate the level of relief you think they have given you".

*Pre-MVP refers to treatment tried before the MVP program, intra-MVP refers to treatments tried since the first visit with the MVP program (n=86 were administered this question), and 2 months post-MVP refers to treatments tried by the participant since their last visit with the MVP.

Examples include acupuncture, yoga, ice pack on vulva, mindfulness, laser therapy, vaginal dilators, Ativan (.5mg), etc.

Table 3: Self-reported treatments options women tried prior to entering the MVP at pre-treatment, post-treatment, and 2-month follow-up

Anxiety and Depressive Symptoms: Impact of MVP

Upon examining women's general psychological functioning from pre- to post-treatment, a Bonferroni correction was applied to these analyses to account for multiple significance testing (.05/2 = .03). Significant main effects of time were found, with women's scores on the STAI state subscale, F (1,102) = 6.91, p =.01, and the BDI, F (1,102) = 10.49, p = .002, significantly decreasing from pre- to post-treatment. There was no main effect of PVD type and no interaction between time and PVD type for either measure (ps > 0.05).

Pain-Related Psychological Functioning: Impact of MVP

With regard to women's pain-related functioning and using a Bonferroni correction (.05/5 = .01), there was a significant main effect of time for the PCS rumination subscale, F (1,102) = 24.10, PCS magnification subscale, F (1,102) = 17.16, PCS helplessness subscale, F (1,102) = 53.18, and PISES, F (1,102) = 72.33, ps < .001; these scores significantly improved from pre- to post-treatment. In addition, a trend emerged for decreased scores over time on the PVAQ, F (1,102) = 3.11, p = 0.08, suggesting that pain vigilance/awareness may have been reduced. There was no significant main effect of PVD type, nor was there a significant time x PVD type interaction, for any of the subscales/measures (ps > .05).

Table 4 presents the means and SDs of the outcomes by PVD type at pre- and post-treatment, as well as for the total sample. Effect sizes are also shown in Table 4.

Variable		Primary PVD			Secondary PVD			Total			Effect Size[a]
		N	Mean	SD	N	Mean	SD	N	Mean	SD	
STAI-State[b]	Pre-treatment	31	42.90	10.15	73	41.45	9.69	104	41.88	9.81	0.29
	Post-treatment	31	39.13	13.43	73	39.14	10.12	104	39.14	11.14	
BDI[b]	Pre-treatment	31	11.58	9.66	73	10.36	6.36	104	10.72	7.47	0.33
	Post-treatment	31	8.68	7.60	73	8.66	6.13	104	8.66	6.56	
PCS – Rumination[b]	Pre-treatment	31	8.45	4.64	73	9.42	4.00	104	9.13	4.20	0.64
	Post-treatment	31	6.94	4.36	73	6.74	3.72	104	6.80	3.90	
PCS-Magnification[b]	Pre-treatment	31	3.55	3.21	73	3.97	2.37	104	3.85	2.64	0.54
	Post-treatment	31	2.65	2.76	73	2.70	1.98	104	2.68	2.23	
PCS-Helplessness[b]	Pre-treatment	31	11.77	5.77	73	12.67	5.15	104	12.40	5.33	0.91
	Post-treatment	31	8.10	5.42	73	8.15	5.12	104	8.13	5.18	
PISES[b]	Pre-treatment	31	5.64	1.82	73	5.64	1.82	104	5.67	1.61	1.09
	Post-treatment	31	7.17	1.55	73	7.17	1.55	104	7.19	1.51	
PVAQ[c]	Pre-treatment	31	38.87	12.66	73	38.63	10.89	104	38.70	11.38	0.27
	Post-treatment	31	38.35	12.57	73	35.10	9.29	104	36.07	10.42	

Note: PCS = Pain Catastrophizing Scale (score range 0-52); **PISES** = Painful Intercourse Self-Efficacy Scale (score range 1-10); **PVAQ** = Pain Vigilance and Awareness Questionnaire (score range 0-80); **STAI** = State-Trait Anxiety Inventory (score range 20-80); **BDI** = Beck Depression Inventory (score range 0-63)

[a]Effect sizes shown are Cohen's d and represent the effect size for the total sample between pre and post-treatment

[b]Indicates a significant main effect of time, all ps ≤.01

[c]Indicates a trend for a main effect of time, p < 0.08

Table 4: Psychological outcomes at pre-treatment and post-treatment for women with primary and secondary provoked vestibulodynia (PVD) and the total sample

Follow-Up Analyses for Psychological Functioning

At two-month follow-up, STAI, BDI, PISES, and PCS helplessness subscale data were available for 76 women and PCS rumination subscale, PCS magnification subscale, and PVAQ data were available for 75 women.

Two Month Follow-Up of Anxiety and Depressive Symptoms: Mixed repeated measures ANOVAs with three levels of time included as the within-subjects factor (pre-treatment; post-treatment; two month follow-up), and using a Bonferroni correction (0.5/2 = 0.03), revealed significant main effects of time for both the STAI state subscale, F (2,148) = 4.90, p =.009, and the BDI, F (1.66, 122.86) = 5.52, p = .008 (Greenhouse-Geisser corrected). Scores on these measures significantly decreased with time. No significant main effect of PVD type and no significant time x PVD type interaction were found for either measure (ps> .05). Paired samples t-tests indicated that the reduction in state anxiety and depressive symptoms were maintained from post-treatment to two-month follow-up (Ps> .05).

Two Month Follow-Up of Pain-Related Psychological Functioning: Using a Bonferroni correction (.05/5 = .01) and mixed repeated measures ANOVAs with the three levels of time as the within-subjects factor, a significant main effect of time was found for all of the pain-related measures: PCS rumination subscale [F (2, 146) = 15.96], PCS magnification subscale, [F(1.80,131.43) = 14.39 (Greenhouse-Geisser corrected)], PCS helplessness subscale [F (2,148) = 37.28], PISES [F (2,148) = 47.76] (ps < .001), and the PVAQ, F (1.76,128.63) = 4.90, p = 0.01 (Greenhouse-Geisser corrected). Scores on these subscales/measures improved over time following participation in the MVP. Paired samples t-tests found no significant differences between the pain-related scores at

post-treatment and two-month follow-up, thereby indicating that the improvement in scores were maintained over time (ps> .05). Finally, no significant main effect of PVD type and no significant time x PVD type interaction were found for any of the pain-related measures (ps > .05).

Sexual Penetration: Impact of MVP

At pre-treatment, 87.5% (n = 91) of the sample reported having times when sexual penetration was not possible (n=12 reported they did not have this experience; n=1 had missing data). Seventy-two women provided the sexual penetration data immediately following MVP participation; just over half reported that there were times when penetration was not possible (n = 39; 54.2%), which indicated a significant difference compared to pre-treatment (p<.001). 41.8% (n=23) of the 55 women who provided sexual penetration data at two-month follow-up reported times when penetration was not possible; there was no significant change in the proportion of women reporting that penetration was not possible between post-MVP and follow-up (p=.45), suggesting that the gains in this measure at post-treatment were retained.

Comment

Decreases in anxiety and mood symptoms, as well as decreased pain catastrophizing, increased pain self-efficacy, and a trend towards decreased pain hypervigilance after MVP participation suggest that a brief, multidisciplinary treatment approach may positively impact psychological aspects of PVD. Moderate to large effect sizes were observed for most of the pain-specific measures, with smaller effects detected for hypervigilance, anxiety, and depressive symptoms. Following the MVP, fewer participants also reported having times when penetration was not possible. Our team has previously reported that women who participated in the MVP reported decreased sexual pain and improvement in sexual health [16-18].We hypothesize that the benefits of the program are due to multiple factors which include; benefits of meeting other women with vulvodynia (normalization and validation of their experiences); education about vulvodynia; and development of skills to diminish psychological distress.

This finding is keeping with the recent changes in vulvodynia terminology that explicitly identify factors that may be associated with the "genesis and expression of the pain of vulvodynia" [29]. Pain is both a sensory and emotional experience. Psychosocial factors may be key factors that contribute to a woman's chronic vulvar pain. Researchers have hypothesized that there may be role for using factors, such as psychological distress, to classify women with vulvodynia for the specific purpose of guiding therapy. Allaptu, *et al*. [30] were able to classify women in the National Vulvodynia Registry into two distinct groups; one group with high pain sensitivity and high psychological distress; and the other group with low pain sensitivity and low distress. Chisari, *et al.* [31]. Also reported a relationship between pain severity and psychological distress in a population of women with vulvodynia. It was hypothesized that psychological distress, as measured by depression and anxiety symptoms would be associated with greater pain severity. Negative illness perceptions and certain cognitions or beliefs were also hypothesized associated with greater levels of pain. Higher levels of these pain related cognitions (eg. fear, pain-related anxiety and hypervigilance of perceived impending pain) and behaviours would all be associated with greater levels of pain severity. The study results found: that catastrophizing was found to be significantly associated with greater pain; and that greater psychological distress was associated with greater severity of pain and pain interference.

With regard to the impact on women's anxiety, mood, and pain-specific psychological functioning, the fact that many parts of the MVP were delivered in group likely provided validation and normalized the experience of living with PVD. Women with vulvar pain often report feeling shameful [32], isolated, and lacking in support [33], and previous qualitative research found that group treatment for PVD reduced feelings of isolation and provided a sense of normalization and validation [17,34].

Our MVP also focused heavily on patient education. Previous research has shown that educational seminars alone can significantly improve psychological functioning of women with PVD; including improvement in anxiety and depressive symptoms [35]. Qualitative research conducted within our program has found that many participants do not have adequate information about their condition upon referral [17]. Pain catastrophizing and anxiety may have lessened by providing women with accurate and comprehensive information. Education also serves to validate and normalize the pain experience and may have empowered women to feel more in control and better able to cope with their pain (i.e., more self-efficacious).

Skills learned in the program may have directly contributed to women's improvements. The psychological sessions directly targeted negative cognitions such as catastrophizing and taught CBT (e.g., Thought Records) and mindfulness (e.g., Body Scan) techniques known to reduce anxiety and improve mood. A four-session combined CBT and mindfulness treatment for PVD has recently been shown to significantly improve women's pain-related catastrophizing, hypervigilance, and self-efficacy [36], among other outcomes, thus lending support for the use of psychological skills in the management of PVD. The physiotherapy sessions also emphasized skills-acquisition. For example, women were taught pelvic floor relaxation exercises and guided in the use of vaginal inserts. By helping women approach their pain in a more controlled, self-paced, and relaxed manner, these sessions likely reduced pain-related catastrophizing and vigilance and helped women feel better equipped to manage their PVD symptoms. Given that women with vulvar pain have reported feeling a lack of control over their symptoms [37], and self-efficacy has been shown to be a significant predictor of treatment outcome among women with PVD, even when treatment is topical [19], increasing self-efficacy may have consequences for women's continued progress following active treatment.

There is also the possibility that improvement in psychological symptoms and ability to have penetration were due to a more "cumulative" effort in which the components of our program built on each other. A woman may have been able to apply, for example, some of the anxiety-reduction techniques learned in the psychological skills session to her practice with the physiotherapy exercises. By learning that the various knowledge and skills acquired in the MVP can be applied effectively in different contexts, the woman's anxiety, self-efficacy, and other pain-related outcomes may have improved.

Our analyses also tested for differences between women with primary versus secondary pain. No significant group differences were found, indicating that women with primary PVD may be equally responsive to brief, multimodal treatment despite the longer-term nature of their symptoms. It appears that the primary development of PVD symptoms is not necessarily a barrier to change, as has been previously suggested in research showing differences in treatment outcomes by PVD subtype [38,39]. Clinicians should be aware of the psychological needs of women with PVD, regardless of subtype.

Finally, we found an effect of our program from pre- to post-treatment with regard to women's increased ability to have sexual penetration. We have previously documented that our MVP participants report improvements in sex-related distress, sexual functioning, and dyspareunia [16]. Increased integration of sexual intercourse/penetration is often an important outcome for women seeking treatment for PVD, regardless of their relationship status. Research is needed to understand the underlying mechanisms that make it more possible for women to experience penetration following treatment, including investigation into potential psychological mechanisms.

Limitations to our research include the lack of a control group, which questions the extent to which noted improvements were a direct result of treatment. Recent research indicates that improvement in PVD pain may naturally occur with time [40]. Additionally, the generalizability of the results is limited given the demographic make-up of our sample, and it is not known whether women with different characteristics would receive the same amount of benefit from our programs. This study also did not measure which treatment component(s) offered the most benefit and to whom or whether the noted improvements indeed resulted from the treatments received in our program. A purpose of the MVP is to outline available therapies that may be beneficial and to help facilitate a woman's treatment decisions upon entry into and discharge from the program; as noted in this research, the use of various therapies were reported by participants, including at the post-treatment and follow-up timepoints. Finally, given the specialty providers and amount of resources required, the MVP is not necessarily a feasible model for all health care settings.

Nevertheless, our results highlight the importance of considering a multidisciplinary treatment model for PVD. There is a need for treatment to address the psychological sequelae of PVD: emotional suffering often accompanies PVD and research has documented that anxiety and mood disorders are both a risk factor for developing and a consequence of experiencing vulvodynia [41]. The current research suggests that a multidisciplinary treatment program may have psychological benefits for women, as well as increasing women's ability to have penetration.

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Conflicts of Interest

Drs. Smith and Seal have been employed as therapists by the Multidisciplinary Vulvodynia Program. Dr. Smith was employed as the Interim Director of the Program from July 2014-May 2015 and is the Research Director from 2015-2017. The authors have no other disclosures.

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Condensation

A multidisciplinary treatment program for provoked vestibulodynia appears to positively impact affected women's psychological functioning, as well as ability to have sexual penetration.

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