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PAIN

Attentional Bias for Pain and Sex, and Automatic Appraisals of Sexual Penetration: Differential Patterns in Dyspareunia vs Vaginismus?



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ABSTRACT

Introduction: Current information processing models propose that heightened attention bias for sex-related threats (eg, pain) and lowered automatic incentive processes (“wanting”) may play an important role in the impairment of sexual arousal and the development of sexual dysfunctions such as genitopelvic pain/penetration disorder (GPPPD). Differential threat and incentive processing may also help explain the stronger persistence of coital avoidance in women with vaginismus compared to women with dyspareunia.

Aims: As the first aim, we tested if women with GPPPD show (1) heightened attention for pain and sex, and (2) heightened threat and lower incentive associations with sexual penetration. Second, we examined whether the stronger persistence of coital avoidance in vaginismus vs dyspareunia might be explained by a stronger attentional bias or more dysfunctional automatic threat/incentive associations.

Methods: Women with lifelong vaginismus (n = 37), dyspareunia (n = 29), and a no-symptoms comparison group (n = 51) completed a visual search task to assess attentional bias, and single target implicit-association tests to measure automatic sex-threat and sex-wanting associations.

Results: There were no group differences in attentional bias or automatic associations. Correlational analysis showed that slowed detection of sex stimuli and stronger automatic threat associations were related to lowered sexual arousal.

Conclusion: The findings do not corroborate the view that attentional bias for pain or sex contributes to coital pain, or that differences in coital avoidance may be explained by differences in attentional bias or automatic threat/incentive associations. However, the correlational findings are consistent with the view that automatic threat associations and impaired attention for sex stimuli may interfere with the generation of sexual arousal.

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Key Words: Dyspareunia; Vaginismus; Genital Pain; Attentional Bias; Implicit Measures; Sexual Arousal

INTRODUCTION

Genital pain is a common phenomenon in women, and a substantial proportion of women (20%–47%) report regular pain experiences during coitus.^{1–3} Genital pain and fear of

genital pain are also core symptoms of the *Diagnostic and Statistical Manual, 5th edition* (DSM-5)-defined genitopelvic pain/penetration disorder (GPPPD).⁴ Current information processing models of sexual arousal propose that attentional processes may be critically involved in the impairment of sexual arousal and the persistence of sexual problems such as genital pain.^{5–7} If attention is preferentially directed toward threatening aspects of having sex, this may impede the development of sexual arousal. Attempts of penile-vaginal penetration in the absence of sufficient arousal and lubrication may well result in genital pain. Repeated painful experiences may increase both fear of pain and vigilance for pain cues, leading to further impairment of sexual arousal.^{8,9} Consistent with the view that attentional bias for pain might be involved in GPPPD, women with dyspareunia showed relatively strong color naming interference effects when pain-related stimuli (eg, burning, cutting) were presented in a

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modified Stroop task.¹⁰ However, we cannot be sure that the interference effects during the Stroop task reflect processing priority; it also may reflect attempts to inhibit the processing of pain stimuli¹¹ or fear-induced rumination.¹² Therefore, the first aim of this study was to test further whether women with coital pain are indeed characterized by an attentional bias for pain-related stimuli in terms of faster detection and heightened distraction.

In this study we also measured attentional bias for sex stimuli. Because sex has frequently been paired with the experience of pain, sex stimuli may have acquired pain-signaling properties in women with coital pain. Such acquired threat value may promote avoidance of sex cues. Consistent with this view, women with dyspareunia showed relatively few eye fixations on sex-relevant details in a free viewing task.¹³ Actively avoiding the processing of sexual cues (eg, attention regulation) interferes with the generation of sexual arousal,^{7,14} which in turn may contribute to the development or persistence of GPPPD.^{13,15} In line with the view that threat signals will elicit enhanced vigilance and increased distraction,¹⁶ a visual probe study that focused on the initial more automatic allocation of attention found that female students who reported relatively frequent experiences of coital pain and low sexual arousal showed a relatively strong attentional bias for verbal sex stimuli.¹⁵ In the current study we tested the robustness of these earlier findings and examined if women with GPPPD show a heightened attentional bias for sex stimuli. In addition, we examined whether we could replicate the earlier finding that attentional bias for sexual stimuli was associated with low sexual arousal.

We included both women with dyspareunia and women with lifelong vaginismus. Despite the recent integration of vaginismus and dyspareunia into a single diagnosis within the DSM-5, there are striking coping differences towards sexual penetration attempts between the 2 groups. There is evidence indicating that the prospect of genital penetration elicits relatively strong fear-avoidance tendencies in women with vaginismus,¹⁷ whereas women with dyspareunia show stronger task persistence in the context of painful intercourse.¹⁸ These differences in avoidance/persistence tendencies towards penetration cues may be due to differences in sensitivity for signals of pain (attentional bias). Therefore, we tested whether women with dyspareunia are less vigilant for and less distracted by (signals of) pain than women with vaginismus.

In addition, vaginal penetration has been shown to be more strongly connected to threat in women with vaginismus than in women with dyspareunia.^{17,19} Therefore, we also tested if sexual penetration stimuli elicited weaker automatic threat associations in women with dyspareunia than in women with vaginismus. Finally, differences in penetration attempts between women with dyspareunia and women with vaginismus may relate to differences in approach motivation.²⁰ Sexual penetration stimuli may elicit stronger automatic incentive processes^{21,22} (“wanting”) in women with dyspareunia than in women with vaginismus. Therefore, we also tested if women with dyspareunia show

stronger automatic wanting associations with sexual penetration stimuli than women with vaginismus.

Together, we tested the following hypotheses: (1) women with GPPPD show heightened attentional bias for pain stimuli relative to controls and the attentional bias for pain is especially pronounced in women with vaginismus; (2) women with GPPPD show heightened attentional bias for sex stimuli relative to controls, and the attentional bias for sex is especially pronounced in women with vaginismus; (3) women with vaginismus show stronger penetration-threat associations than women with dyspareunia; (4) women with dyspareunia show stronger automatic wanting associations towards sexual penetration stimuli than women with vaginismus; (5) independent of diagnosis, lower sexual arousal will be associated with heightened attentional bias for both pain and sex, together with weaker sex-wanting and stronger penetration-threat associations.

METHODS

Participants

Patients were referred by a gynecologist or general practitioner to the Regional Centre of Sexology from Maastricht University Medical Centre. Inclusion criteria for the clinical group were lifelong vaginismus (never been able to engage in full intercourse, ie, the penis never passed the pelvic floor muscles) or, for the dyspareunia group, genital pain in at least 50 % of (attempted) vaginal penetrations for at least 3 months duration; age between 19 and 45 years, good command of the Dutch language, and a heterosexual relationship for at least 3 months. Participants were excluded in case of pregnancy, breast-feeding, major affective disorder, psychotic disorder, substance-related disorder, post-traumatic stress disorder resulting from sexual abuse (according to DSM-IV-TR criteria,²³ which was used in the Netherlands at the time of the study, or a physical explanation for the sexual dysfunction). All women with dyspareunia/ vaginismus underwent a standardized physical examination²⁴ to exclude physical causes for the complaint. The diagnosis of lifelong vaginismus/ dyspareunia was assessed in the context of a full sexual history.

The control sample was recruited through advertisements at the university, in the local media, and by personal contact. Inclusion criteria for the control women were: absence of sexual problems, age between 19 and 45 years, good command of the Dutch language, and a heterosexual relationship for at least 3 months. The study was approved by the medical ethical committee of the Maastricht University Medical Centre (P06-130). Some of the participating women with vaginismus and some in the control group also participated in another study.²⁵ The total study sample consisted of 117 participants: 37 women with vaginismus, 29 women with dyspareunia, and a control group of 51 participants without sexual complaints. [Table 1](#) shows the demographic characteristics. There were no significant differences in terms of age, years of education, or cohabitation-status between the groups.

Table 1. Demographic and clinical characteristics

	Dyspareunia (n = 29)	Vaginismus (n = 37)	Controls (n = 51)	Total (n = 117)	Between groups value/or F value	Effect size Cramer's v/or ηp^2	Vag vs dysp value/or t value	Effect size Cramer's v
Age (M/SD)	25.6 (6.1)	26.5 (6.3)	25.2 (5.2)	25.7 (5.8)	.57	ns	.3	ns
Lives with partner (% yes)	41.2	57	37	44	3.5	ns	.9	ns
Education (%)					2.5	ns	1.4	ns
Secondary school	3.6	2.7	3.9	3.4				
Higher secondary school	57.1	48.6	39.2	46.6				
College- university	39.3	48.6	56.9	50				
Religion (% yes)	48.3	70.3	49	55.6	4.7	ns	3.3	ns
Coitus attempts (% yes)	71.9%	28.9%	97.9%	68.6%	47.1 [†]	.6	12.8 [†]	.4*
Arousal (FSFI)	3.9 (1.1)	4.3 (1.5)	5 (.8)	4.5 (1.2)	11.5 [†]	.2	1.1	ns

M = Mean; SD = standard deviation; ηp^2 = partial eta squared.

Women with dyspareunia had significantly less coitus attempts than control women [$\chi^2 (1) = 11.9^$, $cramer's\ v = .39$].

[†] $P \leq .001$.

Part of the (vaginismus and control) sample that participated in another study²⁵ did not receive single target Implicit Association Tests (st-IATs). Therefore, analyses of the st-IAT results were restricted to a subsample of 82 participants (19 women with vaginismus (age $M = 25.37$, $SD 6.69$), 32 women with dyspareunia (age $M = 25.84$, $SD 6.09$), and 31 control women (age $M = 24.87$, $SD 4.48$)). Participants received 20 euros as compensation for their participation in the study.

Main Outcome Measures

Visual Search Task

We used a Visual Search Task (VST)²⁶ to measure attentional bias for pain and sexual stimuli. The VST can differentiate between 2 relevant components of attention: enhanced vigilance, evidenced by faster detection of relevant (pain/sex) cues, and heightened distraction.²⁷ Each trial started with a tone followed by a 500-ms fixation cross in the middle of the screen. Subsequently, participants were presented with a 5×4 matrix of 20 words. Participants had to indicate as fast as possible whether the matrix contained 20 words of the same category or contained one word from a different category by pressing the proper button of a response box.

For the pain VST, 3 word categories were used: 1 pain-related (eg, irritating, prickly, stinging etc.), and 2 neutral control categories: color (eg, green, purple) and nationality (eg, Belgian, Spanish). Also for the sex VST, 3 word categories were used: sexual words (eg, penetration, penis, arousal), and words from 2

types of neutral control categories: cooking (eg, draining, kitchen) and sport (eg, rugby, running).^a

Matrices on target-present trials consisted of 1 pain (or 1 sex) word among 19 neutral words, 1 neutral word among 19 pain (or 19 sex) words, 1 neutral word (eg, nationality) among 19 neutral words from another neutral category (eg, colors). Each of the 6 types of matrices was shown 19 times to each participant. The first 12 trials were presented as practice trials, followed by the test phase of 114 target-present trials and 30 target-absent trials. The function (ie, target or distractor) of the neutral categories was counterbalanced over participants.

Because only the target-present trials were relevant for testing the hypotheses, the analyses were restricted to these trials. Errors (ie, misses; pain: 8.7%; sex: 6.4%) and missing data (only in the pain task, 0.1%) of the target-present trials, responses faster than 200 ms (1 trial in the pain task) and higher than 3 SD above the overall mean of the remaining response latencies were excluded (pain: 1.3%; sex 0.9%). False

^aTo construct the genital pain category, we initially selected the 28 most often mentioned pain words from the McGill Pain Questionnaire Dutch Language Version by women with dyspareunia.^{28,29} For the Sex VST, we selected 32 commonly used sexual words that describe male and female genitals, and sexual behavior. On the basis of a pilot study among women with dyspareunia ($n = 20$), lifelong vaginismus ($n = 22$), or without symptoms ($n = 20$) we selected for each category the 20 words with highest scores on familiarity and representativeness.

alarm rates to the target-absent trials were low (Pain VST: pain: 2.3%; color 4.7%; country: 2.3 %; Sex VST: sex: 3.5%; sport: 5.1%; cook: 5.2%).

Single Target Automatic Association task (st-IAT)

The st-IAT was developed to assess to what extent a single target category (in this case, vaginal penetration) is associated with 2 attribute categories.^{25,30} We used a “threat vs safe” and a “wanting” vs not wanting” st-IAT to assess the role of “threat” and “wanting” associations with sexual penetration. Target stimuli were pictures representing vaginal penetration. Attributes were “threat- vs safe-related and “wanting”- vs “not wanting”-related words. The st-IAT started with 20 practice trials, followed by 2 test phases. Participants were instructed to sort sexual pictures and attribute words that appeared in the middle of a computer screen as fast as possible into the appropriate category by pressing either the P or Q keys on a keyboard. In 1 test phase, “sex pictures” and “threat”/“not wanting” were mapped onto a single response key and “safe”/“wanting” on the other. In the other test phase, this mapping was reversed. The target-attribute combinations that shared response keys were counterbalanced. Each critical test phase consisted of 60 trials in which responses were divided equally over the 2 response keys to prevent response bias.

The D-4 measure was computed^{31,32} on the trials of the test phases.^{25,30} A negative D-measure reflected relatively strong threat and weak wanting associations.

Female Sexual Function Index

To index sexual arousal we used the total score of the four-item sexual arousal subscale of the Female Sexual Function Index (FSFI)^{33,34} Since the FSFI is only considered valid if the respondent has been sexually active in the preceding 4 weeks,³⁵ women who did not engage in sexual activity in the preceding 4 weeks were excluded from analyses involving the FSFI (4 women with vaginismus, 1 woman with dyspareunia). Cronbach’s α of the arousal subscale were satisfactory for all subgroups (vaginismus $\alpha = 0.87$, dyspareunia $\alpha = 0.73$, and controls $\alpha = 0.84$).

Penetration Behavioral Questionnaire

To index intercourse behavior during the last 4 weeks, the 1 item “intercourse attempts” of the Penetration Behavioral Questionnaire (PBQ) was used.^{36,37} The PBQ is rated on a 4-point scale: (a) not attempted, (b) attempted but unsuccessful, (c) attempted and sometimes successful, and (d) attempted and always successful. Ratings were dichotomized with 0 reflecting not attempted (a) and 1 reflecting attempted (a, b, or c).

Procedure

After informed consent was obtained, participants received a personalized internet link to complete the questionnaire at home. Thereafter the lab session took place. To prevent undesirable priming effects on our measure of attentional bias, the pain and sex VSTs were presented first (in counterbalanced order). After a

10-minute break the experiment continued with the threat and wanting st-IATs (and 2 IATs that were unrelated to this study), also in counterbalanced order. We also included a group of participants who completed the VSTs in the context of another study.²⁵ These participants also started the lab session with the VST but completed the questionnaire after the VST the during lab session. Comparing the subgroups revealed no significant differences in outcome variables (VST).

Analyses

To examine group differences in detection speed, reaction times (RTs) on Target trials of the VST were subjected to a 3 (Group) \times 2 (Target: Pain/Sex vs Neutral) repeated measures ANOVA. Differences in distraction were tested with a 3 (Group) \times 2 (Distractor: Pain/Sex vs Neutral) repeated measures ANOVA on Distractor trials. To assess group differences in automatic sex appraisal, we used multivariate ANOVAs with groups as independent variables and the D-4 measures^{31,32} of the threat and wanting st-IAT as the dependent variable. For all analyses, effect sizes are reported using Partial Eta squared η^2 .³⁸

Bivariate correlations were computed to evaluate the relationships between attentional bias, automatic associations, and sexual arousal. Attentional bias scores were calculated by subtracting mean scores (RTs) of pain and sex VSTs from the mean scores (RTs) of the neutral VSTs. Negative scores reflected slower detection/more distraction, whereas positive scores reflected faster detection/less distraction than neutral targets.

RESULTS

Clinical Characteristics

As can be seen in Table 1, women with dyspareunia showed more coital attempts than women with vaginismus, but women with dyspareunia reported significantly less attempts than control women. Women with dyspareunia and vaginismus reported significantly lower sexual arousal than women in the control group.

Attentional Bias for Sexual and Pain Stimuli

Technical problems led to missing data in the Pain VST for 3 in the control group, and in the Sex VST for 4 women in the vaginismus group, 1 in the dyspareunia group, and 3 in the control group. Table 2 shows the RTs for the various types of trials as a function of group. Main effects for Target Pain $F(1110) = 4.9$, $P = .029$, $\eta^2 = 0.04$ and Target Sex $F(1107) = 20.78$ $P < .001$, $\eta^2 = 0.16$ were found, indicating that overall, women were significantly faster to detect both pain and sex targets than neutral targets in arrays of neutral stimuli. Main effects of Distractor Pain: $F(1110) = 6.8$, $P = .01$, $\eta^2 = 0.06$ and Distractor Sex: $F(1107) = 31.25$, $P < .001$, $\eta^2 = 0.23$ were found, indicating that participants were significantly quicker to detect a neutral target in an array of pain stimuli, than in an array of neutral distractors. In a similar vein, participants

Table 2. Outcome VST and st-IAT tasks

VST		Reaction times			
		Dyspareunia	Vaginismus	Controls	Total
Pain VST		(<i>n</i> = 29)	(<i>n</i> = 37)	(<i>n</i> = 48)	(<i>n</i> = 114)
t pain	Mean (SD)	4341 (671.16)	4257.08 (879.25)	4033.06 (669.79)	4184.1 (749.84)
t/d no pain	Mean (SD)	4361.74 (590.17)	4368.05 (706.08)	4209.67 (700.91)	4299.15 (674.54)
d pain	Mean (SD)	4230.45 (714.76)	4363.3 (714.76)	4007.81 (687.89)	4179.82 (728.08)
Sex VST		(<i>n</i> = 28)	(<i>n</i> = 33)	(<i>n</i> = 48)	(<i>n</i> = 110)
t sex	Mean (SD)	4172.02 (791.93)	4102.35 (891.89)	3951.1 (727.44)	4050.89 (793.83)
t/d no sex	Mean (SD)	4342.09 (934.8)	4430.13 (837.43)	4303.59 (753.55)	4350.65 (818.38)
d sex	Mean (SD)	4111.97 (837.16)	4044.55 (789.06)	3841.54 (645.2)	3968.96 (742.83)
st-IAT		D-4 measures			
		(<i>n</i> = 25)	(<i>n</i> = 14)	(<i>n</i> = 29)	(<i>n</i> = 68)
Threat	Mean (SD)	.04 (.23)	-.10 (.37)	.04 (.32)	.01 (.30)
Wanting	Mean (SD)	.29 (.49)	.21 (.68)	.18 (.70)	.23 (.61)

d = distractor; SD = standard deviation; st-IAT = single target Implicit Association Test; t = target; VST = Visual Search Task.

were quicker to detect a neutral target in an array of sex stimuli, than in an array of neutral distractors. These effects were comparable across groups, as evidenced by the absence of significant interactions with group, $F \leq \sum 1.11$; $P \geq .35$; $\eta^2 \leq .02$.

Implicit Threat/Wanting Associations

Technical problems (failure to save data) led to missing data for 5 women in the vaginismus group, 7 in the dyspareunia group, and 2 in the control group. The D-4 scores are presented in Table 2. For the sex-wanting task the st-IAT index was overall larger than 0 as evidenced by a significant intercept $F(1, 65) = 8.44$, $P \leq .01$, $\eta^2 = 0.12$, indicating that women had overall stronger automatic wanting than not-wanting associations with vaginal penetration pictures. There was no significant main effect of Group $F(2, 65) = 0.22$, $P = .8$, $\eta^2 = .01$, indicating that the automatic wanting associations were similar for all groups. For the sex-threat st-IAT, overall the index did not significantly differ from 0 $F(1, 65) = 0.03$ $P = .86$, $\eta^2 = .001$. In addition, the index was similar across groups as evidenced by the absence of a main effect of Group $F(2, 65) = 1.21$ $P = .31$, $\eta^2 = .04$.

Relationships Between Attention and Automatic Threat, and Wanting Associations and Sexual Arousal

Low sexual arousal was related to slow detection of sex stimuli and relatively strong automatic sex-threat appraisals. Automatic sex-wanting associations appeared unrelated to sexual arousal scores. Furthermore, the D-4 scores of the 2 st-IATs correlated positively with each other, indicating that the stronger the automatic sex-threat associations the weaker the sex-wanting associations. No relationships were found between attentional bias for pain or sex and automatic associations. Table 3 shows the relationships of attention, implicit appraisals, genital pain, and sexual arousal.

DISCUSSION

This study examined attentional bias for pain and sex together with automatic sex-wanting and sex-threat associations in the context of GPPPD. The main findings can be summarized as follows: (1) women generally showed an attentional bias for pain and sex as indexed by both faster detection and heightened distraction; (2) women generally showed stronger automatic sex/wanting than sex/not-wanting associations, whereas their sex/threat and sex/safe associations were of similar strength; (3) the strength of the attentional biases and automatic sex-associations were similar for all groups; and (4) overall, low sexual arousal was associated with slow detection of sex-relevant target words and strong sex-threat associations.

Attentional Bias

Women were generally quicker to detect pain and sex stimuli than neutral stimuli. This response pattern was similar for all groups and thus, the hypothesis that women with GPPPD are characterized by a facilitated detection of pain or sex stimuli and/or heightened distraction by pain or sex stimuli was not supported.

These findings seem inconsistent with earlier work showing an attentional bias for pain-related words in women with dyspareunia.¹⁰ However, this earlier study used the Emotional Stroop task (ES), and several authors have challenged the validity of the ES as an index of attentional bias.^{11,12} The current failure to find a heightened attentional bias for pain stimuli in women with GPPPD parallels the failure to find a robust attentional bias towards pain-related words or pictures in chronic pain patients.³⁹ So far, attentional bias has mainly been indexed by visual tasks. However, the visual dimension might not be the most critical in the context of pain. To further examine the relevance of attentional bias in GPPPD it might be important for future research to use tactile (eg, genital pressure) instead of visual stimuli.

Table 3. Relationships of attention, implicit appraisals, genital pain, and sexual arousal

	VST t-Pain	VST d-Pain	VST t-Sex	VST d-Sex	st-IAT threat	st-IAT wanting
t-Pain (<i>n</i> = 113)						
d-Pain (<i>n</i> = 113)	.43 [†]					
t-Sex (<i>n</i> = 107)	.03	.08				
d-Sex (<i>n</i> = 107)	.02	.1	.65 [†]			
st-IAT threat (<i>n</i> = 62)	.16	-.13	-.1	-.02		
st-IAT wanting (<i>n</i> = 63)	.21	.08	.19	.14	.31*	
Genital pain (<i>n</i> = 118)	-.11	.03	.05	-.04	-.05	.07
Arousal (<i>n</i> = 123)	-.05	-.01	.17*	.04	.25*	.07

d = distractor; St-IAT = single target Implicit Association Test; t = target; VST = Visual Search Task.

**P* ≤ .05.

[†]*P* ≤ .01.

Interestingly, the correlational analyses across groups showed that slowed detection of sex stimuli was related to *lower* levels of sexual arousal. Thus consistent with the information processing model of sexual arousal,⁶ this finding suggests that impaired attention for sex may hinder the generation of sexual arousal. To arrive at more final conclusions it would be important to replicate the current findings, preferably in studies using multiple indices of attentional bias.¹⁴

Automatic Associations

The current study showed an overall relationship between relatively strong automatic sex-threat associations and relatively low levels of sexual arousal. Previous studies already showed that *self-reported* threat appraisals may interfere with the generation of sexual arousal.^{40,41} The current study is the first to show also that more *automatic* sex-threat associations are associated with low sexual arousal.^{25,30} To modify low sexual arousal it may be important to target both the more deliberate and automatic threat appraisals.⁴²

In line with previous research,^{25,30} the current study failed to find evidence for heightened automatic penetration-threat associations in women with GPPPD. Together the available findings suggest that in women with GPPPD, the automatic responses may have kept a predominantly sexual meaning; possibly protected by the reproduction value of sex, positive reinforcement of sexual responses, confirmation of the relationship, etc. Such an interpretation also is in line with the consistent finding that although women with GPPPD do report impaired levels of subjective sexual arousal, they do not show lower levels of genital arousal towards sexual penetration pictures than women without sexual problems.^{40,41,43} Thus the available evidence seems to conclude that in particular, the more explicit subjective negative appraisals are involved in GPPPD.

The current study was the first to assess automatic sex-wanting associations in women with GPPPD. The findings indicated that women generally showed an automatic motivational orientation toward sexual penetration. The findings failed to support the hypothesis that women with dyspareunia show stronger automatic motivational associations with sexual penetration stimuli

than women with vaginismus. Thus relatively weak sex-wanting associations seem not involved in the avoidance of penetration attempts in women with vaginismus. It should be acknowledged that the sex-wanting associations were assessed in a non-individualized laboratory context using generic pictures of sexual penetration. Because automatic associations in women have been found to be highly context-dependent,⁴⁴ it cannot be ruled out that automatic wanting associations in women with vaginismus are hampered in the context of actual sexual behaviors and heightened sexual arousal.

Interestingly, relatively strong automatic sex-threat associations were associated with relatively weak automatic sex-wanting associations. This is in line with the view that a strong threat value of sex may interfere with an individual's readiness of having sex and hamper the generation of sexual arousal. However, it should be acknowledged that these findings are purely correlational; thus, neither the direction of the relationship nor the causal properties of the automatic associations can be derived from the current findings.

Limitations

The sex stimuli and the pain stimuli that were used might not be a proper conceptual representation of the relevant features that women with GPPPD actually experience during sex. Therefore, it remains to be seen whether comparable results will occur in real life contexts by the influence of the presence of the partner and by highlighting the emotional consequences of sexual (dys) functioning. A challenge for future research is to develop more ideographic stimuli that may help to improve the external validity of laboratory research.

With respect to the automatic associations, the group of women with vaginismus was very small (*n* = 14), thereby lowering the sensitivity of the current study to find group differences; however, since the differences between groups were very small, these negative findings seem to be not merely attributable to a lack of statistical power. Although the current findings suggest that dysfunctional automatic attention and automatic appraisal processes are not critically involved in GPPPD, further research with automatic tasks with higher

external ecological validity is needed to arrive at more solid conclusions in this respect.

CONCLUSIONS

The findings of the present study did not support the view that attentional bias for pain or sex is involved in GPPPD, or that relatively strong automatic threat and/or relatively weak wanting associations with sexual penetration play an important role in the generation and/or maintenance of dyspareunia and/or vaginismus. In terms of clinical implications, we can conclude that explicit, subjective negative appraisals are the most promising targets for interventions aiming at reducing genital pain and vaginal penetration problems. To increase sexual arousal it may be helpful to encourage women to direct more attention to sexual stimuli and to modify the automatic threat appraisals.^{45–47}

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REFERENCES

- Elmerstig E, Wijma B, Swahnberg K. Prioritizing the partner's enjoyment: a population-based study on young Swedish women with experience of pain during vaginal intercourse. *J Psychosom Obstet Gynaecol* 2013;34:82-89.
- Elmerstig E, Wijma B, Swahnberg K. Young Swedish women's experience of pain and discomfort during sexual intercourse. *Acta Obstet Gynecol Scand* 2009;88:98-103.
- Landry T, Bergeron S. How young does vulvo-vaginal pain begin? Prevalence and characteristics of dyspareunia in adolescents. *J Sex Med* 2009;6:927-935.
- American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. Fifth Edition. Arlington: American Psychiatric Publishing; 2013.
- Barlow DH. Causes of sexual dysfunction: the role of anxiety and cognitive interference. *J Consult Clin Psychol* 1986;54:140-148.
- Janssen E, Everaerd W, Spiering M, et al. Automatic processes and the appraisal of sexual stimuli: toward an information processing model of sexual arousal. *J Sex Res* 2000;37:8-23.
- de Jong DC. The role of attention in sexual arousal: implications for treatment of sexual dysfunction. *J Sex Res* 2009;46:237-248.
- Desrochers G, Bergeron S, Khalife S, et al. Fear avoidance and self-efficacy in relation to pain and sexual impairment in women with provoked vestibulodynia. *Clin J Pain* 2009;25:520-527.
- Pukall CF, Binik YM, Khalife S, et al. Vestibular tactile and pain thresholds in women with vulvar vestibulitis syndrome. *Pain* 2002;96:163-175.
- Payne KA, Binik YM, Amsel R, et al. When sex hurts, anxiety and fear orient attention towards pain. *Eur J Pain* 2005;9:427-436.
- de Ruiter C, Brosschot JF. The emotional Stroop interference effect in anxiety: attentional bias or cognitive avoidance? *Behav Res Ther* 1994;32:315-319.
- MacLeod C, Rutherford E, Campbell L, et al. Selective attention and emotional vulnerability: assessing the causal basis of their association through the experimental manipulation of attentional bias. *J Abnorm Psychol* 2002;111:107-123.
- Lykins AD, Meana M, Minimi J. Visual attention to erotic images in women reporting pain with intercourse. *J Sex Res* 2011;4:43-52.
- Both S, Laan E, Everaerd W. Focusing "hot" or focusing "cool": attentional mechanisms in sexual arousal in men and women. *J Sex Med* 2011;8:167-179.
- Beard C, Amir N. Attention bias for sexual words in female sexual dysfunction. *J Sex Marital Ther* 2010;36:216-226.
- Baum C, Schneider R, Keogh E, et al. Different stages in attentional processing of facial expressions of pain: a dot-probe task modification. *J Pain* 2013;14:223-232.
- Lahaie MA, Amsel R, Khalife S, et al. Can fear, pain, and muscle tension discriminate vaginismus from dyspareunia/provoked vestibulodynia? Implications for the new DSM-5 diagnosis of genito-pelvic pain/penetration disorder. *Arch Sex Behav* 2015;44:1537-1550.
- Brauer M, Lakeman M, van Lunsen R, et al. Predictors of task-persistent and fear-avoiding behaviors in women with sexual pain disorders. *J Sex Med* 2014;11:3051-3063.
- Reissing ED, Binik YM, Khalife S, et al. Vaginal spasm, pain, and behavior: an empirical investigation of the diagnosis of vaginismus. *Arch Sex Behav* 2004;33:5-17.

20. Dewitte M, Van Lankveld J, Crombez G. Understanding sexual pain: a cognitive-motivational account. *Pain* 2011;152:251-253.
21. Toates F. An integrative theoretical framework for understanding sexual motivation, arousal, and behavior. *J Sex Res* 2009;46:168-193.
22. Dewitte M. Gender differences in liking and wanting sex: examining the role of motivational context and implicit versus explicit processing. *Arch Sex Behav* 2015;44:1663-1674.
23. Diagnostic and Statistical Manual of Mental Disorders. 4th edition, and text revision. Washington, DC: American Psychiatric Association; 2000.
24. de Kruijff ME, ter Kuile MM, Weijnenborg PT, et al. Vaginismus and dyspareunia: is there a difference in clinical presentation? *J Psychosom Obstet Gynaecol* 2000;21:149-155.
25. Melles RJ, Ter Kuile MM, Dewitte M, et al. Automatic and deliberate affective associations with sexual stimuli in women with lifelong vaginismus before and after therapist-aided exposure treatment. *J Sex Med* 2014;11:786-799.
26. Smeets E, Roefs A, van Furth E, et al. Attentional bias for body and food in eating disorders: increased distraction, speeded detection, or both? *Behav Res Ther* 2008;46:229-238.
27. Rinck M, Becker ES. Spider fearful individuals attend to threat, then quickly avoid it: evidence from eye movements. *J Abnorm Psychol* 2006;115:231-238.
28. Brauer M, ter Kuile MM, Laan E, et al. Cognitive-affective correlates and predictors of superficial dyspareunia. *J Sex Marital Ther* 2009;35:1-24.
29. Verkes RJ, Vanderiet K, Vertommen H, et al. De MPQ-DLV, een standaard nederlandse versie van de McGill Pain Questionnaire voor België en Nederland. De MPQ-DLV, een standaard nederlandse versie van de McGill Pain Questionnaire. *Achtergronden en handleiding* 1989:57-73.
30. Borg C, de Jong PJ, Schultz WW. Vaginismus and dyspareunia: automatic vs. deliberate disgust responsivity. *J Sex Med* 2010;7:2149-2157.
31. Greenwald AG, Nosek BA, Banaji MR. Understanding and using the implicit association test: I. An improved scoring algorithm. *J Pers Soc Psychol* 2003;85:197-216.
32. Glashouwer KA, Smulders FT, de Jong PJ, et al. Measuring automatic associations: validation of algorithms for the Implicit Association Test (IAT) in a laboratory setting. *J Behav Ther Exp Psychiatry* 2013;44:105-113.
33. Rosen R, Brown C, Heiman J, et al. The Female Sexual Function Index (FSFI): a multidimensional self-report instrument for the assessment of female sexual function. *J Sex Marital Ther* 2000;26:191-208.
34. ter Kuile MM, Brauer M, Laan E. The Female Sexual Function Index (FSFI) and the Female Sexual Distress Scale (FSDS): psychometric properties within a Dutch population. *J Sex Marital Ther* 2006;32:289-304.
35. Jiann BP. Pitfalls in using the female sexual function index. *J Sex Med* 2012;9:1229.
36. ter Kuile MM, Bulte I, Weijnenborg PT, et al. Therapist-aided exposure for women with lifelong vaginismus: a replicated single-case design. *J Consult Clin Psychol* 2009;77:149-159.
37. van Lankveld JJ, ter Kuile MM, de Groot HE, et al. Cognitive-behavioral therapy for women with lifelong vaginismus: a randomized waiting-list controlled trial of efficacy. *J Consult Clin Psychol* 2006;74:168-178.
38. Tabachnick BG, Fidell LS. Using Multivariate Statistics. 5th edition. Upper Saddle River, NJ: Pearson Allyn & Bacon; 2001.
39. Crombez G, Van Ryckeghem DM, Eccleston C, et al. Attentional bias to pain-related information: a meta-analysis. *Pain* 2013;154:497-510.
40. Brauer M, ter Kuile MM, Janssen SA, et al. The effect of pain-related fear on sexual arousal in women with superficial dyspareunia. *Eur J Pain* 2007;11:788-798.
41. Cherner RA, Reissing ED. A psychophysiological investigation of sexual arousal in women with lifelong vaginismus. *J Sex Med* 2013;10:1291-1303.
42. Vasey MW, Harbaugh CN, Buffington AG, et al. Predicting return of fear following exposure therapy with an implicit measure of attitudes. *Behav Res Ther* 2012;50:767-774.
43. Brauer M, ter Kuile MM, Laan E. Effects of appraisal of sexual stimuli on sexual arousal in women with and without superficial dyspareunia. *Arch Sex Behav* 2009;38:476-485.
44. Dewitte M, Koster EH. Attentional breadth and proximity seeking in romantic attachment relationships. *Br J Soc Psychol* 2014;53:74-92.
45. Notebaert L, Clarke PJ, Grafton B, et al. Validation of a novel attentional bias modification task: the future may be in the cards. *Behav Res Ther* 2015;65:93-100.
46. Clerkin EM, Teachman BA. Training implicit social anxiety associations: an experimental intervention. *J Anxiety Disord* 2010;24:300-308.
47. Clerkin EM, Werntz AJ, Magee JC, et al. Evaluating age differences in coping motives as a mediator of the link between social anxiety symptoms and alcohol problems. *Psychol Addict Behav* 2014;28:880-886.