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Coping with pain in intimate situations: Applying the avoidance-endurance model to women with vulvovaginal pain

Ida Katrina Flink[a,*], Linnéa Engman[a], Moniek M. Ter Kuile[b], Johanna Thomtén[c], Steven J. Linton[a]

[a] Center for Health and Medical Psychology (CHAMP), School of Law, Psychology, and Social Work, Örebro University, Örebro, Sweden
[b] Department of Psychosomatic Gynaecology and Sexology, Leiden University Medical Center, Leiden, The Netherlands
[c] Department of Psychology, Mid Sweden University, Östersund, Sweden

HIGHLIGHTS

- There are few studies about the mechanisms involved in vulvovaginal pain.
- This longitudinal study explored the links between catastrophizing, coping and pain.
- Avoidance and endurance of sexual activities were explored as coping behaviors.
- Avoidance emerged as a mediator of the link between catastrophizing and pain.
- This indicates that reactions as well as coping are central for pain in this group.

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ABSTRACT

Background and aims: Chronic vulvovaginal pain is strikingly common and has a serious impact on women's lives. Nevertheless, there are few longitudinal studies focusing on mechanisms involved in the pain development. One area of interest is how women cope with sexual activities and how this affects their pain. In this study, avoidance and endurance coping behaviors were explored as possible mediators of the relation between catastrophizing and pain, cross-sectionally and longitudinally.
Methods: 251 women (18–35 years old) with vulvovaginal pain were recruited in university settings and filled out questionnaires about their pain, catastrophizing and coping behaviors at two occasions, with five months in between. Multiple mediation models were tested, exploring avoidance and endurance as mediators of the relation between catastrophizing and pain.
Results: The results showed that avoidance was an influential mediator of the link between catastrophizing and pain. Using multiple mediation models we found that although the indirect effects of both avoidance and endurance were significant cross-sectionally, only avoidance was a significant mediator in the combined model exploring associations over time.
Conclusions: This study indicates that the strategies women with vulvovaginal pain use for coping with sexual activities are important for the course of pain. Avoidance and, to a lesser degree, endurance strategies were identified as important mediators of the effects of catastrophizing on pain. When exploring the links over time, only avoidance emerged as a significant mediator.
Implications: In this longitudinal study, catastrophizing was linked to vulvovaginal pain, via avoidance and endurance of sexual activities. Hence, targeting catastrophizing early on in treatment, as well as addressing coping, may be important in clinical interventions.

* Corresponding author at: School of Law, Psychology, and Social Work, 70182 Örebro, Sweden.
E-mail address: ida.flink@oru.se (I.K. Flink).

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1. Introduction

Chronic vulvovaginal pain and other types of gynecological pain are widespread problems, reported by 8–21% of premenopausal women (e.g. [1,2]). The pain has a serious impact on women's lives, affecting daily activities [3] and quality of life [4] as well as sexual activities and satisfaction [5] since vaginal penetration often is very painful. Yet, there are few longitudinal studies focusing on this pain group.

One topic of interest is how these women cope with sexual activities. In other pain populations, fear-related avoidance has emerged as a central coping strategy [6], which may seem functional in the short run but is associated with worse outcome over time because of increased pain and disability. The fear-avoidance model of pain [7] was developed to illustrate this vicious circle, and has been endorsed by substantial empirical support, mainly in people suffering from musculoskeletal pain (see e.g. [6,8]). While fear-avoidance tendencies are acknowledged as maladaptive also in women with vulvovaginal pain (for a review, see [9]), there is limited support for the impact over time. To our knowledge, there is only one prospective study exploring this topic [10]. In that study, changes in fear-avoidance variables over a two-year period were *not* associated with outcomes. Endurance is another frequently used coping behavior in women with vulvovaginal pain (e.g. [11]), but longitudinal data of its influence is lacking.

In line with the fear-avoidance model of pain, avoidance behavior mediates the link between pain catastrophizing (i.e. exaggerated negative cognitions around pain) and pain-related outcomes [7]. An alternative possibility is that women with vulvovaginal pain instead of avoiding rather endure sexual activities, because they catastrophize around other topics than the pain itself (e.g. losing the partner). This hypothesis is supported by evidence that these women more often have intercourse because of mate guarding and duty or pressure motives than women without vulvovaginal pain [12,13]. Endurance behavior may however result in a lack of arousal, insufficient lubrication and an increase in nociceptor sensitization [14]. Hence, an alternative model is that endurance mediates the relationship between catastrophizing and pain-related outcomes. Consequently, there are two possible mediation models to be tested, cross-sectionally, of a descriptive purpose, and longitudinally. Examining mediation in this context is important, as it may help to understand the link between catastrophizing and pain. It may also provide a direction for interventions early on in the pain development. The aim of this study is to explore whether avoidance and/or endurance of sexual activities, when triggered by catastrophizing, might influence vulvovaginal pain over time.

2. Methods

2.1. Design

This longitudinal study is based on a subsample from a larger data set (Sex and Pain, SAP) including women with and without vulvovaginal pain who filled out a number of self-report inventories and were followed over time, in order to study the development of vulvovaginal pain. The current study used data from the first and second measurement points, with five months in between.

2.2. Recruitment

Women between 18 and 35 years were recruited at two universities in two middle sized cities in Sweden. The university setting was chosen to maximize the chances of getting the women to respond on several occasions, which in turn enables analyses of how mechanisms influence vulvovaginal pain over time. All women in 66 classes were invited to remain in the classroom after lectures to get information about the study. The purpose of the study was described as: "...to increase the understanding of sexual pain in women, with the main focus on psychological and relational factors linked to pain, but also to explore sexual habits more broadly." If the women agreed to participate, they filled out informed consents, picked questionnaires from an open box in the classroom, completed the questionnaires, and put them in blank envelopes in a closed box in the classroom. If they preferred to fill out the questionnaires at home, they got the possibility to bring them and hand them in later, in a closed box at the research center. The participants were provided coffee coupons as incentives. Five months later, all participants were sent an identical questionnaire to their home address together with written information about the study and a pre-paid envelope. Non-responders were sent e-mail reminders after two and four weeks. After returning the questionnaire, responders were sent cinema tickets as incentives. The study was approved by the Regional Ethical Review Board in Uppsala, Sweden (D Number 2014-407).

Table 1
Demographic data for the sample at baseline ($N = 251$).

Age (years)	
Mean (*SD*)	23.08 (3.3)
Relationship	
Yes (*n*, %)	198 (79%)
No (*n*, %)	47 (19%)
Other (*n*, %)	6 (2%)
Relationship length (years)	
Mean (*SD*)	3.1 (2.7)
Gender of partner	
Male (*n*, %)	196 (96%)
Female (*n*, %)	6 (3%)
Other (*n*, %)	2 (1%)
Children	
Yes (*n*, %)	25 (10%)
No (*n*, %)	223 (90%)
Pain subscale FSFI (1–6)	
Mean (*SD*)	2.84 (1.3)

2.3. Participants

Inclusion criteria were: (1) 18–35 years old, (2) vulvovaginal pain during the last 6 months ("Have you experienced recurrent pain during sexual intercourse/touch/contact with the vulva during the last 6 months?") and (3) sexually active during the last month. 1034 women completed the questionnaire at the first occasion. 12 women were excluded because informed consents were lacking. Out of the remaining 1022 women, 296 (29%) reported vulvovaginal pain. Of these women 39 were excluded because they were not sexually active and additionally 6 women had too many missing values (>20% or more than 1 missing value/subscale) on the measures used in the analyses. The remaining 251 women constitute the sample of the current study. At the second measurement point, 140 of the 251 women (56%) filled out the questionnaire; of these 2 women had too many missing values on the variables used in the study, resulting in 138 women included in the analyses at time point 2. At the second measurement point, 100 women (72%) reported vulvovaginal pain. Table 1 displays baseline characteristics of the sample. As can be seen, the mean age was 23, nearly 80% were is a relationship and 10% had children. The mean level of pain intensity was 2.84 (out of 10). A non-response analysis between responders at time point 1 only ($N = 111$) and responders answering the questionnaire at both time points ($N = 138$) was executed on the variables age, pain catastrophizing, avoidance, endurance and pain intensity, showing no significant differences between non-responders and responders

on any of the variables ($t(249) = .50$, $p = .62$; $t(249) = -.53$, $p = .60$; $t(249) = .62$, $p = .53$; $t(249) = -.50$, $p = .62$; $t(249) = -.78$, $p = .43$).

2.4. Measures

Swedish versions of all measures were used.

2.4.1. Demographics

The women completed details about their age, health care consumption, relationship status, and children based on questions used in earlier studies on this population [15].

2.4.2. Avoidance and endurance coping behaviors

The CHAMP Sexual Pain Coping Scale (CSPCS) [16] was used to assess endurance and avoidance. This measure was recently developed to assess how women with vulvovaginal pain cope with sexual activities, and is divided into three subscales: avoidance (e.g. "When my sexual partner wants to have intercourse, I make excuses to avoid it because it can be painful", "Because of my pain, my motto is "sex isn't for me".), endurance (e.g. "During painful intercourse, I try to endure because I would feel like a failure if I didn't keep going.", "When intercourse is painful, I try to think of something else and ignore the pain.") and alternative strategies (e.g. "When intercourse is painful, me and my sexual partner try to find other ways to have sex, so that we both can enjoy it."). Responders rate how often they consider each statement being true for them on a seven-point Likert scale (1 = Never true; 7 = Always true). In the preliminary validation of the questionnaire, which was made on a Swedish sample, the psychometric properties of the avoidance and the endurance subscales turned out to be good, whereas the alternative subscale was only partly supported [16]. Consequently, the avoidance and the endurance subscales were used in the current study, and the internal consistency was good (Cronbach's alpha = .77 vs. .86).

2.4.3. Pain

The pain subscale from the Female Sexual Function Index (FSFI) [17] was used to assess pain. This subscale consists of three items reflecting different aspects of pain in relation to vaginal penetration (frequency during intercourse, frequency after intercourse and pain intensity) (e.g. "Over the past 4 weeks, how would you rate your level (degree) of discomfort or pain during or following vaginal penetration?"). The responders rate their answers on a six-point Likert scale, ranging from 0 to 5. As an answer of 0 indicates no sexual activity, women who responded 0 at the first measurement point were excluded from the study. The total score on the subscale ranges from 1 to 6 at the first measurement point, and from 0 to 6 at the second measurement point. To facilitate the interpretation of the results, the total score was reversed, meaning that in our study 6 indicates high levels of pain. FSFI has shown adequate psychometric properties [17], and is validated in a Swedish sample [18]. Cronbach's alpha on the pain subscale in our sample was excellent (Cronbach's alpha = .96 at measurement point 1 and .97 at measurement point 2).

2.4.4. Pain catastrophizing

The Pain Catastrophizing Scale (PCS) [19] was used to assess pain-related catastrophizing as a general tendency, not specifically linked to pain during intercourse. The PCS consists of 13 thoughts and feelings that people may have when in pain, and is divided into three subscales: magnification (e.g. "I keep thinking of other painful events"), rumination (e.g. "I can't seem to keep it out of my mind"), and helplessness (e.g. "I feel I can't go on"). Respondents rate to what extent they experience each thought and feeling on a five-point scale (0 = Not at all; 4 = All the time). The PCS has shown good psychometric properties [19], and the Swedish version is widely used (e.g. [39]). In the present study, we used the total score on the PCS, and the internal consistency was good (Cronbach's alpha = .92).

2.5. Data analyses

IBM Statistical Package of Social Sciences (SPSS) 23.0 was used for the analyses. Missing values were replaced with the individual's mean score of the subscale, allowing maximum one missing value/subscale, if the missing values did not exceed 20%.

First, the data were summarized and inspected through descriptive and correlational statistics. Next, the two proposed mediators (avoidance vs. endurance) of the relation between catastrophizing and pain were combined in a multiple mediation model, cross-sectionally and longitudinally, enabling the comparison of the independent effect of each mediator in relation to the other. Due to high intercorrelation between the two mediators, the pathway through both mediators combined was also accounted for in the model [20]. The PROCESS macro for SPSS [21] was used to establish the indirect effects of the putative mediators in the model, as recommended by Hayes and Rockwood [22]. To evaluate the significance of the indirect effects, the macro generates bootstrapped bias-corrected confidence intervals which indicates significant mediation when the bootstrapped confidence interval does not contain zero [20]. The number of bootstraps ($n = 5000$ bootstrap resamples) were based on recommendations by Hayes [23]. Lastly, effect sizes of the indirect effects were calculated using k^2 to estimate the strength of the indirect effects. k^2 is the ratio of the observed indirect effect to the maximum possible indirect effect that could have occurred, and the recommendations used for determining the effect sizes were: small ~.01; medium ~.09; large ~.25 [24]. The level of significance was set at $p < .05$.

3. Results

First, the associations between the variables in the mediation models were examined. To enhance understanding and provide an overview of the sample characteristics on the variables used in the analyses, Table 2 displays descriptive statistics and correlations between the variables. There were significant positive correlations between all variables, varying between weak ($r = .21$, $p < .05$) and strong ($r = .57$, $p < .001$) [25].

Table 3 displays the results of the multiple mediation analysis where avoidance and endurance were proposed to mediate the relationship between catastrophizing and pain cross-sectionally. The multiple mediation model showed a decrease in the total effect (c, $\beta = .28$, $p < .001$) compared to the direct effect (c', $\beta = .06$, NS) from significant to non-significant at time point 1 (see Fig. 1). Furthermore, there was a significant indirect effect, excluding zero in the bootstrapped confidence interval, through avoidance as a mediator ($a_1 \times b_1$, $\beta = .148$, 95% BCI [.090, .225]), through endurance as a mediator ($a_2 \times b_2$, $\beta = .032$, 95% BCI [.006, .071]), as well

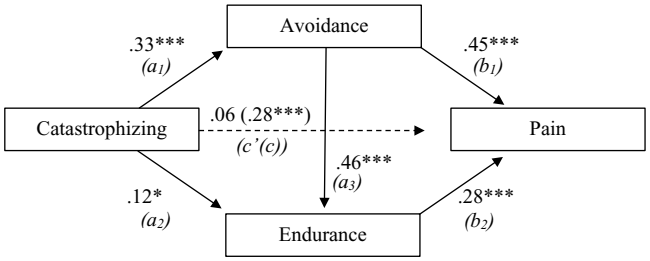

Fig. 1. Multiple mediation model with avoidance and endurance as proposed mediators cross-sectionally. Standardized regression coefficients (β) for the relationship between catastrophizing and pain as mediated by avoidance and endurance, respectively and combined. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Table 2
Descriptive statistics and correlations between the main variables of the study.

	N	Range	*M* (*SD*)	2	3	4	5
1. Pain catastrophizing (PCS, *t*1)	251	0–52	18.28 (10.81)	.36***	.29***	.29***	.21*
2. Avoidance (CSPCS-A, *t*1)	251	4–28	9.18 (5.04)	–	.50***	.57***	.41***
3. Endurance (CSPCS-E, *t*1)	251	4–28	13.78 (6.16)		–	.49***	.33***
4. Pain (FSFI-P, *t*1)	251	0–6[a]	2.84 (1.30)			–	.37***
5. Pain (FSFI-P, *t*2)	138	0–6	2.00 (1.43)				–

Notes. PCS, Pain Catastrophizing Scale; CSPCS-A, CHAMP Sexual Pain Coping Scale-Avoidance subscale; CSPCS-E, CHAMP Sexual Pain Coping Scale-Endurance subscale; FSFI-P, Female Sexual Function Index-Pain subscale. *t*1, time point 1; *t*2, time point 2.
[a] Women scoring 0 at time point 1were excluded from the analysis.
* $p < .05$.
*** $p < .001$.

Table 3
Multiple mediation model of catastrophizing on pain by avoidance and endurance coping, cross-sectionally ($N = 251$).

Model	R^2	β	*SE*	*p*	CI (95%)
Model without mediators					
Catastrophizing → Pain (*c*)		.284	.059	<.001	.168–.401
$R^2_{Y,X}$	.09				
Model with mediators					
Catastrophizing → Avoidance (a_1)		.326	.053	<.001	.222–.431
Catastrophizing → Endurance (a_2)		.117	.054	<.05	.010–.224
Avoidance → Endurance (a_3)		.462	.060	<.001	.344–.582
Avoidance → Pain (b_1)		.454	.065	<.001	.863–1.074
Endurance → Pain (b_2)		.275	.061	<.001	.154–.395
Catastrophizing → Pain (c')		.063	.053	.233, NS	−.041 to .167
$R^2_{M1,X}$	.13				
$R^2_{M2,M1,X}$	.26				
$R^2_{Y,M1M2X}$	.38				
Indirect effects					
Through avoidance ($a_1 \times b_1$)		.148	.034		.090–.225
Through endurance ($a_2 \times b_2$)		.032	.016		.006–.071
Through both mediators ($a_1 \times a_3 \times b_2$)		.042	.013		.021–.072
Total indirect effect		.222	.042		.148–.311

Notes. $R^2_{Y,X}$, proportion of the variance in the pain variable (*Y*) explained by catastrophizing (*X*); $R^2_{M1,X}$, proportion of the variance in the avoidance variable (M_1) explained by catastrophizing (*X*); $R^2_{M2,M1,X}$, proportion of the variance in the endurance variable (M_2) explained by the avoidance variable (M_1) and catastrophizing (*X*); $R^2_{Y,M1M2X}$, is the proportion of the variance in the pain variable (*Y*) explained by avoidance (M_1), endurance (M_2) and catastrophizing (*Y*). The 95% CIs for the indirect effects are obtained by the bias-corrected bootstrap with 5000 resamples. NS = non-significant.

as through both avoidance and endurance as combined mediators ($a_1 \times a_3 \times b_2$, $\beta = .042$, 95% BCI [.021, .072]). When comparing the indirect effects of the mediators, the indirect effect through avoidance was significantly larger than both the indirect effect through endurance ($a_1 \times b_1 - a_2 \times b_2$, $\beta = .116$, 95% BCI [.045, .199]) and through both mediators ($a_1 \times b_1 - a_1 \times a_3 \times b_2$, $\beta = .107$, 95% BCI [.051, .183]). Zero was included in the bootstrapped confidence interval, indicating that there was no significant difference between the indirect effects of endurance as sole mediator and the combined mediators ($a_1 \times a_3 \times b_2 - a_2 \times b_2$, $\beta = .009$, 95% BCI [−.025, .053]).

Table 4 displays the results of the multiple mediation analysis where avoidance and endurance were proposed to mediate the relationship between catastrophizing and pain over time. There was a change from significant to non-significant in the total effect (*c*, $\beta = .22$, $p < .05$) and the direct effect (c', $\beta = .06$, NS) when avoidance and endurance were explored as mediators of the relationship between catastrophizing and pain after five months (see Fig. 2). The bootstrapped indirect effect was significant through avoidance as a mediator ($a_1 \times b_1$, $\beta = .124$, 95% BCI [.046, .253]) and through both mediators in combination ($a_1 \times a_3 \times b_2$, $\beta = .030$, 95% BCI [.005, .080]), excluding zero in the confidence interval. The indirect effect of endurance as a mediator was not significant ($a_2 \times b_2$, $\beta = .008$, 95% BCI [−.020, .058]). However, the

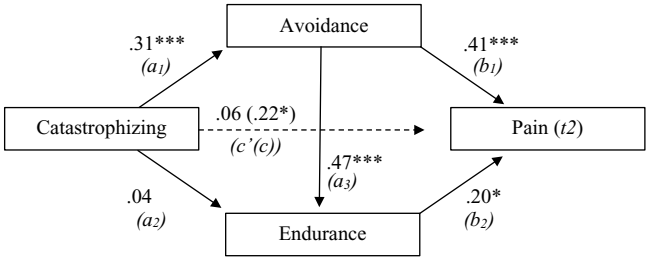

Fig. 2. Multiple mediation model with avoidance and endurance as proposed mediators longitudinally. Standardized regression coefficients (β) for the relationship between catastrophizing and pain as mediated by avoidance and endurance, respectively and combined. *T*2 = time point 2. *$p < .05$; **$p < .01$; ***$p < .001$.

indirect effect through avoidance was significantly greater than through both mediators combined ($a_1 \times b_1 - a_1 \times a_3 \times b_2$, $\beta = .095$, 95% BCI [.008, .218]), when comparing their individual indirect effects.

4. Discussion

This study suggests that avoidance is an influential mediator of the relationship between catastrophizing and vulvovaginal

Table 4
Multiple mediation model of catastrophizing on pain by avoidance and endurance coping, longitudinally ($N = 138$).

Model	R^2	β	*SE*	*p*	CI (95%)
Model without mediators					
Catastrophizing → Pain (c)		.224	.091	<.05	.044, –.405
$R^2_{Y,X}$	.04				
Model with mediators					
Catastrophizing → Avoidance (a_1)		.307	.067	<.001	.174–.440
Catastrophizing → Endurance (a_2)		.038	.082	.642, NS	–.124 to .201
Avoidance → Endurance (a_3)		.472	.098	<.001	.279–.666
Avoidance → Pain (b_1)		.405	.116	<.001	.174–.635
Endurance → Pain (b_2)		.204	.095	<.05	.016–.391
Catastrophizing → Pain (c')		.063	.090	.489, NS	–.116 to .242
$R^2_{M1,X}$	.13				
$R^2_{M2,M1,X}$	.18				
$R^2_{Y,M1M2X}$	.20				
Indirect effects					
Through avoidance ($a_1 \times b_1$)		.124	.050		.046–.253
Through endurance ($a_2 \times b_2$)		.008	.018		–.020 to .058
Through both mediators ($a_1 \times a_3 \times b_2$)		.030	.018		.005–.080
Total indirect effect		.162	.055		.070–.287

Notes. $R^2_{Y,X}$, proportion of the variance in the pain variable (Y) explained by catastrophizing (X); $R^2_{M1,X}$, proportion of the variance in the avoidance variable (M_1) explained by catastrophizing (X); $R^2_{M2,M1,X}$, proportion of the variance in the endurance variable (M_2) explained by the avoidance variable (M_1) and catastrophizing (X); $R^2_{Y,M1M2X}$, is the proportion of the variance in the pain variable (Y) explained by avoidance (M_1), endurance (M_2) and catastrophizing (Y). The 95% CIs for the indirect effects are obtained by the bias-corrected bootstrap with 5000 resamples. NS = non-significant.

pain. Using multiple mediation models we found that although the indirect effects of both avoidance and endurance were significant cross-sectionally, the combined model exploring associations over time demonstrated that avoidance was the only influential mediator over time.

These findings are in line with the extensive support for avoidance as being a salient risk factor for persistent pain and disability [6,8]. In the area of vulvovaginal pain, fear-avoidance beliefs – the cognitive aspect of avoidance behaviors – have been linked to increased sexual dysfunction, negative emotional reactions to pain and higher pain ratings [9]. Likewise, pain catastrophizing has been identified as a critical component, both in other pain problems (e.g., [26,27]) and in vulvovaginal pain (e.g., [28,29]). Our findings verify and extend the support for catastrophizing as well as avoidance behavior as being central factors also in women with vulvovaginal pain. More specifically, when catastrophizing is associated with avoidance behavior, this may lead to an increase in pain over time.

Our results are in line with the fear-avoidance model [7], highlighting the similarities between vulvovaginal pain and other pain disorders. However, our findings contradict the results from an earlier study where changes in fear-avoidance variables over a 2-year time period did *not* predict pain outcomes [10]. One explanation of the conflicting results is that Davis and colleagues used an indirect measure of avoidance by asking participants to recall the frequency of attempted sexual intercourse. The number of attempts, successful or not, was taken as a measure of avoidance. As the authors themselves admit, their measure relied on recall, and consisted of a single item which did not take into account practical circumstances (e.g. the willingness of the partner). Our measure of avoidance was a more general one, including behavioral as well as cognitive aspects, which may have resulted in a more sensitive measure. Taken together, our findings suggest that the psychological mechanisms in vulvovaginal pain is fairly similar to in other pain conditions.

One aspect where vulvovaginal pain differs from other pain conditions is that the pain occurs in an intimate interpersonal context. The partners' reaction to the pain (i.e. the coping strategies of the partner) has been shown to interact with the women's reaction, and the dyadic adjustment influences on pain and relational outcomes (see e.g., [30]). In this, the fear-avoidance model may not fully explain coping in women with vulvovaginal pain, pointing at a dire need for an expanded version of the model, taking the interpersonal context into account [9]. Nevertheless, the impact of partner responses on the woman's coping behavior goes beyond the scope of the current study.

Although endurance was a mediator between catastrophizing and pain cross-sectionally, it was not significant in the longitudinal analysis. There may be several reasons for this. First, earlier studies on the importance of endurance on outcomes in other pain populations have yielded mixed findings [31]. This indicates that although endurance may be maladaptive, it does not have the same impact on pain as avoidance. Secondly, in our study we only assessed pain-related catastrophizing, and not catastrophizing about other issues such as losing the relation or letting the partner down. It may be that endurance of vaginal intercourse is more closely linked to other types of catastrophizing, beyond the pain itself. Our measure of endurance does indeed involve interpersonal aspects which may influence the tendency to endure vaginal intercourse despite pain (e.g. "When I have intercourse and it's painful, it's more important that my sexual partner is satisfied than it is to take my pain into consideration"). In an earlier study, nearly half of the women who experienced pain during vaginal intercourse reported that they continued despite discomfort, often because they did not want to displease their partner [11].

According to the *approach-avoidance motivational theory*, women may engage in sexual activities despite pain if the goal of enhancing intimacy is viewed as more important than avoiding pain [32]. If so, there may be cases where endurance is linked to positive affect which in turn counteracts its maladaptive impact on outcomes. This would be in line with the Avoidance-Endurance Model (AEM) of pain [33], in which different enduring subgroups have been identified. Likewise, in women suffering vulvovaginal pain there may be subgroups in which endurance plays different roles, and earlier studies support this assumption. In women with provoked vestibulodynia, for instance, approach sexual goals which may be reflected in endurance, have been linked to higher sexual and relationship satisfaction [34]. This means that endurance may not be regarded as a purely maladaptive coping strategy – its influence rather depends on the woman's goals.

From the current findings we cannot tell whether avoiding and enduring strategies are opposites or if they may be used in combination. One possibility is that there are women who both avoid

and endure vaginal intercourse, depending on the different goals within that specific situation [35]. Although these strategies might seem to be antonyms, the intercorrelation between them in the current study was large (.5). Consequently, one suggestion for future research is to explore if avoidance and endurance are separate strategies or if they are used in combination.

The longitudinal design of this study is a clear strength considering that there have been few prospective studies focusing on this population. Yet, the time frame was fairly short (five months), risking an underestimation of the mediation effects. Also, we need to keep in mind that only two assessment points were used in the mediation analyses, which naturally threatens the conclusions that can be drawn. We view this as a first study, and the results need to be replicated with three assessment points and a longer time between baseline and follow-up. An obvious shortcoming relates to the sample selection. As we do not have data of how many women were invited to participate, we cannot provide an exact response rate. Consequently, we miss information about whether women who agreed to participate in the study differed from the ones who did not. To maximize the chances of getting a fairly large sample in an age group important for sexual and relational development, the participants were recruited in a university setting where it was possible to track students over time. Nevertheless, nearly 20% of the sample was lost at the follow up assessment, and although these women did not differ at the first assessment, we cannot exclude that this may have influenced the results. Although attrition is a well-known problem in longitudinal studies [36], it naturally limits the conclusions that can be drawn. Yet, our purpose was not to report on epidemiological outcomes such as prevalence, where it is crucial to have a representative sample, but instead to study psychological mechanisms. Therefore it should be less sensitive to the make-up of the sample. Another potential limitation is that women who totally avoided vaginal penetration were excluded from the analyses, as our pain measure (the FSFI) asks about pain specifically during intercourse. However, the FSFI is the most frequently used measure in this context, and also the coping measure requires some degree of sexual activity to be relevant. An additional potential drawback is the measure used for assessing avoidance and endurance. This measure has recently been developed and validated [16] which may raise questions about its psychometric robustness. One shortcoming is that the measure includes both clear coping behaviors, as well as thoughts behind the coping behaviors. This means that it captures more aspects of coping than the pure behavior. Nevertheless, to our knowledge there are no other measures of coping in this group and we have used the subscales that were found to have sound psychometric properties [16].

In sum, this study indicates that the strategies women use for coping with sexual activities when suffering from vulvovaginal pain are important for the development of chronic pain. We have identified avoidance and, to a lesser degree, endurance strategies as important mediators of the effects of catastrophizing on pain. This has considerable clinical importance since these women are often given recommendations that involve avoidance or endurance. Both strategies may be helpful in certain contexts allowing women to accommodate to the circumstances, but our results indicate that avoidance may be a risk factor for prolonged pain problems in the long run. Graded exposure in vivo, which focuses on reducing excessive avoidance behavior through gradual confrontation to the feared (sexual) stimuli, may be a viable treatment strategy for women with high levels of avoidance. Indeed, exposure has shown to be successful in decreasing fear and negative penetration beliefs in women with lifelong vaginismus [37,38]. The effect of exposure in women with other types of vulvovaginal pain is still to explore. Taken together, future research is direly needed to explore further the characteristics of adaptive coping in this group.

5. Conclusions

This study indicates that the strategies women with vulvovaginal pain use for coping with sexual activities are important for the course of pain. Avoidance and, to a lesser degree, endurance strategies were identified as important mediators of the effects of catastrophizing on pain. When exploring the links over time, only avoidance emerged as a significant mediator.

6. Implications

In this longitudinal study, catastrophizing was linked to vulvovaginal pain, via avoidance and endurance of sexual activities. Hence, targeting catastrophizing early on in treatment, as well as addressing coping, may be important in clinical interventions.

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Ethical issues

The participants filled out informed consents and the study was approved by the Regional Ethical Review Board in Uppsala, Sweden (D Number 2014-407). The study protocol was not registered.

Conflict of interest

The authors have no conflicts of interest in relation to this study.

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