

Effects of Aversive Classical Conditioning on Sexual Response in Women With Dyspareunia and Sexually Functional Controls

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ABSTRACT

Introduction: In dyspareunia—a somatically unexplained vulvovaginal pain associated with sexual intercourse—learned pain-related fear and inhibited sexual arousal are supposed to play a pivotal role. Based on research findings indicating that enhanced pain conditioning is involved in the etiology and maintenance of chronic pain, in the present study it was hypothesized that enhanced pain conditioning also might be involved in dyspareunia.

Aim: To test whether learned associations between pain and sex negatively affect sexual response; whether women with dyspareunia show stronger aversive learning; and whether psychological distress, pain-related anxiety, vigilance, catastrophizing, and sexual excitation and inhibition were associated with conditioning effects.

Methods: Women with dyspareunia ($n = 36$) and healthy controls ($n = 35$) completed a differential conditioning experiment, with one erotic picture (the CS^+) paired with a painful unconditional stimulus and one erotic picture never paired with pain (the CS^-).

Main Outcome Measures: Genital sexual response was measured by vaginal photoplethysmography, and ratings of affective value and sexual arousal in response to the CS^+ and CS^- were obtained. Psychological distress, pain cognitions, and sexual excitation and inhibition were assessed by validated questionnaires.

Results: The two groups showed stronger negative affect and weaker subjective sexual arousal to the CS^+ during the extinction phase, but, contrary to expectations, women with dyspareunia showed weaker differential responding. Controls showed more prominent lower genital response to the CS^+ during acquisition than women with dyspareunia. In addition, women with dyspareunia showed stronger expectancy for the unconditional stimulus in response to the safe CS^- . Higher levels of pain-related fear, pain catastrophizing, and sexual inhibition were associated with weaker differential conditioning effects.

Conclusions: Pairing of sex with pain negatively affects sexual response. The results indicate that a learned association of sex with pain and possibly deficient safety learning play a role in dyspareunia. **Both S, Brauer M, Weijnenborg P, Laan E. Effects of Aversive Classical Conditioning on Sexual Response in Women With Dyspareunia and Sexually Functional Controls. J Sex Med 2017;XX:XXX–XXX.**

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Key Words: Dyspareunia; Pain; Sexual Dysfunction; Conditioning; Photoplethysmography

INTRODUCTION

Dyspareunia, a persistent or recurrent vulvovaginal pain associated with sexual intercourse (described as genito-pelvic pain/penetration disorder in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*) is a relatively common sexual complaint. Prevalence figures in premenopausal women

range from 10% to 20%.^{1,2} Research considering psychosomatic factors have reported evidence for a higher prevalence of (previously diagnosed) anxiety and depression,^{3,4} comorbidity with other chronic pain conditions,⁵ increased pain hypervigilance and catastrophizing,^{4,6,7} and hyperalgesia⁸ in women with dyspareunia, indicating that, in the pathogenesis of dyspareunia, similar emotional and cognitive mechanisms could be active as in other chronic pain conditions.^{9,10}

Importantly, apart from the vulvovaginal pain, women with dyspareunia report sexual dysfunction, more specifically low sexual desire, and complaints of decreased sexual arousal and vaginal lubrication.^{7,11–13} Whether these sexual complaints precede, follow, or develop parallel to the sexual pain complaints is unclear. In clinical practice, many women with dyspareunia

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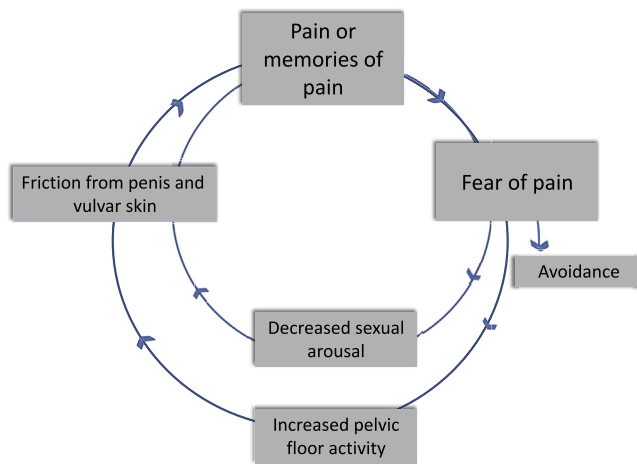


Figure 1. Cognitive behavioral model of dyspareunia.

report a loss of sexual desire and activity. Some women continue having sex, including painful intercourse, to satisfy their partner.^{14–16}

A cognitive behavioral model of dyspareunia (Figure 1) integrates the pain and sexual aspects of dyspareunia. According to this explanatory model, an initial experience of pain can lead to fear of pain in new sexual situations. That fear can result in decreased sexual arousal and vaginal lubrication¹⁷ and increased pelvic floor muscle tone tightening the vaginal entrance,^{18,19} which increases the likelihood of pain during attempted penetration. In addition, fear of pain can result in avoidance behavior and, hence, in a lack of opportunity to overcome fear of pain, resulting in chronic dysfunction.¹⁰

The focus in this model on learned fear through initial pain experiences is in agreement with views that recognize an important role of basic learning mechanisms in chronic pain.²⁰ These views emphasize that animals and humans are built with a system to signal potential threat or pain and equipped with the capability to learn to predict pain by associative learning mechanisms. However, these adaptive associative learning mechanisms can contribute to pain, pain-related distress, and disability when it results in avoidance behavior and, hence, in a lack of opportunity to overcome fear of pain, facilitating chronic pain conditions.

One form of associative learning is classic conditioning. A pain stimulus can be considered an unconditional stimulus (US) that elicits fear, and conditional stimuli (CSs) can be stimuli that precede or coincide with the pain stimulus. Through repeated pairing of stimuli with pain, these stimuli can elicit conditioned fear responses. Extended to pain conditioning in a sexual situation, different stimuli, such as the naked partner or the sensation of specific caresses, can become signals for impending pain. When, during sexual encounters, repeated pairing of sexual stimuli and pain has occurred, previously appetitive sexual stimuli can elicit anticipatory defensive responses and impede the sexual arousal response. Recent studies in healthy sexually functional women have provided the initial evidence for negative effects of pain conditioning and fear on sexual response.^{21,22}

Interestingly, experimental studies have indicated stronger effects of pain conditioning in patients with chronic pain. Compared with pain-free controls, patients with chronic back pain and headache showed enhanced conditioned muscular responses and less extinction of these responses,^{23,24} and patients with fibromyalgia showed enhanced aversively conditioned eye-blink reflexes.²⁵ Although the number of studies in individuals with chronic pain is limited, and more research is needed, the initial evidence suggests that enhanced pain conditioning might be involved in the etiology and maintenance of chronic pain conditions.

In the present study, we investigated the effects of aversive pain conditioning on sexual arousal and affect in women with dyspareunia and sexually functional controls. It was expected that repeated pairing of a sexual stimulus with pain would result in decreased sexual arousal and in increased negative affect in response to this stimulus and that these conditioning effects would be stronger in women with dyspareunia compared with sexually functional controls. Based on previous research,^{3,4,6,7} we expected higher levels of trait anxiety, psychological distress, pain-related anxiety, vigilance, and catastrophizing in women with dyspareunia compared with controls, and we expected higher scores on these variables to be associated with stronger effects of pain conditioning on sexual arousal and affect. Also, we examined whether the tendency toward sexual excitation and sexual inhibition differed between women with dyspareunia and controls and whether these tendencies were associated with effects of pain conditioning on sexual arousal responses. According to the dual control model, individuals differ in their propensity for sexual excitation and sexual inhibition, a variability that might be genetically determined or might be the result of early learning experiences.²⁶ Individuals with a propensity for sexual excitation get easily aroused in response to sexual stimuli, whereas the propensity for sexual inhibition reflects easily losing one's sexual arousal because of inhibiting cues. We hypothesized that individual differences in sexual excitation and inhibition would be related to the strength of the effect of pain conditioning and predicted that a stronger tendency for sexual inhibition would be associated with stronger pain conditioning effects and that a stronger tendency for sexual excitation would be associated with weaker pain conditioning effects.

METHODS

Recruitment and Inclusion

In previous sexual conditioning studies from our laboratory, medium to large effects were observed.^{22,27} An a priori power analysis, with a chosen α value of 0.05 and a power of 80%, determined that a minimum of 26 women would be needed per group to detect large differences ($d = 0.8$) in responding between groups. In the present study, 36 women with dyspareunia and 35 controls participated. All women were paid (35€) for taking part in the study. Women with dyspareunia were recruited by sending a letter to patients on the waiting list for treatment of

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