Avoiding the sexual: Visual attention and distraction in dyspareunia

Amy D Lykins

University of Nevada, Las Vegas

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AVOIDING THE SEXUAL: VISUAL ATTENTION AND
DISTRACTION IN DYSPAREUNIA

by

Amy D. Lykins

Master of Arts
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Amy Dianne Lykins

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Dean of the Graduate College

Graduate College Faculty Representative
ABSTRACT

Avoiding the Sexual: Visual Attention and Distraction in Dyspareunia

by

Amy D. Lykins, M.A.

Dr. Marta Meana, Examination Committee Chair
Professor of Psychology
University of Nevada, Las Vegas

Dyspareunia, defined as genital pain associated with intercourse, holds the unenviable status of being one of the most prevalent yet understudied of the sexual dysfunctions. The coupling of sex and pain creates an interesting theoretical conundrum of clinical significance: are women with dyspareunia distracted from sexual stimuli (as the sexual dysfunction literature would suggest), or are they hypervigilant to sexual stimuli because these stimuli elicit thoughts and expectations of pain (as the pain literature would suggest)? Eye-tracking may be a uniquely relevant tool to measure potential differences in attention between women with and without dyspareunia. The current study tested distraction by presenting women with and without dyspareunia a series of erotic images, each containing a semantically-inconsistent object, while tracking their eye movements as they looked at them. Significant group differences were found for two of the three visual attention dependent variables (total number of fixations, total gaze duration), such that women with dyspareunia looked fewer times and for less total time at the sexual scene regions (i.e., the bodies) than both women with low sexual desire ($p =$
.018, and \( p = .024 \), respectively) and the no-dysfunction control women (\( p = .003 \), and \( p < .001 \), respectively). Women with dyspareunia were also found to have looked at the context scene region significantly more times and for longer periods of time than the no-dysfunction control women (\( p = .013 \), and \( p = .042 \), respectively). No group differences were found for average fixation duration, or any of the four memory variables (e.g., number of semantically inconsistent objects correctly recalled, number of intrusions, number correctly recognized, number of false positives). Results did not support the attentional hypervigilance that would have been consistent with the pain disorder conceptualization, but were potentially supportive of the attentional distraction hypothesis that is consistent with the sexual dysfunction theory. There appeared to be evidence of a cognitive avoidance process occurring in women with dyspareunia, such that sexual information may have triggered anxiety (due to fear of threat or harm), thus creating overall attentional avoidance of these scene regions. Limitations of the current study and future directions are provided.
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CHAPTER 1

INTRODUCTION

Dyspareunia, defined as genital pain associated with intercourse (DSM-IV-TR), represents a conundrum in female sexual health. The first detailed description of the disorder dates back to the Rasseum Papyri IV scrolls of ancient Egypt, making it the oldest documented sexual dysfunction (Fordney, 1978). Despite its history, dyspareunia currently holds the unenviable status of being one of the most prevalent yet understudied of the sexual dysfunctions. Serious empirical investigations began a mere decade ago, even though its estimated prevalence ranges from 14-22% in the general female population (Laumann, Gagnon, Michael, & Michaels, 1994) and it is the presenting problem in up to 30% of all gynecologic visits (Harlow & Stewart, 2003).

Although our scientific knowledge is lagging in comparison to research on other disorders, our understanding of dyspareunia is progressing at a moderate rate. Historically, the woman complaining to her gynecologist of pain during intercourse with no evident physiological pathology was all too often considered “frigid” and quickly referred to a psychiatrist/psychologist. The mental health professional would then focus therapy on determining why the woman did not accept and enjoy sex, rather than on the characteristics and properties of the pain. The paradigm shift that began in the 1990’s was characterized by a movement from the initial conceptualization of sexual pain as a somatic manifestation of inner sexual conflict to the recent acknowledgment that the
woman's sexual pain is a 'real' pain that can be measured and quantified and deserves to be treated as seriously as any other pain. The fact that we can now look at the past and be incredulous about our historical neglect of the pain symptomatology in dyspareunia stands as a testament to the dramatic shift in our scientific viewpoint in recent years. Current conceptualizations of dyspareunia involve a detailed focus on the pain aspects of the disorder, with several prominent researchers in this area calling into question the utility of dyspareunia's inclusion in the sexual disorders section of the DSM-IV-TR (Binik, 2005). We now have studies documenting biological and neurological factors associated with sexual pain, providing empirical support for the assertion that dyspareunia evidences patterns similar to those found in other chronic pain conditions (Meana, Binik, Khalife, & Cohen, 1997a), which have not been labeled psychosomatic. Though few in number, some investigations have focused upon psychological correlates of dyspareunia, and many have examined the efficacy of various interventions used to treat this disorder (Bergeron et al., 2001; Bergeron et al., 2002). However, it seems that an unfortunate consequence of recognizing the woman's pain is not "all in her head" has been, perhaps, an overemphasis on the investigation of pain characteristics to the paradoxical exclusion of what is actually occurring "in her head."

Prior to the 1990's, theorizing about dyspareunia swung far in the psychosexual direction, but we now run the risk of almost defiantly swinging in the completely opposite direction and decontextualizing the experience of dyspareunia pain. A more integrated approach to the study dyspareunia would seem preferable. The current dualistic perspective that exists in research on sexual pain seems to ignore the significant interplay of mind and body. Considering that the sexual response inarguably involves
both, it seems we still do not have a complete picture of dyspareunia, what it looks like both in the mind and the body. Ignoring the psychological factors associated with a pain that occurs in the context of an act as highly valued and socio-culturally laden as sexual intercourse is likely to hinder in our efforts to both understand and effectively treat this distressing health problem. Relatively recent efforts in sexuality research using methodologies developed in cognitive psychology (e.g., priming tasks, memory studies, visual attention and cognitive processing) have the potential to significantly inform and impact both our knowledge of and interventions aimed at treating dyspareunia. It is in this line of reasoning that we set out to investigate the most important sexual organ, the brain, and determine the role of attention and cognition in women experiencing sexual pain.
Characterizing Dyspareunia

Description and Classification

Ancient Greek for “difficult mating,” dyspareunia is one of the oldest-documented yet least understood of the sexual dysfunctions. Conceptualizations of dyspareunia, or genital pain associated with intercourse according to the DSM-IV-TR (APA, 2000), have ranged from a psychosomatic response to inner conflict about intercourse to a simple vulvar or urogenital pain, depending on one’s orientation (psychological or medical) and concordant historical context. There remains no one agreed-upon conceptualization of dyspareunia, thus a review of the many ways it has been considered is necessary to an understanding of the multiple etiologies and treatments that have been proposed.

According to the DSM-IV-TR, the following criteria are required for a diagnosis of Dyspareunia (302.76):

A. Recurrent or persistent pain associated with sexual intercourse in either a male or a female

B. The disturbance causes marked distress or interpersonal difficulty

C. The disturbance is not caused exclusively by Vaginismus or lack of lubrication, is not better accounted for by another Axis I disorder (except another
Sexual Dysfunction), and is not due exclusively to the direct physiological effects of a substance (e.g., a drug of abuse, a medication) or a general medical condition.

Three specifiers are also required in this classification system; these are onset, context, and etiological factors. Onset refers to lifetime onset rather than onset of the pain within an intercourse episode and is categorized as either lifelong or acquired; lifelong signifying the woman has never had sex without experiencing pain, and acquired that the pain developed after a significant period of pain-free intercourse. Context is specified as either generalized (i.e., pain occurs across all situations, partners, etc.) or situational (i.e., pain occurs in some situations but not others). The most unclear and often controversial specifier is that of etiological factors; is the pain due primarily to psychological factors, or due to a combination of factors? Much research (which will be explored in further depth in following sections) has been conducted in an effort to inform this issue, yet the picture remains unclear.

As dyspareunia clearly has physiological components, and women with pain generally present to general practitioners or gynecologists, medical doctors have included it in their diagnostic classification system as well. Used more commonly by physicians than psychologists, the International Classification of Diseases (WHO, 1992), currently in its tenth edition (ICD-10), considers dyspareunia to be more a symptom of an underlying physical pathology than as a separate diagnostic category of its own. Like the DSM-IV-TR, the ICD-10 also dichotomizes etiological factors; the two categories in this system are organic (indicating underlying physical pathology), and psychogenic (i.e., underlying psychological pathology) dyspareunia. It is interesting to note that the two
primary diagnostic systems in medicine and psychology continue to perpetuate the notion that the experience of sexual pain is either in the woman’s head or in her body. Despite dismissive acknowledgments that the human body is an interactive system, current scientific endeavors often continue propagating the myth of the mind-body dichotomy.

One classification system that better bridges the gap and focuses specifically on the pain aspect of dyspareunia is that formulated by the International Association for the Study of Pain (IASP). According to the IASP, 'pain' is defined as an “unpleasant sensory and emotional experience associated with actual or potential tissue damage” (Merskey & Bogduk, 1994). Within this system are five major classification axes: 1) region affected (e.g., vulva, vagina, uterus, ovaries); 2) system involved (e.g., nervous, musculoskeletal, cutaneous); 3) temporal characteristics (e.g., continuous or nearly continuous, intermittent, recurring regularly or irregularly, linked to sensory stimulation or not); 4) patient’s statement of intensity (mild, moderate, severe) and duration (time since onset); and 5) etiology (e.g., trauma, inflammatory, infection). In one of the first endeavors to categorically examine different types of dyspareunia, Meana et al. (1997a) found that these IASP criteria more effectively differentiated sub-types of dyspareunia than the DSM-IV criteria. Proposed sub-types

Relatively recent efforts to delineate potential subgroups of women with dyspareunia have been predicated upon Meana and Binik’s landmark research in this area. Using both the DSM-IV guidelines for a diagnosis of dyspareunia and the IASP categorical criteria, Meana et al. (1997a) found that the IASP criteria better represented the different presentations of sexual pain typology in their sample. The four different
dyspareunia groups in Meana et al.'s (1997a) study were: 1) no physical findings, accounting for 24% of the sample; 2) vulvar vestibulitis, now called vestibulodynia (Friedrich, 1987: a syndrome characterized primarily by a hyperalgesic area at the entry of the vagina exclusively), comprising nearly half the sample at 46%; 3) vulvar or vaginal atrophy (13% of the sample), as evidenced by an impoverishment of skin elasticity, turgor, and thinning of the vaginal mucosa (usually attributed to estrogen deficiency, particularly in post-menopausal women); and 4) a mixed findings group, the catch-all group for physical conditions that could reasonably be associated with coital pain but that were neither clearly vestibulodynia nor vaginal atrophy, accounting for 17% of the sample (Meana et al., 1997a).

Of particular relevance in the correct classification of women into these dyspareunia sub-groups were two IASP criteria: onset and location of pain. Meana et al. (1997a) found that for 92% of the vestibulodynia and atrophy groups, the pain started at the initial moment of penetration, in contrast to the no physical findings group, in which 49% reported that pain started once the penis had fully entered the vagina. Additionally, whereas the no-physical-findings group reported the pain being almost equally dispersed among the majority of the sites of interest, 48% of the vestibulodynia women reported the pain occurred at the entry of the vagina only, and 32% of the vestibulodynia women located the pain at both the entry point and inside the vaginal canal. Because the vulvar vestibulitis group accounts for such a relatively high percentage of pre-menopausal women with sexual pain in this and other studies, and because most of the recent research in this area seems to have targeted vestibulodynia samples specifically, a further review of this condition is warranted.
According to Friedrich (1987), a diagnosis of vulvar vestibulitis syndrome requires the following three criteria be met: 1) severe pain upon vestibular touch or attempted vaginal entry; 2) tenderness to pressure localized within the vulvar vestibule; and 3) physical findings confined to vestibular erythema (redness) of various degrees. These symptoms must be of at least six months duration and of at least moderate to severe intensity. Vestibulodynia is commonly diagnosed via cotton-swab palpation of the vulvar vestibule, and the experience of vestibulodynia is characterized by irritation and often described as painful, burning, and/or itching (Marinoff & Turner, 1992). Marinoff and Turner (1992) also noted that the accompanying erythema often extends beyond the vulvar vestibule, involving the labia majora and minora, as well as other nearby structures. One study found that prevalence in the general gynecologic practice population approximated 15% (Goetsch, 1991), though nearly 37% of this sample evidenced some degree of positive testing for vestibulodynia symptomatology.

Vestibulodynia is associated with several types of biological, psychological, and experiential patterns. Women with vestibulodynia often report sexual side effects including lower frequencies of intercourse and masturbation; lower levels of desire, pleasure, and arousal; higher levels of anorgasmia; and more negative attitudes toward sexuality than matched controls (Payne, Binik, Amsel, & Khalife, 2004). Women with vestibulodynia also have been found to catastrophize more in relation to pain experienced during intercourse in comparison to other more commonly experienced pains (Pukall, Binik, Khalife, Amsel, & Abbott, 2002), and have higher rates of anxiety (Gates & Galask, 2001; Granot, Friedman, Yarnitsky, & Zimmer, 2002; Nunns & Mandall, 1997) and depression (Dunn, Croft, & Hackett, 1999; Jantos & White, 1997) than controls.
Vestibulodynia has been associated with early use of oral contraceptives, early intercourse, and early menarche in some studies (Bazin et al., 1994), and in others it has been found to be associated with HPV infection, recurrent chronic candidiasis (yeast infections), and abnormal vaginal acidity levels. Much of what is known about dyspareunia has been garnered from research on women with vestibulodynia, so hypothesized etiological factors for dyspareunia in general are quite similar to those of vulvar vestibulitis.

Dyspareunia is only one form of painful sex according to the DSM-IV-TR. The second type of sexual pain disorder is vaginismus. According to the DSM-IV-TR (APA, 2000), vaginismus is defined as the “recurrent or persistent involuntary spasm of the musculature of the outer third of the vagina that interferes with intercourse.” Few controlled empirical studies have been conducted on etiological factors, however one study found that vaginismus was significantly related to a history of childhood sexual interference and less positive attitudes about their sexuality than women with vestibulodynia or no pain during intercourse (Reissing, Binik, Khalife, Cohen, & Amsel, 2003). One problematic aspect of the classification of vaginismus is that it is often difficult to differentiate between a diagnosis of vaginismus and dyspareunia (Schultz et al., 2005). In fact, at least two studies have found that the only differentiating factor between these two diagnoses is the avoidance of penetration by women with vaginismus (de Kruiff, ter Kuile, Weijenborg, & van Lankveld, 2000; Reissing, Binik, Khalife, Cohen, & Amsel, 2004), and they often co-occur (Engman, Lindehammar, & Wijma, 2004; ter Kuile, van Lankveld, Vieland, Willekes, & Weijenborg, 2005). Though these two disorders evidence significant overlap to such a great degree that some researchers
have suggested that they are the same disorder (Ohkawa, 2001), the present study will focus exclusively on women reporting symptoms of dyspareunia.

A similar yet distinct sub-type of dyspareunia is vulvodynia. According to the International Society for the Study of Vulvar Disease (ISVDD), vulvodynia is experienced as a diffuse, chronic vulvar discomfort that is characterized by complaints of burning, stinging, irritation, and rawness (McKay et al., 1991), and occurs in an estimated 16% (Harlow & Stewart, 2003) to 18.5% (Harlow, Wise, & Stewart, 2001) of women. We mention vulvodynia because at first glance, it appears the terms vulvodynia and dyspareunia are interchangeable, perhaps different vernacular for the same underlying problem; however, this is not the case. Unlike dyspareunia, however, vulvodynia is chronic vulvar pain that is not limited to intercourse or other activities involving genital contact. Because our focus is specifically on pain that occurs during sexual activity, the literature reviewed will focus only on what is known about dyspareunia sub-types in which the pain is associated exclusively with genital contact.

**Epidemiologic characteristics**

The prevalence of dyspareunia in the general population is quite simply unknown (because dyspareunia is rarely found in men, this literature review and research proposal will focus solely on women). In a review of the sexual pain literature, Meana and Binik (1994) discovered that depending on the sample used, population prevalence estimates ranged from a mere 4% to an astounding 55%! The National Health and Social Life Survey (NHSLS; Laumann et al., 1994), the most extensive and comprehensive survey of sexual behavior in the United States, found that 15% of respondents responded positively to a question regarding the experience of physical pain during intercourse. Age
stratification of these data provided evidence that women aged 18-29 had the highest
group percentage of women reporting pain during sex at 21%; these percentages
decreased as age of respondents increased (Laumann, Paik, & Rosen, 1999). Though this
single question did not provide detailed data about how long the pain has been a problem
or the extent of its interference as required by the DSM-IV criteria, it is certainly the most
epidemiologically sound estimate of dyspareunia prevalence we have to date.

Few studies have examined demographic variables associated with dyspareunia,
concluded that dyspareunia is found predominantly in Caucasian women of reproductive
age, and onset typically occurs in the woman’s early 20’s. About half of women with
dyspareunia report having had pain-free intercourse prior to onset. Dyspareunia was
found to be associated with younger age, poor health, lower education, decreased family
income, increased stress, and more frequent emotional problems (Masheb et al., 2000).
Additionally, women with dyspareunia have reported decreased quality of life, reduced
general happiness, and lower levels of satisfaction with the emotional and physical
aspects of their relationships (Masheb et al., 2000). While these characteristics may
describe the dyspareunia prototype, the question of causality and potential reciprocal
determinism cannot be answered by simple averages; only etiological and experimental
paradigms may serve to resolve these questions.

**Biological and Neurological Features of Dyspareunia**

In an effort to determine etiological factors in the development of sexual pain,
psychologists and physicians alike have turned to explorations of potential physiological
or organic causes for the pain. Major areas of interest have been infection,
anatomic/physical abnormalities, iatrogenic causes, and more recently, genetic markers for pain or infection predisposition. Theories have also been proposed to explain what may be co-occurring with the pain in the central nervous system (CNS) and the brain, more specifically. Although dyspareunia is not a consistent consequence of any particular organic disease (Meana & Binik, 1994), pain is the result of tissue damage more often than not (although not always). Investigations into the source of the damage can help in determining the appropriate treatment.

Vaginal infection. The most researched and best understood organic or pathologic etiology is that of vaginal infection, reported by approximately 40% of women with dyspareunia (Van Lankveld, Weijenborg, & Ter Kuile, 1996). Of the various infections associated with sexual pain, candidiasis (yeast infection) is the most oft-cited potential cause (Bergeron, Binik, Khalife, & Pagidas, 1997). Candida, an organism causing an intense inflammatory reaction, is often the cause of extensive erythema and edema in the vaginal area (McKay & Farrington, 1995). It is hypothesized that recurrent candida infections may cause localized hypersensitivity in the vaginal area, triggering the itching or burning characteristic of candida to persist after the infection has been eliminated (McKay & Farrington, 1995). It is a logical consequence for dyspareunia to occur in a woman whose vaginal region has become hypersensitized as a result of recurrent yeast infections, as stimulation (such as that which occurs during intercourse) would create irritation and discomfort.

Other types of infections associated with dyspareunia are interstitial cystitis, cyclic vulvovaginitis, and urinary tract infections. Interstitial cystitis, an infection that mimics the symptoms of a bladder infection and creates constant pelvic and bladder pain,
has a high concordance rate with vulvar vestibulitis and dyspareunia (Fitzpatrick, DeLancey, Elkins, & McGuire, 1993; McCormack, 1990; Whitmore, Siegel, & Kellogg-Spadt, 2007). As many as 2/3 of interstitial cystitis patients report dyspareunia (McKay & Farrington, 1995). Cyclic vulvovaginitis, a condition that causes recurrent episodes of vulvar burning related to specific times during the menstrual cycle, has been reported in 44% of women with vestibulodynia (Schover, Youngs, & Cannata, 1992). Urinary tract infections have also been associated with dyspareunia and vestibulodynia in particular, with as many as 33% of patients reporting a history (Schover, Youngs, & Cannata, 1992).

Anatomic variation. Another area of etiological interest is potential anatomic variables that may predispose women to pain during sexual activity. These anatomic high-risk factors may be congenital or developmental, and primarily affect the introitus and the vaginal canal (Meana & Binik, 1994). Of increased recent interest is the hypertonicity of the pelvic floor found in women who experience dyspareunia (Reissing et al., 2004; Reissing, Brown, Lord, Binik, & Khalife, 2005). Women with dyspareunia often evidence a higher muscle tension than no-pain controls in this region. It is believed this tension, and often accompanying vaginal spasm, contribute to pain experienced during sexual intercourse (Reissing et al., 2004; Reissing et al., 2005). Other possible physical causes of dyspareunia are anatomic distortion of the upper genital tract, vulvar vestibule and lower vagina; chronic vaginal ulceration; mucosal atrophy; and urethral diverticulum, a condition wherein obstruction and infection in the periurethral glands create small outpouchings of pus that may cause pain when stimulated (Reid & Linninger, 1993).
Iatrogenic factors. An iatrogenic etiology for sexual pain also has been explored. Iatrogenic factors are those unintentionally induced by the physician for treatment of an altogether different condition, usually surgical procedures such as an episiotomy (Meana & Binik, 1994) or vaginal creams (Bergeron et al., 1997). In one study, as many as 29% of women with dyspareunia reported its onset after some type of gynecological surgery (Schover, Youngs, & Cannata, 1992).

Genetic variables. With more advanced technology often comes a greater depth of understanding of illness and disorders, and recent genetic investigations have shed light on potential genetic variables related to sexual pain. At a conference on sexual/genital pain syndromes, many such potential genetic contributor variables were proposed. For example, Witkin (2004) found that some women with vulvar vestibulitis are genetically more susceptible to microbial infections than women without vestibulodynia, and are more likely to respond to such microorganisms with an exaggerated inflammation. Accordingly, women with vestibulodynia present with a greater microbiological organism presence and more acidic vaginal pH than controls (Harlow, 2004). Foster (2004) noted increased pro-inflammatory genetic variants in women with vestibulodynia, with a particularly increased risk in women with fair skin. Autoimmunity has also been suggested to be a factor in vestibulodynia (Ashman & Ott, 1989), and problems such as irritable bowel syndrome and fibromyalgia have been found to co-occur with dyspareunia (Gordon, Panahian-Jand, McComb, Melegari, & Sharp, 2003). Finally, Goldstein (2004) hypothesized that androgen insensitivity may lead to diminished function of the vestibular glands, thus leading to more inflammation and dyspareunia. Research endeavors in the area of genetics are still in their nascency, but even early findings hold
great promise to discovering root physiological causes for a sexual pain predisposition, thus creating avenues for treatment.

Theoretical explanations for pain. Although little is known about sexual pain specifically in relation to the brain and central nervous system processing, much of what is know about pain in general theoretically can be applied to sexual pain. For example, Binik, Meana, Berkeley, and Khalife (1999) described the process of central sensitization in relation to sexual pain, thus highlighting the plasticity of information processing in the periphery and the central nervous system. This theory hypothesizes that intense stimulation, such as injury or threat thereof, may sensitize afferent fibers so that they continue to send information to the spinal cord even when the pain stimulus is no longer present. Subsequent stimulation can sensitize the neurons even further, such that previously subthreshold levels of influence are now experienced as present or even painful (Binik et al., 1999). The authors argue that central sensitization theory is consistent with the finding that dyspareunia is associated with a history of vulvo-vaginal infection (Binik et al., 1999).

A related theory implicating both the nervous system response and cognitive components is the gate control theory of pain (Melzack & Wall, 1965; Reid & Linninger, 1993). The gate control theory of pain (Melzack & Wall, 1965) posits that the experience of pain is determined by a multitude of factors at various levels of the nervous system – not simply by the precipitant tissue injury. Therefore, what a person describes as pain is a complicated interplay of excitatory and inhibitory factors, derived from both the site of the tissue injury and higher modulating centers. This theory is clearly of interest to sexual pain perception, as it supports the idea that cognitive and affective factors can influence
the quality and severity of the pain experienced, as well as an individual’s response to it (Reid & Linninger, 1993). This cognitive component is of particular importance with regard to sexual pain, as sex is so emotionally laden an activity, and a person’s appraisals appear to play an important role in pain experienced during it.

Much of the research in this area to date has focused upon pathologic (e.g., infection), anatomic, and more recently, genetic predispositions for dyspareunia, and resulted in interesting findings in strong support for a physiological etiology (at least for vestibulodynia). However, not much research has broached the complex interplay between the biology of sexual pain and corresponding psychological (particularly cognitive) correlates. What is the experience of the woman who suffers from pain during an activity that is supposed to be pleasurable? Are there predisposing psychological differences between women who have sexual pain and those who do not?

Psychological and Psychosexual Characteristics of Dyspareunia

Though the current driving force in the literature is moving the field toward a physiological explanation for dyspareunia, there exist notable psychological and psychosexual correlates as well. Examples of research projections are psychopathology (e.g., depression, anxiety, somatization), history of trauma or sexual abuse, psychosexual correlates (e.g., sexual function, attitudes about sexuality), and interpersonal or relationship characteristics. Hypothesized relationships between the aforementioned psychosocial constructs and sexual pain tend to be vague, and psychosocial factors are often presented as equally likely to be etiological or consequential. The lack of prospective and longitudinal studies in this area perpetuates this confusion. However,
fairly consistent findings lend support to the notion that psychological and psychosexual features are worthy of continued research efforts.

**Depression.** Potential psychopathology in women with dyspareunia has been investigated from the outset, first conceptualized as a cause of this disorder (the “it’s all in her head” mentality) and more recently as consequent to the experience of pain during sexual activity. Depression and depressive symptoms are often found in women who experience sexual pain (see review by Latthe, Mignini, Gray, Hills, & Kahn, 2006). Schover, Youngs, and Cannata (1992) found that 36% of their sample acknowledged experiencing depressive symptoms and Meana, Binik, Khalife, and Cohen (1997b) reported that their dyspareunia sample experienced more depression than control participants. Similar results have been found in vestibulodynia-only samples. For example, Sackett, Gates, Heckman-Stone, Mee-Ran Kobus, and Galask (2001) found the following percentages of women with vestibulodynia to have reported experiencing these depressive symptoms: depressed mood (39%), anhedonia (22%), fatigue (52%), hostility/irritability (25%), concentration problems (36%), and tearfulness (29%). Brotto, Basson, and Gehring (2003) found that just under half of their vestibulodynia sample reported negative affect and social withdrawal, and just over a third reported difficulty with anger and hostility control. Additionally, Meana, Binik, Khalife, and Cohen (1998) found depressive symptomatology to be an important predictor of women’s pain reports; this was especially true for the subgroup of women who evidenced no obvious physical pathology. It is important to keep in mind that all of this research is correlational. Only tentative conclusions can be drawn regarding the direction of these relationships. Depressive symptoms may predispose a woman to have sexual pain; they may, on the
other hand, be a consequence of the pain, or, alternately, pain and depression may share similar pathways and affect each other concurrently and reciprocally. There are data supporting a strong relationship between pain (in general) and depression, particularly for women (Meana, 1998), so it is not unlikely that women with dyspareunia would evidence higher levels of depressive symptoms than non-clinical samples.

**Anxiety.** Similar results have been found with regard to anxiety symptoms and disorders. Nunns and Mandal (1997) found that women in their sample with vulvar vestibulitis had elevated state and trait anxiety, and Granot and Lavee (2005) found this association between dyspareunia and elevated trait anxiety as well. Meana et al. (1998) also found anxiety to be an important factor in predicting pain ratings. Women with sexual pain have also been found to report more interpersonal sensitivity and phobic anxiety (Meana et al., 1997b), and in a vestibulodynia sample, 32% have reported experiencing anxiety/nervousness with 57% reporting that they felt “stressed out” (Sackett et al., 2001). Lundqvist and Bergdahl (2005) found a personality structure in women with vestibulodynia that characterized them as cautious, careful, insecure and pessimistic. In the NHSLS survey, sexual pain was found to be associated with emotional problems and stress (Laumann, Paik, & Rosen, 1999), and the Latthe et al. review also revealed a relationship between dyspareunia and anxiety. Clearly there exists a relationship between sexual pain and anxiety-spectrum experiences; this makes sense as the fear of impending pain may predispose a person toward experiencing pain or magnifying its experience. This type of attentional bias was found in a recent study with a vestibulodynia sample. Payne et al. (2004) found that women with vestibulodynia reported hypervigilance toward coital pain; furthermore, results supported the notion of
an attentional bias toward pain stimuli, and this effect predicted measures of state and trait anxiety and fear of pain.

Interestingly, a recent study (Brauer, Laan, & ter Kuile, 2006) compared genital responses to visual sexual stimuli (both noncoital and coital) between women with and without dyspareunia, with the expectation that dyspareunic women would exhibit a conditioned anxiety response to depictions of coital activity, resulting in lowered genital response. However, results for genital response indicated quite the opposite: women with dyspareunia had higher levels of genital arousal to coitus than sexually functional women, whereas the sexually functional women demonstrated more genital arousal to noncoital activity than women with dyspareunia. In contrast, women with dyspareunia reported less positive feelings in response to both types of erotic stimuli than control women. The authors suggested that there was no evidence for impaired genital responsiveness in women with dyspareunia, but the contrasting results between subjective and physiological responses is nonetheless intriguing. Clearly more research is needed to elucidate the potential role of fear and anxiety in the development and maintenance of dyspareunia.

Somatization. Because dyspareunia is a disorder experienced in the body, and because there is rarely clear physical pathology associated with it, researchers have also investigated whether sexual pain could constitute a type of somatization in some women. Some studies have shown that dyspareunia samples have evidenced increased somatization and pain catastrophizing (Granot & Lavee, 2005), scored higher on the somatization scale of the MMPI (Van Lankveld, Weijenborg, & Ter Kuile, 1996), and as many as 42% of one sample met criteria for somatization disorder (Schover, Youngs, &
In addition, women with vestibulodynia have scored higher on measures of harm avoidance and reported more somatic symptoms than controls (Danielsson, Eisemann, Sjoberg, & Wikman, 2001). However, not all studies have found this relationship between dyspareunia and somatization characteristics (Meana et al., 1997a). The results supporting a link between dyspareunia and somatization may be the consequence of having a pain that cannot be explained or of pain hypervigilance. It is interesting that despite evidence supporting the role of psychological components in dyspareunia, proponents of the pain disorder conceptualization of dyspareunia are largely ignoring these.

**Trauma.** Some have hypothesized that dyspareunia may be the result of prior aversive or traumatic sexual experiences, sexual abuse in particular. Findings are mixed. Some research supports this theory (Harlow & Stewart, 2003; Latthe et al., 2006; Schover, Youngs, & Cannata, 1992), and other research has not found this association (Meana et al., 1997b). Though there is no clear evidence for a relationship between dyspareunia and sexual or genital trauma, it certainly seems important to acknowledge the possibility in both the assessment and treatment of this disorder.

**Sexual dysfunction.** As dyspareunia occurs during sexual activity, it is likely that it may affect various stages of the sexual response cycle; these effects are well-documented at all stages. Low sexual desire is common in women with dyspareunia, with many reporting low sexual desire in general (Schover, Youngs, & Cannata, 1992; Meana et al., 1997b), and most reporting a significant decrease in sexual desire upon developing vestibulodynia (Sackett et al., 2001). Many women report difficulty with arousal and/or lubrication (Meana et al., 1997b; Nunns & Mandal, 1997; Schover, Youngs, & Cannata,
1992; van Lankveld, Weijenborg, & Ter Kuile, 1996), and in one study, over half reported they are situationally anorgasmic (Schover, Youngs, & Cannata, 1992). Vaginismus is not uncommon (Brotto, Basson, & Gehring, 2003; Schover, Youngs, & Cannata, 1992), and most women report they are less willing and/or able to participate in sexual activity (Sackett et al., 2001). Women with dyspareunia often report negative thoughts (Nunns & Mandal, 1997) and emotions (Van Lankveld, Weijenborg, & Ter Kuile, 1996) about and during sexual activity, and they have been found to be more erotophobic and hold more negative attitudes about sexuality than controls (Meana et al., 1997b). Not surprisingly, women with sexual pain report less satisfaction with sex (Brotto, Basson, Gehring, 2003), and lower overall levels of sexual function (Meana et al., 1997b; Reissing et al., 2003), particularly lower and/or decreased frequency of intercourse (Brotto, Basson, & Gehring, 2003; Gordon et al., 2003; Meana et al., 1997b) and more avoidance of sexual activity (Brotto, Basson, & Gehring, 2003).

Relationship variables. Because sexual pain is an interpersonal pain affecting two people, relationship variables and adjustment have been examined as well. Poor marital or relationship adjustment has been found to be related to the experience of pain during sexual activity (Gordon et al., 2003; Meana et al., 1997b; Meana et al., 1998; Schover, Youngs, and Cannata, 1992), with poor communication about sexual matters characteristic of almost 50% of women with dyspareunia in one sample (Schover, Youngs, & Cannata, 1992). Meana et al. (1998) also found marital adjustment to be an important factor in predicting pain rating: the more adjusted the couple, the lower the pain rating tended to be. One study found that increased partner solicitousness for sexual activity and hostility toward the afflicted partner were also associated with high levels of
pain during intercourse in women with vestibulodynia (Desrosiers et al., 2008). However, some research has found no difference in marital satisfaction between women with dyspareunia and controls (Van Lankveld, Weijenborg, & Ter Kuile, 1996), and one recent review of relationship adjustment and dyadic interaction concluded that empirical support is lacking for the theory that dyadic factors play an important role in the etiology, maintenance, and/or exacerbation of dyspareunia (Davis & Reissing, 2007).

**Attributional style.** One research area encompassing many of the aforementioned issues is that of attributional style, as investigated by Meana, Binik, Khalife, and Cohen (1999). They compared women with sexual pain who made psychosocial (e.g., anxiety, relationship problems, history of sexual assault/abuse) vs. physical (e.g., something physical, vaginal infection, hormonal, lubrication difficulties) causal attributions for their pain, resulting in some interesting findings. Compared to those who made physical attributions, women who made psychosocial attributions had higher pain scores, higher levels of psychological distress, lower levels of marital adjustment, and more sexual dysfunction (Meana et al., 1999). It is unclear whether the attributions themselves resulted in these psychosocial problems or if women who are predisposed to making psychosocial attributions for their pain are also predisposed to psychosocial difficulties. Importantly, however, the causal attributions of the women in this sample were unrelated to gynecologic findings. This means that the attributions and not the actual pathology found on examination predicted distress. This is highly suggestive of the potential causal force of cognitions about a disorder, be they accurate or not.

Many of the most influential dyspareunia researchers appear to be pushing for a re-classification of the disorder from the sexual dysfunction section of the DSM into the
pain disorders section. Although there is a rationale for this proposed move, it seems to ignore the complex and varied psychological, psychosexual, and relationship correlates of dyspareunia. As reviewed, dyspareunia sometimes has clear psychopathological pathways, an undeniable negative impact on (or predisposition toward) sexual function at all stages of the sexual response cycle, and an important interpersonal relationship component that likely would be ignored if dyspareunia is re-classified as a simple pain disorder. Whether these psychosocial factors serve as predispositions toward or common sequelae of dyspareunia remains largely undetermined, and thus begging for further empirical investigation.

Treatment and Efficacy

The large variety of proposed etiologies for dyspareunia is matched by the numerous interventions used to treat this disorder. Depending on the therapist or doctor's theoretical and/or clinical orientation, the recommended treatment may be psychological, physical, medical, surgical, or some combination of the above options. Each of these various treatment methods will be reviewed with a discussion of factors which may predispose an individual toward treatment success or failure, as well as what is known about treatment efficacy.

Psychosocial Treatments. Many current treatments have been developed in concordance with the etiological perspective that the roots of dyspareunia can be found in the mind. The utility of psychological/behavioral interventions, including sex therapy, has been explored. Different forms of sex therapy, primarily based upon desensitization models, have been used to treat dyspareunia; major methods of this sex therapy include vaginal dilatation, in vivo desensitization, and Kegel's exercises. One of the oldest and
most widely used treatments is vaginal dilatation (Meana & Binik, 1994). Vaginal
dilatation involves the introduction of increasingly larger dilators into the vagina in an
effort to desensitize the woman to penetration cognitively, emotionally and physically
(Meana & Binik, 1994). With regard to in vivo desensitization, sexual intercourse is not
permitted until the couple has completed a series of activities increasingly approximating
penetration (Meana & Binik, 1994). Kegel's exercises, involving voluntary vaginal
muscle contractions, are also used to teach the woman that sensations in her genital area
are under her control, at least to some degree (Meana & Binik, 1994).

Other non-sex-therapy methods have been tried as well. One case study
evaluating the utility of hypnotherapy found that this type of treatment helped to decrease
anticipatory anxiety, created a positive association of pleasure with intercourse, and
helped to create a sense of control over the client's pain (Kandyba & Binik, 2003). Other
potential alternative treatments include cold application and acupuncture (Bergeron,
Binik, Khalife, & Pagidas, 1997). Though no data currently exist on the use of these
techniques for treatment of dyspareunia, they have been successful in the management of
other chronic pain conditions and are theoretically plausible interventions for sexual pain
(Bergeron, Binik, Khalife, & Pagidas, 1997).

Most investigators in this area recommend a combination of psychotherapy
interventions, involving sex therapy, cognitive-behavioral therapy for accompanying
psychological distress or dysfunction, and pain management (Bergeron, Binik, Khalife, &
Pagidas, 1997; Bergeron, Meana, Binik, & Khalife, 2003). It is important to keep in mind
that the efficacy of the aforementioned treatments is largely unknown and, much as in the
case of medical treatment, psychotherapy and sex therapy are generally recommended in combination with other treatments.

Physical Therapy. One form of treatment that bridges both psychological and medical treatments is physical therapy (see review by Rosenbaum, 2005). Physical therapy, in its various forms, has been utilized in treatment for rehabilitation of pelvic floor muscles. Physical therapy interventions and techniques have included stretching and relaxing of contracted muscles and massage of painful scars (Graziottin, 2001), biofeedback and soft tissue mobilization (Bergeron et al., 2003), and electrical stimulation (Nappi et al., 2003). In a retrospective study, Bergeron et al. (2002) found that a combination of physical therapy techniques (e.g., proprioception, normalization of muscle tone, pain modification, mobilization applied on surface of perineum internally by vaginal palpation, myofascial release, trigger-point pressures, massage, Kegel’s exercises) resulted in a significant decrease in pain, and significant increases in intercourse frequency and levels of desire and arousal. Fifty-one percent of the sample reported great improvement, 20% reported moderate improvement, and 27% reported little to no improvement post-treatment. Bergeron et al. (2002) argued that these findings underlined the importance of controlling vaginal muscular reactions. Women who are taught how to maintain a relaxed pelvic floor during intercourse may be able to decrease the sensation of pain. In a sample of women with vulvar vestibulitis syndrome, Glazer, Rodke, Swencionis, Hertz, and Young (1995) found that electromyographic feedback effected a 95% increase in pelvic floor muscle contractions, a 68% decrease in resting tension levels, and a 62% decrease in the instability of resting muscle tone. Subjective pain reports decreased by 83%, and 22 of the 28 women who had previously abstained
from intercourse had resumed it by the end of treatment (Glazer et al., 1995). Finally, Nappi et al. (2003) found that a 10-week program of electrical stimulation (applied to the vestibular area and vaginal introitus) resulted in a significant reduction in pain, rehabilitation of pelvic floor muscles, progressive desensitization to pain, and a high rate of subjective improvement. Though its application to sexual pain is relatively new, physical therapy clearly has the potential to become a vital component of any dyspareunia treatment paradigm.

**Medical/Surgical Treatments.** Generally recommended as a first line treatment (Bergeron et al., 2003), medical interventions are most often aimed at treating the underlying disease suspected to be the cause of pain during sex (Meana & Binik, 1994). Medical interventions often involve the topical application of ointments such as anesthetics, antifungals, antibiotics (Bergeron et al., 1997), as well as corticosteroid and estrogen creams (Bergeron et al., 2003). Hormone-replacement therapy (HRT) has been used in an effort to limit or prevent vulvo-vaginal atrophy that occurs during and post-menopause (Binik et al., 1999). The efficacy of these various treatments remains largely unknown (Bergeron et al., 2003), but they are generally thought to be ineffective in the treatment of dyspareunia (Bergeron et al., 1997). While still considered the typical first line treatment, medical interventions are seldom adequate and should be followed by some form of psychological intervention (Meana & Binik, 1994).

Considered to be the most drastic and invasive treatment option, vaginal surgery is a final treatment option for women suffering from introital pain associated with vestibulodynia. Theoretically, vaginal surgery cures the pain syndrome by removing the inflamed vestibular tissue characteristic of vestibulodynia (Bergergon, Binik, Khalife,
Meana, et al., 1997). There are two such surgeries: laser treatment and vestibulectomy. Laser treatment involves the ablation of the vestibular area to a depth of 1.5mm to 1cm; it remains a controversial procedure as it is suspected to have potentially aggravating effects (Bergeron et al., 1997). Vestibulectomy is a modified form of perineoplasty involving the excision of the hymen and the sensitive areas of the vulvar vestibule, most often located in the posterior fourchette, to a depth of approximately 2mm (Bergeron et al., 1997). The vaginal mucosa is often mobilized and brought downward to cover the excised area (Bergeron, Binik, Khalife, Meana et al., 1997; Bergeron et al., 1997). Vestibulectomy is typically carried out under general anesthesia and requires a hospital stay of only one day; the healing period is typically 4-8 weeks, with sexual intercourse gradually resuming after 8 weeks time (Bergeron et al., 1997).

Vestibulectomy is usually recommended as a last treatment option following the failure of medical management (Binik et al., 1999). Despite the general reluctance of doctors and therapists to recommend this treatment, vestibulectomy is most consistently reported as achieving the best therapeutic outcome (Bergeron et al., 1997), evidencing success rates higher than 60% (Bergeron et al., 2001). A recent review of treatment outcome studies for vestibulodynia also revealed that surgical treatment continues to have the highest overall success rates (Landry, Bergeron, Dupuis, & Desrochers, 2008). According to Goldstein, Klingman, Christopher, Johnson, and Marinoff (2006), long-term patient satisfaction with vestibulectomy is quite high; 93% of their sample reported they would have the surgery again and would recommend it to other women with similar symptoms. However, the picture is not all rosy. Many women fear the risk of infection, scar tissue, increased pain, cysts, disfigurement, and potential recurrence of symptoms.
The expectation of pain during intercourse also remains high even after surgery (Meana & Binik, 1994).

**Integrative treatments.** Recommended interventions for dyspareunia often encompass a range of the aforementioned treatment methods, starting with the least invasive interventions and moving toward surgery, if needed (Bergeron et al., 2003). The most agreed upon course of treatment starts with medical interventions for potential underlying disease or infection, and includes physical therapy and biofeedback to reduce myalgic tension of pelvic floor muscles and fear of vaginal penetration. Recommended treatment protocols also often involve psychotherapy focused on pain management, sexual schema, and relational issues, and, finally, surgical procedures if none of the prior interventions have been effective (Bergeron & Lord, 2003; Bergeron et al., 2003; Graziottin & Brotto, 2004). Graziottin and Brotto (2004) further recommend psychodynamic or interpersonal therapy to address lifelong difficulties or issues, brief behavioral therapy to deal with co-morbid vaginismus and/or aversion, and the use of clitoral vibrators to help improve arousal and resume sexual intimacy.

Bergeron et al. (2003) presented a detailed psychosocial approach involving: 1) psychoeducation, alliance building, and goal formulation; 2) treatment strategies for reducing sexual pain and dysfunction; and 3) review and consolidation of learned strategies. In the first stage, the therapist helps the client to reconceptualize dyspareunia as a multidimensional problem that is influenced by a variety of factors (e.g., thoughts, behaviors, emotions, couple interactions), as well as to help the couple find enjoyment in non-penetrative activities. The second phase includes self-exploration of the client’s genitals, breathing and relaxation exercises, Kegel’s exercises, and cognitive
restructuring (i.e., preparing for anticipation of pain, confronting and handling the sensations of pain, coping with feelings after painful intercourse, and breaking the avoidance of sex habit). In the final stage of treatment, the therapist and client review and synthesize the techniques and progress with the goals of facilitating the woman's internal attributions of her improvement and identify areas requiring continued attention for the future maintenance of treatment gains.

Outcome predictors. Some researchers have investigated factors associated with treatment outcome. Schover, Youngs, and Cannata (1992) found that positive treatment outcome was associated with willingness to participate in psychological treatment, higher socioeconomic status, and self-report of specific and localized (rather than vague and diffuse) pain. Graziottin and Brotto (2004) delineated the characteristics of different vestibulodynia groups and the relationship of these characteristics to treatment outcome. Characteristics of the low-risk vestibulodynia patients with good prognosis were: 1) pain duration of less than 1 year; 2) normal systemic pain threshold; 3) no history of invasive treatments; 4) no difficulties with sexual function before onset of vestibulodynia symptoms; 5) demonstrable self-efficacy and coping strategies; and 6) a positive relationship with a supportive partner (Graziottin & Brotto, 2004). In the high-risk group with questionable prognosis, characteristics were: 1) duration of longer than 1 year; 2) chronic candida and candida treatment resistance; 3) a history of vulvar vestibular laser treatment; 4) local and systemic hyperalgesia; 5) pre-existing sexual problems; 6) depression and anxiety symptoms; and 7) being single or in a troubled relationship. It is unknown how generalizable these categories and characteristics are as the samples were exclusively of women with vulvar vestibulitis syndrome. There do, however, appear to be
some clear patterns that may predispose a woman toward or away from successful
treatment of dyspareunia.

**Treatment Efficacy.** Perhaps the most problematic issue with regard to the
treatment of dyspareunia is that of treatment efficacy. To date, the vast majority of
treatment outcome studies lacked control groups, had unclear measurements for pain
experience and a short length of follow-up, and the therapeutic criteria for treatment
success was seldom defined operationally (Bergeron, Binik, Khalife, Meana et al., 1997).
In their review of treatments for sexual dysfunction, Heiman and Meston (1997)
concluded that, at that point in time, the available data were not sufficient to conclude
that any of the medical, psychological, or surgical interventions were even probably
efficacious for the treatment of dyspareunia. However, in 2001, Bergeron et al. reported
on the first randomized treatment outcome study performed on women with
vestibulodynia. Seventy-eight women were randomly assigned to one of three treatment
groups: cognitive-behavioral therapy (12 weeks), surface electromyographic feedback
(12 weeks), and vestibulectomy (surgery). Participants were assessed at pre- and post-
treatment, as well as for a 6-month follow-up, on gynecological examinations and
structured interviews and standardized questionnaires examining pain, sexual function,
and psychological adjustment. Results indicated significant pain reduction for all
treatment groups, although the vestibulectomy group was significantly more successful
than the other two groups. Additionally, all treatment groups showed significant
improvement on measures of psychological adjustment and sexual function, leading the
authors to conclude that women with vulvar vestibulitis can benefit from both medical
and behavioral interventions. However, the absence of a “no-treatment” control group to
examine potential time effects of vestibulodynia development needs to be noted. Additionally, seven of the women assigned to the vestibulectomy group did not go through with the surgery, potentially creating an artificial increase in efficacy rates for this intervention and masking the problem of treatment palatability.

At a 2.5-year follow-up, all treatments continued to evidence significant improvements in pain over time (Bergeron, 2003). The effects of CBT had caught up to those of vestibulectomy with regard to self-reported pain, suggesting that while the results of CBT may be slower to appear, surgery can be avoided if one is willing to wait longer for treatment to take effect. Importantly, however, there were no differences in frequency of intercourse or overall sexual functioning between these two time periods, suggesting that spontaneous sexual functioning does not recur even if pain is eliminated. This raises the important issue of what exactly is the appropriate outcome variable in dyspareunia treatment studies – reduction in pain or an improvement in sexual function?

A more recent treatment outcome study compared electromyographic biofeedback to topical lidocaine immediately after 4-months treatment and 6 months post-treatment (Bohm-Starke, Brodda-Jansen, Linder, & Danielsson, 2007). Both subjective and physiological measures of pain were recorded at each time to examine self-reported improvements and vestibular pain pressure thresholds. Results indicated that both types of treatment increased vestibular pain thresholds, reduced dyspareunia, and improved general bodily pain. However, the global hypersensitivity to pain found in the vestibulodynia sample was not improved post-treatment, suggesting that even “successful” treatments are not always effective in reducing the general hypersensitivity to pain found in many women with dyspareunia.
In conclusion, although various treatment modalities have been used to effectively treat sexual pain in some women, the "throw everything in but the kitchen sink" method clearly does not serve to identify active treatment ingredients. Even the best established efficacy rates for pain reduction are under 70%, and overall sexual functioning remains quite low. If the goals for treating dyspareunia remain pain reduction and enhanced sexual functioning, our current interventions fall short of achieving both. This lack of holistic success raises questions about our conceptualizations of dyspareunia and how best to treat concurrent problems of sexual function and pain.

The Dyspareunia Debate

The recent increase in research efforts examining dyspareunia has initiated a debate regarding our current conceptualizations of this disorder. Some now argue that dyspareunia would be better classified as a genital pain disorder that causes interference with sexuality rather than as a sexual disorder characterized by pain (Binik et al., 2002). Support for both sides of this debate comes from a variety of theoretical, clinical, etiological, and treatment perspectives (Binik, Pukall, Reissing, & Khalife, 2001).

Those who would move dyspareunia from the sexual dysfunctions into the pain disorders section of the DSM make their case primarily on the grounds that: 1) the sexual difficulties of dyspareunia are incidental to the pain, 2) dyspareunia shares more with other pain disorders than it does with other sexual dysfunctions, and 3) research and treatment would be enhanced by the pain conceptualization.

The first part of this argument departs from the observation that, although the major symptom of dyspareunia is pain, the sexual dysfunction conceptualization ignores the pain component almost entirely, potentially leading to inconsistent descriptions of
dyspareunia (Binik et al., 1999; Pukall, Reissing, Binik, Khalife, & Abbott, 2000). Binik (2005) notes that the basic and faulty foundation underlying the concept of dyspareunia is that there is a special type of pain that is, by nature, sexual (Binik et al., 1999). This characterization is quite different from most types of pain, which are typically characterized by the anatomical region affected and not by the activity with which the pain interferes (Binik, 2005; Binik et al., 1999). In addition, the label of dyspareunia lumps together women with vastly different clinical presentations, overlooking potentially important differences and thus resulting in inadequate interventions (Binik, 2005). Furthermore, it has been found that the taxonomic criteria developed by the International Association for the Study of Pain are better at predicting dyspareunia subtypes based on gynecological examination than those of the DSM-IV-TR (Binik, 2005; Meana et al., 1997a). Finally, dyspareunic pain is often experienced during non-sexual activities such as tampon insertion, urination, sports, and gynecological exams (Binik, 2005; Binik et al., 1999) and is thus not exclusive to sex or even penetration. Pain, rather than difficult sex, is thus the central defining characteristic of dyspareunia just as pain, rather than difficulty lifting heavy objects, is the central defining characteristic of back pain.

The second part of the argument revolves around the contention that pain experienced during intercourse is characteristically similar to pain found in other pain syndromes (Binik, 2005; Meana & Binik, 1994; Meana et al., 1997a). It has been found that women with vestibulodynia may suffer more than controls from other non-genital pain syndromes (Danielsson et al., 2001), but not from other sexual dysfunctions (Binik et al., 1999). Physiological findings support the similarity of dyspareunia with other pain
disorders. Tactile pressure sensitivity for women with vestibulodynia appears to be elevated, such that touch thresholds for women without vestibulodynia are equal to pain thresholds for women with vestibulodynia (Pukall et al., 2002). These differences in touch and pain thresholds were also found in body regions other than the vulvar vestibule (Pukall et al., 2002; Pukall, Binik, & Khalife, 2003). Granot, Friedman, Yarnitsky, and Zimmer (2002) also found a lower pain and unpleasantness thresholds in women with vestibulodynia as compared to normal control women on areas of the body other than the vulva (e.g., the arm). Using quantitative sensory testing (including both tactile and heat stimulation), Lowenstein et al. (2004) also found lower pain thresholds in women with vestibulodynia. Giesecke et al. (2004) tested pain threshold levels on four body regions (vulvar area, thumb, deltoit, shin) and found that women with vulvodynia had significantly lower pain thresholds across all locations. Differences have been found in brain region activation as well. Pukall et al. (2005) found that women with vestibulodynia have increased activation in pain-related brain regions in response to pressure appraised as painful in comparison to control women, evidencing the typical “pain signature” (i.e., activation in primary and secondary somatosensory cortices, insular cortex, and anterior cingulated cortex; Bushnell, Villemure, Strigo, & Duncan, 2002). This brain region activation pattern has also been found in evoked response to pain in individuals with other chronic pain syndromes (Bushnell et al., 2002; Pukall et al., 2005). So, dyspareunia seems to be characterized by properties common to other pain syndromes that have nothing to do with sex.

The third part of the argument is concerned with treatment efficacy. Some argue that traditional treatments for dyspareunia based on the sexual dysfunction model (e.g.,
vaginal dilatation, in vivo desensitization, Kegel's exercises) have not been particularly useful or effective (Binik et al., 1999). Binik (2005) argues that conceptualizing dyspareunia as a sexual dysfunction limits the range of potential interventions to be considered, whereas treatments for chronic pain syndromes tend to be more varied. He and others also believe that considering dyspareunia a pain disorder rather than a sexual dysfunction helps the therapeutic alliance by focusing on the presenting complaint (Binik, 2005), as well as assisting the client in coping with the pain and helping significant others understand and have empathy for the pain (Meana, Binik, Khalife, Bergeron et al., 1997). This move might also aid in more reliable diagnostic procedures and promote more descriptive investigations examining pain as the central feature (Bergeron et al., 1997). Pukall et al. (2000) argue that if re-classification occurs, clinical assessment will focus on the pain and its functional effects in case conceptualization and treatment. Some also believe that re-classification would lead to more multimodal treatments involving both physical and psychosocial interventions (Bergeron et al., 1997; Pukall et al., 2000). Finally, considering dyspareunia to be a pain disorder may allow for more social institutions to participate in addressing the problem of genital pain (Meana, Binik, Khalife, Bergeron et al., 1997), as well as aiding researchers in obtaining funding (Binik, 2005).

Despite these well-reasoned arguments, not all researchers are in agreement with the seemingly radical move of dyspareunia from the sexual dysfunction section of the DSM-V to the pain disorder one. The argument against the move is organized primarily around 1) a concern that ignoring the sexual context of this pain would be no improvement over ignoring the pain aspects, 2) the current reliance on empirical data
limited to one sub-type of dyspareunia (vestibulodynia), and 3) lack of empirical support for the superiority of pain management over sex therapy as a treatment for dyspareunia.

First, some researchers believe that favoring either the sexual or the pain aspect of dyspareunia is highly problematic. There clearly exists empirical support that women with dyspareunia experience real pain; however, evidence also exists supporting the co-morbidity of dyspareunia with other sexual dysfunctions (Carpenter & Andersen, 2005; Payne, 2005), and disruption at all stages of the sexual response cycle (Carpenter & Andersen, 2005). Re-classification into the pain disorders section of the DSM may actually reduce the likelihood that co-morbid sexual dysfunction would be noticed and/or treated (First, 2005).

The second complication with the re-classification movement is its over-reliance on data collected almost exclusively with women suffering from vulvar vestibulitis, just one of four of the sub-types of dyspareunia (Meana et al., 1997a; Meana, 2005). Though vestibulodynia seems to represent the highest proportion of dyspareunia cases, it may only account for 50% of women with sexual pain. This concentration on the study of women with vestibulodynia has resulted in a lack of knowledge regarding other dyspareunia sub-types, creating a situation of unknown generalizability of results from these samples to women presenting with the other sub-types. Though Binik (2005) uses the terms interchangeably, vestibulodynia and dyspareunia are not synonyms, and our lack of data on other presentations of sexual pain suggest that it might be premature to call for radical classification changes (Meana, 2005).

Finally, Binik (2005) claims that pain management techniques will be more effective in the treatment of dyspareunia than traditional sex therapy methods. The
problem with this assertion is that no one has actually compared these two types of interventions empirically. It is currently pure conjecture as to whether pain management is more effective, less effective, or evidences similar efficacy rates as sex therapy methods. As a matter of fact, pain management and certain aspects of sex therapy share much in common. Furthermore, the inclusion of pain specialists may not be guaranteed by re-classification (Carpenter & Andersen, 2005; First, 2005), and even if pain management techniques are more successful, it does not necessarily mean dyspareunia must be a pain disorder (Wakefield, 2005).

Although those who believe re-classification of dyspareunia into the Pain Disorders would be beneficial for a host of reasons, the general consensus seems to be that we are not at the point of moving dyspareunia out of the sexual dysfunctions group quite yet. It seems we still have a great deal to learn about this disorder, and the intense focus on the pain symptom itself, useful though it has been, seems to have unfortunately curbed research endeavors examining other characteristics of this problem.

Conclusion

The many varied presentations of dyspareunia make it a complicated yet intriguing disorder to study. The high prevalence rates and distress associated with it make it particularly deserving of further research so that we can better help afflicted women. To date, dyspareunia has been found to be associated with both biological and psychological disturbances, and psychosocial and medical treatment interventions evidence varying rates of efficacy. As research and clinical practice moves further away from sexist dismissals of women’s sexual pain, perhaps we can introduce the utility of investigating the cognitive aspects of dyspareunia without risking the misinterpretation of
claiming that the pain is “all in their heads.” Many cognitive aspects of pain perception (e.g., attention, memory) found to be important in other types of pain (e.g., back pain, arthritis) have been almost entirely ignored. Now that we can collectively agree that the woman’s pain is not entirely in her head, we are left to wonder what is going on in the thoughts and cognitions of women who experience pain during an activity as highly interpersonally and socio-culturally loaded as is sexual intercourse. In order to move in the direction of investigating cognitive correlates of dyspareunia, it is first important to review the literature on sexuality and cognition. This body of literature suggests paradigms and methodologies that might prove useful in the study of dyspareunia-related cognitive processes.

Cognition in Sexuality

The study of cognitive factors in sexuality research initially began in an effort to further inform treatment regimens for various sexual dysfunctions. Research utilizing a diverse range of methodologies has supported the important roles of cognitive distraction/attentional factors, anxiety, and mood in the development and maintenance of sexual dysfunction. It was not until the cognitive revolution of the 1980’s and 1990’s, however, that we began to see a push toward understanding cognitive processes in normal sexuality. The effects of this change in focus can be seen in the employment of more refined cognitive methodologies designed to access these underlying cognitive processes in both functional and dysfunctional sexuality. Though the field is moving toward a more comprehensive and clear understanding of cognitive factors in sexuality, albeit slowly, there currently exists only one published study (Payne et al., 2004) investigating the role of cognition in dyspareunia specifically.
Cognition in Sexual Dysfunction

Early studies examining different psychological variables associated with sexual dysfunction (most often arousal difficulties) focused primarily on the effects of cognitive distraction, anxiety, and different mood states on sexual function. Several paradigms have been used to distract an individual away from erotic material, including tallying tones heard through headphones while viewing erotic material (Farkas, Sine, & Evans, 1979), engaging in an adding task while listening to erotic material (Adams, Haynes, & Brayer, 1985), listening to a reading of a non-erotic novel while viewing arousing films (Abrahamson, 1985), and participating in a dichotic listening task wherein individuals must selectively attend to and repeat sentences heard in one ear while ignoring aural erotic material presented in the other ear (Elliott & O’Donohue, 1997). Not surprisingly, the aforementioned cognitive distraction manipulations all negatively affected sexual arousal to varying degrees. Anxiety has most often been induced by threat of shock (Barlow, Sakheim, & Beck, 1983; Beck & Barlow, 1986; Hale & Strassberg, 1990); but also by telling participants that they will be videotaped during the experimental session (Elliott & O’Donohue, 1997) or by showing them a film clip depicting threatened amputation (Palace & Gorzalka, 1990). General results suggest that experimentally-induced anxiety may decrease sexual response in functional individuals, but either have no effect or facilitate sexual response in sexually dysfunctional individuals (Van den Hout & Barlow, 2000). Finally, some investigators have utilized mood induction techniques, such as presenting emotionally-laden film clips (Palace & Gorzalka, 1990), various music pieces (Laan, Everaerd, Von Berlo, & Rijs, 1995; Mitchell, DiBartolo, Brown, & Barlow, 1998), or listening to audiotaped mood induction statements (Meisler
& Carey, 1991). Individuals have also been asked to retrospectively self-report on how different mood states affect their sexual interest and response (Bancroft, Janssen, Strong, Carnes, Vukadinovic et al., 2003; Bancroft, Janssen, Strong, & Vukadinovic, 2003; Lykins, Janssen, & Graham, 2006). Overall, negative mood (e.g., depressed mood) has been found to negatively affect sexual arousal; positive mood either facilitates or has no effect on sexual arousal.

In conclusion, cognitive distraction, anxiety, and mood states have all been found to impact sexual functioning in significant ways, most often in a negative manner. However, there exist some serious problems with these studies. First, there is often no consensus regarding the constructs of interest (e.g., cognitive distraction, anxiety); the lack of consistent operationalization of constructs across studies also makes it difficult to draw meaningful conclusions from this body of research. Additionally, neither the methods used to create these experiences in the laboratory environment nor the degree to which these experiences have been successfully induced demonstrate adequate standardization. Finally, and perhaps most importantly, the manner in which cognitive distraction, anxiety, and mood have been experimentally induced often do not realistically approximate actual sexual experiences.

Though the aforementioned research endeavors brought about a fair understanding of some specific cognitive factors in sexual dysfunction, we are left to devise how to characterize cognitive processes (e.g., attention, memory, executive functioning) in functional sexuality. More recently, investigations have turned to techniques originally developed by cognitive psychology researchers and, consequently,
provided important insights into these cognitive processes with regard to sexuality and sexual behavior.

**Information Processing Approach**

James Geer and colleagues have contributed the vast majority of what is known about the role of various types of cognition in sexual function. Geer has argued that the Information Processing Approach (IPA; Massaro & Cowen, 1993) is a model that provides a good basis from which to develop and test ideas related to cognition in sexuality (Geer & Manguno-Mire, 1996). Information processing essentially refers to how information in our environment is modified so that it eventually can be understood and used in some way (Massaro & Cowen, 1993). A number of researchers promoting the use of IPA to the study of cognition believe it is useful to conceptualize individuals as active participants in the processing of the information to which they are constantly exposed. This information can originate internally (i.e., from within the system or body) or externally (i.e., from the environment) and is either given access or rejected, processed if taken in, and used for subsequent responses and decision-making (Geer & Manguno-Mire, 1996). IPA theorists delineate two types of processing: molecular and molar. Molecular processing involves the low-level, basic sensory and attentional processes; in contrast, molar processing refers to more high-level, schematic-type processing involved in cognitive appraisals, as influenced by memory and information organization. In sexuality research, information processing has thus far been researched at the levels of attention, memory, and the organization of sexual information.
Attention to Sexual Information

The first stage of information processing is encoding; the information must get into the system. This molecular type of processing has brought about an interest in the role of attention in sexuality. Though our current understanding of attentional processes is rather limited, more is known about attention and sexuality than about other cognitive processes. Attention to erotic stimuli has been studied through a variety of methods with some interesting results. Of primary interest to those in the sexuality field is what has been termed the sexual content-induced delay, or SCID. SCID refers to the common finding that individuals often evidence slower response times when identifying stimuli that includes erotic information (as compared to stimuli lacking erotic information), evidencing either a form of attentional capture, emotional responding, or some form of interference effected by sexual information (Geer & Manguno-Mire, 1996). SCID effects have been found to be more pronounced in women than in men (Geer & Manguno-Mire, 1996).

A number of studies have found the SCID effect. Geer, Judice, and Jackson (1994) presented an erotic paragraph to 70 undergraduates and obtained reading times for 3 different types of sentences (erotic, romantic, neutral). They found that reading times were significantly longer for the erotic sentences than for either the romantic or neutral sentences, providing evidence for the sexual content-induced delay. The SCID effect has been found when participants are asked to read solitary words as well. Geer and Bellard (1996) instructed participants to make unprimed lexical decisions (i.e., determine whether or not a string of letters was an actual word or not); stimuli consisted of non-words, sexual words, romantic words, and neutral words. Both men and women evidenced
delayed or increased response times when the target word was sexual in nature. In a follow-up study, Geer and Melton (1997) presented participants sentences constructed so that the last word was lexically ambiguous and potentially sexually connotative, in other words a double-entendre (e.g., hump, cock, rubber). After these priming sentences, participants were shown associated target words or non-words and asked to make a decision as to whether the target was a real word or not. Again, the SCID effect was found: lexical decisions to sexual material were slower than non-sexual material, and this delay was accentuated in women (Geer & Melton, 1997).

Some studies have explored the relationship between attention to sexual information and consequent sexual desire and arousal. Prause, Janssen and Hetrick (2003) conducted a study using the dot-probe paradigm to assess attention to sexual stimuli. In this paradigm, one or two pictures (if two, one neutral and one sexual) were presented with a solitary dot appearing immediately after in place of one of the pictures; participants were asked to determine on which side of the screen the dot appeared. Results evidenced the SCID effect, such that responses to the dot appearing in place of a sexual image were slower for both men and women than when in place of a non-sexual picture, suggesting an interference of sexual information.

Spiering, Everaerd, and Janssen (2003) used a priming paradigm to explore the relationship between attention to sexual information and sexual desire and arousal. In their first experiment, participants were exposed to unconscious primes and asked to respond to consciously perceived sexual and neutral targets; it was found that even unconscious primes can activate implicit sexual memory, thus facilitating fast identification of sexual information. In a second experiment, participants were asked to
respond to sexual or neutral targets preceded by conscious sexual or neutral primes. In contrast to unconscious primes, conscious primes decelerated response times, thus evidencing the SCID effect. Sexual targets in this condition elicited more sexual arousal and were rated as more arousing than neutral targets, suggesting that conscious cognitive elaboration of the primes occurred.

Some research indicates that the SCID effect may be absent or even reversed under certain conditions. Spiering, Everaerd, and Elzinga (2002) asked participants to categorize sexual and neutral pictures that were primed by neutral, sexual, or threatening images to which the participants were asked to either attend or ignore. Results suggest that the SCID effect occurred only when participants were asked to ignore the primes (and sexual primes were presented); they also found delayed response times when the sexual images were preceded by threatening primes. When instructed to attend to primes and sexual primes were presented, response times were faster. The authors suggest that the SCID effect may be the result of general emotional activation elicited by emotional (sexual or threatening) stimuli, and that decisions involving sexual information may be facilitated when the sexual system has been previously activated.

In the first direct test of visual attention to erotic stimuli, Lykins, Meana, and Kambe (2006) presented 20 men and women erotic and non-erotic pictures and tracked their eye movements as they gazed at them. Number of fixations, first gaze duration, and total time spent attending to specified regions (e.g., face, body, context) were the dependent variables analyzed to indicate interest in these scene regions. Significant differences were found for both number of fixations and total time between erotic and non-erotic images, providing further support for the cognitive processing differences
between erotic and non-erotic material. Lykins, Meana, and Strauss (2008) conducted a test of gender differences in visual attention to erotic stimuli using eye-tracking methodology and found significant gender differences in attention to scene regions in erotic images (e.g., male face, female face, male upper body, female upper body, male lower body, female lower body, context). Men's attention focused primarily on the female bodily regions, particularly the upper body, whereas attention to erotic images for women seemed more diffuse (i.e., women's attention was spread more evenly across the scene regions than was that of men). Results suggest specificity (men) and non-specificity (women) differences in attention, and possibly arousal, as has been found in other research (Chivers, Rieger, Latty, & Bailey, 2004).

One final study of particular relevance to the current proposal is Payne et al. (2004)'s research on the role of attention in sexual pain. Seventeen women with vulvar vestibulitis (and 17 matched controls) completed an emotional Stroop task, wherein participants were shown a series of emotionally-activating words and asked to name the color in which the word was printed. It was hypothesized that words related to an individual’s concerns would create cognitive interference, as identified by longer response times. Stimuli for this study comprised words from four different categories: pain, social-threat, positive, and neutral. Results evidenced a hypervigilance effect for pain relevant information; women with vestibulodynia exhibited greater interference for pain words than controls, supporting the hypothesis of attentional capture of pain information in women with sexual pain (Payne et al., 2004). More importantly, this study was the first to implicate the vital role of cognitive factors in sexual dysfunction using cognitive methodological techniques.
Memory for Sexual Information

In contrast to the molecular type of processing evident in attention, studies of memory may provide data on the molar processing of sexual information. Once the information is encoded, what is later retrieved may indicate what is relevant to individuals, at least relevant enough to be encoded in long-term memory. Much of the research conducted in memory for sexual information has examined gender differences, and has often supported the finding from attention studies that sexual information is processed in a uniquely different manner than non-sexual information.

In an initial test, 20 men and women read a story detailing a heterosexual sexual encounter (Geer & McGlone, 1990). Participants were later tested on the story’s romantic, erotic, and neutral elements via a recognition test. Though men and women did not differ in recognition to neutral sentences, men were faster and more accurate at identifying erotic sentences than were women, and women were faster and more accurate at identifying romantic sentences than were men (Geer & McGlone, 1990). In a follow-up study, Kirsch-Rosenkrantz and Geer (1991) tested recognition and recall memory for a sexual story. Results supported the hypothesis that men would report more intrusions (i.e., incorrect material) that was sexual in nature than would females; this effect was found for both recall and recognition memory (Kirsch-Rosenkrantz & Geer, 1991). Contrary to expectations, men also showed more romantic intrusions than women, perhaps revealing a gender difference in which men show distortion in any material that contains components that are either overtly sexual or merely suggestive (i.e., romantic) (Kirsch-Rosenkrantz & Geer, 1991).
Several other studies have included components of memory testing for sexual information as well. Castille and Geer (1993) had participants read an ambiguous story and manipulated the content of advance information (i.e., title, description of the story). Participants completed recall and recognition tasks after finishing the reading portion. Castille and Geer (1993) found that the understanding of an ambiguous story can be easily manipulated; participants who read sexual descriptors before the ambiguous story generated more sexual intrusions than participants who received non-sexual descriptors. Similar results were found with the recognition task. Finally, in their study of reading times for erotic material, Geer, Judice, and Jackson (1994) had participants complete a recognition task for the story’s elements. Upon reading an erotic paragraph, participants were shown 36 sentences, 18 of which had appeared in the original text. Results indicated that women were more accurate overall than men, but men more accurately identified erotic sentences than did women (Geer, Judice, & Jackson, 1994).

Organization of Sexual Information

The plethora of gender differences found for attention and memory of sexual information perpetuated an interest in more general cognitive processes, namely the organization of sexual information. Network models are used as an approximation for the manner in which information is stored or represented in memory. The semantic networks developed from these data support the hypothesis of systematic differences between men and women in the meaning of sexual words; women’s and men’s semantic networks differed consistently from each other (Geer, 1996). More specifically, women’s networks evidenced more links on interpersonal words (e.g., affectionate, caring, tender) than did men’s networks, and also more links between positive evaluation words (e.g.,
pleasurable, enjoyable, desirable) and interpersonal words than did men, suggesting that interpersonal relationships are more complex, and more important, for women than they are for men (Geer, 1996). In contrast, men had more links on the female genitals cluster (vagina, cunt), and more links between positive evaluation words and female genital words than did women, indicating a more complex and meaningful structure for sexual material in men than in women (Geer, 1996).

Continuing this line of inquiry, Manguno-Mire and Geer (1998) included sexual orientation as a factor of interest in network knowledge organization. Results indicated that, along with gender, sexual orientation is an important variable to account for in the organization of sexual information. Similar to the previous study, both heterosexual and homosexual women evidenced more associative links than men (both heterosexual and homosexual) between relationship words (e.g., devotion, love, commitment, tenderness) and positive evaluation words (e.g., wonderful, enjoyable, gratifying, pleasing), once again highlighting the relative importance of interpersonal relationships for men and women (Manguno-Mire & Geer, 1998). However, homosexual individuals had more association links among the explicitly sexual words (e.g., cock, pussy, fuck, cum) than did heterosexuals (Manguno-Mire & Geer, 1998). Overall, homosexual individuals evidenced more dense networks and more associative links on words than heterosexual men and women (Manguno-Mire & Geer, 1998). It is suggested that homosexual individuals may more closely identify with or define themselves in terms of sexual orientation or sexual concepts, thus evidencing a relative salience of sexual information that is greater for homosexual individuals than for heterosexual individuals (Manguno-Mire & Geer, 1998).
What can we conclude from the variety of studies conducted to examine the role of cognitive processes in sexuality? There seems to be strong evidence that attentional factors play an important role in the development and maintenance of sexual dysfunction. In terms of normal sexuality, there appear to be gender differences across both molecular and molar processing as evidenced by differential attention to erotic stimuli, variations in recall and recognition memory, and gender differences in the organization of sexual information. Perhaps most importantly, confirmatory evidence suggests that the processing of sexual information is uniquely different from the processing of non-sexual information, lending support to the importance of continued endeavors focusing on the role of cognition in sexuality.

**Attentional Factors in Pain**

In contrast to the paucity of research on cognitive factors in human sexuality, a relative wealth of data exists about cognitive factors in the perception and experience of pain. Attentional factors in pain have received a great deal of investigatory focus in both chronic pain and pain-free samples. Common paradigms involve induced, threatened, or conditioned pain, as well as the exploration of potential dispositional factors on the pain experience. Though none of these investigations have utilized samples with sexual pain, elucidating factors related to non-sexual pain may aid in our understanding of the role of attention and distraction in dyspareunia.

**Attention to Pain in Pain-Free Individuals**

In order to understand the relationship between attention and pain, many investigators have recruited healthy, pain-free individuals and either induced or threatened pain. Crombez, Eccleston, Baeyens, and Eelen (1996) found that low-intensity
electrocutaneous pain stimuli interrupt and distracts individuals from a tone discrimination task, reducing both reaction time and accuracy. A second study found this effect to be amplified in individuals who tend to catastrophize about pain (Crombez, Eccleston, Baeyens, & Eelen, 1998a). A third related study utilized a tone discrimination task with two types of distractors (pain, non-pain) and found that those participants who were threatened with pain showed marked task disruption upon presentation of the pain stimulus (Crombez, Eccleston, Baeyens, & Eelen, 1998b), again providing evidence of the ability of pain to draw attention to it and away from concurrent cognitive tasks.

Aversive conditioning procedures have also been used to examine whether imminent threat captures and holds attention. Koster, Crombez, Van Damme, Verscheure, and De Houwer (2004) conditioned pain-free participants to expect an aversive white noise when a signal was presented, and then measured response times to an attentional task. They found that threatening information detracted attention away from the task, as evidenced by longer response latencies when the signal was present. In a follow-up study, electrocutaneous pain and somatosensory non-pain stimuli replaced the aversive white noise (Van Damme, Crombez, Eccleston, & Goubert, 2004). Again, response times were significantly longer when the painful stimulus was presented, providing further support to other findings showing that pain demands attention and is difficult to ignore.

The dot-probe task has also been used to measure attentional engagement and disengagement to pictorial representations of pain and threat. Koster, Crombez, Verschuere, and De Houwer (2004) presented pictures from the International Affective Picture System depicting images of pain or threat, and measured response times to the dot
probe. Similar to previous findings, they found that participants had difficulty disengaging attention from threatening information.

**Attention to Pain in Chronic Pain Patients**

While these results confirm the hypothesis that pain attracts and holds attention, the pain or threat of pain is experimental. It is important to determine if the same mechanisms prove relevant in clinical populations and in individuals who experience persistent pain outside of the laboratory. For this reason, direct comparisons between individuals with chronic pain syndromes and pain-free controls have been made on many of the attention tasks used in pain-free only samples.

Many researchers have investigated attentional interference in pain with the Emotional Stroop Task and other related tasks (e.g., primary task paradigm, numerical interference task). In these tasks, slower response times are indicative of attentional interference, such that presented information detracts attention from the task at hand (i.e., naming numbers of colors). In a relatively early study, Eccleston (1995) conducted two experiments examining the role of sustained and shifting attention in chronic pain processing. He found that: 1) chronic pain patients who experience high intensity pain show more task interference than those with either low intensity or no pain, and 2) pain negatively affects tasks that require central attentional control. Eccleston and colleagues used this task in two later studies following this line of inquiry. Eccleston, Crombez, Aldrich, and Stannard (1997) found that high pain intensity in combination with high somatic awareness produced the highest degree of interference on this task, highlighting the importance of cognitive attention to the somatosensory experience in distraction caused by pain. In a later study, it was found that attentional interference caused by pain
was best predicted by the interaction between pain intensity and pain related fear (Crombez, Eccleston, Baeyens, Van Houdenhove, & Van der Broeck, 1999).

It has also been found that the mere representation of pain (such as in words or pictorial form) can activate a heightened emotional experience and elicit attentional interference in chronic pain sufferers to a greater degree than in pain-free controls. Crombez, Hermans, and Adriaensen (2000) found that current pain intensity was predictive of chronic pain patients’ involuntary attentional shift toward sensory pain words (as indicated by slower response times to the Emotional Stroop task). Similar results were found in samples of chronic pain patients both with and without Post-Traumatic Stress Disorder (Beck, Freeman, Shiperd, Hamblen, & Lackner, 2001). However, this attentional bias toward pain-related information using the Emotional Stroop task has not always been attributed to pain status (i.e., chronic pain vs. pain-free individuals). One study found that interference caused by pain information or emotionally salient stimuli is better predicted by mood state (anxiety and depression, specifically) as opposed to pain status itself (Pincus, Fraser, & Pearce, 1998). Though not everyone agrees as to why pain information causes attentional interference, and often to a greater degree in individuals with chronic pain disorders, there is much evidence to support the disruptive nature of pain with regard to attention.

Cognitive-Affective Model of Pain

In an effort to explain this common finding, Eccleston and Crombez (1999) developed a cognitive-affective model of the interruptive function of pain. They argue that pain is one of the first indicators that the body is in danger of potential tissue damage, and that through evolutionary selection, we have been genetically programmed
to attend to information suggestive of harm. This attention to pain, as well as its causes, shifts attention away from other stimuli so that the body’s resources can be utilized to escape this threat. The degree to which attention is disrupted and re-focused on pain is moderated by factors related to the pain itself (e.g., intensity, novelty, predictability), as well as factors related to the environment (e.g., emotional arousal). Eccleston and Crombez (1999) argue that because pain is the archetypal warning sign of danger to our bodies, it will always demand more attention than competing tasks.

Factors Related to the Pain Experience

In a search for factors that may moderate the relationship between pain and attentional interference, investigators have turned to exploring internal factors (i.e., those unique to the individual rather than those related to the quality of the pain itself). Personality and dispositional qualities such as anxiety sensitivity, pain expectancies, fear of pain, and pain catastrophizing have been examined, resulting in some interesting relationships.

Anxiety sensitivity has probably elicited the greatest amount of research focus as a mediating factor in the relationship between pain and attentional interference. Anxiety sensitivity is essentially the fear of anxiety-related bodily sensations such as tachycardia, shallow breathing, perspiration, etc. emanating from the (mis)attribution of these sensations to impending harm or threat. Not surprisingly, high anxiety sensitivity has been found to exacerbate fear of pain and promote escape-related behaviors (Asmundson & Taylor, 1996). Individuals low on anxiety sensitivity exhibit a tendency to shift attention away from pain-related information (Asmundson, Kuperos, & Norton, 1997; Keogh, Dillon, Georgiou, & Hunt, 2001), whereas those with high anxiety sensitivity
tend to shift attention toward threatening material and away from positive material (Keogh et al., 2001). Using the cold-pressor test, individuals with high anxiety sensitivity have reported more negative experiences and a greater interpretive bias with regard to pain than those with low anxiety sensitivity, leading Keogh and Cochrane (2002) to conclude that the tendency to misconstrue harmless physical sensations related to panic mediates the relationship between anxiety sensitivity and affective pain experiences. Anxiety sensitivity is undoubtedly playing an important role in the pain experience, but other factors have been studied as well.

Pain expectancy and fear of pain have also been found to impact attention to pain-related information. Chronic low back pain patients who were put through a series of physical exercises reported an increase in pain during the first bout of exercise, but returned to baseline in subsequent bouts, providing evidence that pain expectancies can be corrected (Crombez, Vervaet, Baeyens, Lysens, & Eelen, 1996). Individuals with a high fear of pain exhibit a selective attentional bias toward pain-related information, possibly predisposing such individuals to pain experiences (Keogh, Ellery, Hunt, & Hannent, 2001). Similar to results found with regard to anxiety sensitivity, individuals with low fear of pain orient away from pain-related information, whereas those with high fear of pain seem unable to do so (Keogh, Thompson, & Hannent, 2003). Pain-related fear has been found to be more disabling than the pain itself, evidencing high correlations with self-reported disability and behavioral performance (Crombez, Vlaeyen, Heuts, & Lysens, 1999). Catastrophizing about the negative effects of pain has also been found to enhance attentional interference to cognitive stimuli during the presentation of an electrocutaneous pain stimulus in individuals both with and without chronic pain.
(Crombez, Eccleston, Van den Broeck, Van Houdenhove, & Goubert, 2002). Finally, neuroticism has been found to moderate the relationship between pain severity and catastrophic thinking about pain, such that neuroticism seems to lower the threshold at which pain is perceived as threatening, as well as the point at which catastrophic thoughts about pain tend to emerge (Goubert, Crombez, & Van Damme, 2004).

**Distraction From Pain**

Though a variety of attentional tasks have shown that moving attention away from pain stimuli is a daunting task at best, it seems logical that if one is able to shift attention away from such stimuli to something less aversive, it may alleviate the negative experience of it, to some degree. McCaul and Malott (1984) reviewed the literature on the utility of distraction away from pain as a coping mechanism. They found that: 1) distraction reduces distress more effectively than attempting nothing; 2) distraction techniques that require more attentional capacity are more effective; 3) distraction has stronger effects on low intensity pain than high intensity pain; and 4) distraction is more effective than sensation redefinition for mild pain, but less effective for more intense pain. However, a pain-induction study investigating this very question found quite opposite results. In this study, distraction had no effect on self-reported pain during a lifting task, and showed a paradoxical increase in pain immediately after the task (Goubert, Crombez, Eccleston, & Devulder, 2004). These two contrasting results clearly raise more questions than they answer, but as attention is such a vital component of the pain experience, it is certainly worth further investigation.
Memory for Pain

Memory for pain information has also been investigated. While studies of attentional processing provide information about low-level processing of pain stimuli, what is remembered about pain can serve to inform us about the high-level processing of the pain experience. As past incidents have been shown to affect the experience of current events, the content of these memories involving pain is clearly of vital importance to examine and understand.

The majority of studies examining memory for pain have utilized chronic pain samples and contrasted their memory for pain words (and other types of words) with that of pain-free control groups. Early studies supported the existence of a recall bias for sensory and affective words from the McGill Pain Questionnaire in chronic pain patients but not pain-free controls (Edwards & Pearce, 1992; Pearce et al., 1990). In fact, chronic pain patients recalled more pain words but fewer negative and neutral words than controls, evidencing a clear specificity for a pain-information memory bias (Pearce et al., 1990). Edwards, Pearce, Collett, and Pugh (1992) replicated the aforementioned study using chronic pain patients with and without depression. While chronic pain patients without depression were found to have a recall bias for only sensory adjectives, chronic pain patients with depression and no-dysfunction controls evidenced a recall bias for both pain and depression words. Results thus provided further support for a selective memory effect for pain information which is heightened in individuals who experience chronic pain. Similar results have also been found in individuals with hypochondriasis and somatoform pain disorder (Pauli & Alpers, 2002).
Continuing this line of research, several studies have examined the role of self-reference in memory for pain information (i.e., to what degree does processing pain information in reference to yourself or others affect your memory of said information). Participants in one study were asked to imagine themselves in situations involving certain types of words (sensory pain, affective, neutral), as well as to imagine these words in reference to other people (Pincus, Pearce, McClelland, & Turner-Stokes, 1993). Results indicated that chronic pain patients evidenced an increase in recall of sensory words and a decrease in recall of neutral words when the words were encoded in reference to themselves rather than to others; no-pain controls showed no difference in recall of word types across conditions. In a follow-up study, chronic pain patients with depression were asked to endorse adjectives from a list as descriptors of themselves and of others, and then completed a recall task (Pincus, Pearce, McClelland, & Isenberg, 1995). Chronic pain patients with depression were found to exhibit a bias toward self-referential negative pain words but not self-referential depression words, again highlighting the saliency of pain information. Pincus et al. (1993) argued that this processing bias for pain information may contribute to feelings of helplessness and intensify the emotional impact of the pain experience.

In order to further examine whether the cognitive bias toward pain in individuals experiencing chronic pain was a vulnerability factor or a result of the pain disorder, Edwards, Pearce, and Beard (1995) tested chronic pain patients before and after pain-relieving surgery (hysterectomy or oopherectomy). The typical pain bias was found presurgery, such that women recalled more pain- than non-pain-related words. However, this pattern was reversed post-surgery; women evidenced better recall for non-pain-related
words than for pain-related words. The authors concluded that the memory bias for pain information is better conceptualized as a secondary consequence of experiencing chronic pain than as an established, enduring cognitive vulnerability factor.

Early studies on mood supported mood congruity memory, such that individuals are better able to recall information learned in a particular mood state when they presently are in that mood state (Bower, 1981). Some researchers have extended this to pain, examining whether information learned while the person experienced pain is better remembered while the person is in pain currently. In a second experiment of the Pearce et al. (1990) study, results indicated that if the state of encoding words (pain or no-pain state) was the same state as during a recall task, more words were remembered than if the two states were incongruous, thus supporting state dependent learning. This effect has also been found in chronic pain patients (Edwards et al., 1992). Hence, results support a pain congruity effect in memory similar to that found for mood.

Clearly, pain is salient not only in our attention but in our memories as well. The vast majority of us have experienced pain in one form or another at some time, whether it be the temporary discomfort caused by a pinprick, or the long-lasting aversive effects of some type of trauma or chronic disease. Though it may seem highly intuitive and therefore less than compelling, it has been repeatedly shown that pain grabs our attention from concomitant tasks and holds it. Once our attentional focus is on that pain, it is quite difficult to disengage from it. Additionally, individuals who experience pain evidence a well-documented memory bias toward such pain information. A range of factors have been shown to impact the experience of pain, including dispositional characteristics (e.g., anxiety sensitivity, pain-related fear, personality) as well as features specific to the pain
itself (e.g., quality, type, intensity). As only one study has examined women with
dyspareunia exclusively, we are left to wonder if these women will exhibit similar
patterns. Will self-reported attentional difficulties (i.e., problems focusing on sex) prove
relevant, as has been found in other sexual dysfunctions, or will the act that causes them
such significant pain (i.e., visual depictions of sex) draw and hold their attention in a
manner not seen in other sexual dysfunctions?

General Conclusion

Pain that occurs during sex is one of the most prevalent yet under-reported and
understudied sexual problems. It is also most prevalent in women aged 18-24, 22% of
whom report its chronic occurrence. Past research has shown dyspareunia to be
associated with a variety of physiological factors, including infection, anatomic
abnormalities of the vagina and surrounding structures, iatrogenic causes, and genetic
markers for inflammation predisposition. A wealth of data exist to support a
psychological component to the experience of dyspareunia as well, including significant
associations with depression, anxiety, somatization, other sexual dysfunctions, and
interpersonal relational difficulties. To date, treatments for dyspareunia are as diverse as
its theoretical causes, ranging from the simple application of anesthetic creams to
psychotherapeutic treatment to invasive surgical options. Though some studies have
supported the efficacy of these treatments, many of these conclusions have been based on
research that lacked control groups, involved a short follow-up period, and did not have a
clear operationalization for treatment success. Even “successful” treatments often result
in no appreciable increase in intercourse frequency, leaving us to re-evaluate our
treatment goals and how best to reach them.
Recent debates in the field have centered on the question of the appropriate classification for a disorder that involves both significant pain and sexual components. Those individuals supporting the re-classification of dyspareunia into the pain disorders section of DSM-IV argue that: 1) the sexual difficulties are incidental to the pain; 2) dyspareunia shares more in common with other pain disorders than it does with other sexual dysfunctions; and 3) research and treatment would be enhanced by the pain conceptualization. Not everyone is in favor of this move. Others believe that: 1) ignoring the sexual context of this pain would be no improvement over ignoring the pain aspects; 2) much of the current empirical data are limited to one sub-type of dyspareunia; and 3) empirical support for the superiority of pain management over sex therapy as a treatment for dyspareunia is currently lacking. The recent shift from conceptualizing dyspareunia as psychosomatic manifestations of inner conflict about sex to focusing entirely on the pain to the exclusion of well-documented psychological features of this disorder has continued to perpetuate an inaccurate mind-body dualism. More information regarding the psychological associations, including basic cognitive processes, with this disorder are needed before any drastic re-classification should be seriously considered. The pairing of pain with sex presents a complicated diagnostic picture which could potentially be enlightened by the elucidation of cognitive factors associated with dyspareunia.

One of the most elementary cognitive processes of interest here is that of attention. According to the information processing approach, attention is the first step in introducing information into the system for it to be processed. Discovering what information is attended to by dyspareunic women will likely help to inform our conceptualizations of this disorder as well as its treatments. As there is only one
published study examining attention in women with dyspareunia (Payne et al., 2004), we
turned to research conducted in the broader fields of sexuality and pain in order to
develop hypotheses for the ways in which women with dyspareunia may differ from
women with other sexual dysfunctions or controls in terms of cognitive processes.

A variety of research endeavors using self-report methods and distraction
paradigms have supported the importance of distraction away from sexual stimuli in the
development and maintenance of sexual dysfunction. With the use of standardized
cognitive methodology still in its infancy, the most well-documented finding is the sexual
content-induced delay (SCID) effect. The consistent delay in response times for erotic
material as compared to non-erotic material suggests a form of attentional capture,
emotional responding, or interference effects uniquely elicited by sexual information.
This effect appears to be more pronounced in women.

In contrast to the dearth of research on cognitive factors in human sexuality,
attentional factors in pain have received a great deal of investigatory focus thus far. Many
data exist to suggest that pain requires attention, distracts us from concurrent tasks, and is
quite difficult to ignore. These results have been found in a variety of studies using
threatened pain or pain induction techniques on both chronic pain and pain-free samples.
Eccleston and Crombez (1999) hypothesized that we are genetically predisposed to attend
to pain, as it is one of the first indications of harm to our bodies. Pain is the archetypal
warning sign of danger, and therefore attention shifts to the pain and away from
concomitant tasks. Payne et al.'s (2004) study on women with dyspareunia found similar
results. These findings suggest that women with dyspareunia may evidence heightened
attention to any type of pain stimuli, including visual depictions of the very act that causes them pain—sex.

The coupling of sex and pain creates an interesting theoretical conundrum: what happens to women with dyspareunia when engaged in sex? The sexual dysfunction literature suggests that they would be distracted from sexual stimuli, as distraction has been shown to be linked to sexual dysfunction. However, the pain literature suggests that women with dyspareunia may do just the opposite. They may exhibit hypervigilance to sexual stimuli because these stimuli may elicit thoughts of pain as well as of sex. The cognitive methodology of eye-tracking may be a uniquely relevant tool to measure potential differences in attention and distraction between women with and without dyspareunia. Perhaps if we can establish basic differences at the molecular level of visual attention, we can contribute to a more comprehensive perspective of dyspareunia and potentially create new interventions to effect change at the level of cognition in afflicted women. This could have a major effect on the cognitive-behavioral treatments for dyspareunia, which may currently be asking women to focus on sexual elements that are actually serving as pain-inducing primes.

Aims of the Study

In an attempt to broaden our knowledge about cognitive processes in women with dyspareunia, we designed a study that aimed to address the issue of attention in these women. The reason we chose to focus specifically on visual attention was twofold: 1) visual attention is one of the earliest phases of information processing, the point at which information begins to enter the system to be processed, and 2) the centrality of visual attention to the processing of the sexual experience. Given the competing perspectives
from the sexuality and pain literature, we sought to investigate the extent to which women with dyspareunia may be distracted from erotic stimuli (as the sexual dysfunction literature would suggest) or are inadvertently focused on them (as the pain literature would suggest). In order to examine distraction, we developed an eye-tracking paradigm based on those commonly used in the scene perception literature. In each erotic scene, an object that does not belong in the scene (e.g., a squirrel in a bathtub), also called a semantically-inconsistent object, was inserted. Many studies on general scene perception have found that attention is drawn to these objects and away from other scene regions (Antes, 1974; Buswell, 1935; Loftus & Mackworth, 1978; Mackworth & Morandi, 1967). The explanation offered for this phenomenon is that viewers are trying to make sense of the unanticipated object - the visual attention is considered to be indicative of information processing time and effort devoted to this attempt at deriving meaning from a scene. It is thus expected that viewers will privilege the semantically-inconsistent object. The application of this paradigm to questions of distractibility and its role in sexual dysfunction may help clarify the extent to which attention to sexual stimuli in women with dyspareunia resembles the general distractibility found in other sexual dysfunctions or the hypervigilance found in pain disorders.

All women in this study had two types of stimuli competing for their attention – sexual stimuli and semantically-inconsistent objects. The sexual dysfunction literature would suggest that women with dyspareunia will likely be more distracted by the semantically-inconsistent object than women with no sexual dysfunction. However, the pain literature suggests that the pain stimulus (which in this case also happens to be the sexual stimulus) is likely to be the salient stimulus. In this case, scenes of sexual activity
should act as a pain stimulus, thus activating thoughts of pain and directing attention to the sexual activity to a greater degree than in women with no sexual dysfunction or in women with another sexual problem that does not involve pain, such as hypoactive sexual desire (which been shown to be associated with lower levels of subjective arousal and lower pleasantness ratings for visual sexual stimuli; Conaglen & Evans, 2006). Tests of memory (recall and recognition) may provide a window into higher order cognitive processes, allowing us to determine not only what was attended to, but what was encoded into long-term memory. Because the conceptualization of dyspareunia as primarily a pain disorder currently boasts the most convincing empirical support, the hypotheses for this study were developed to align with the primacy of pain concerns over sexual ones.

Hypotheses

Hypothesis 1: There will be a 3 (Group: Dyspareunia, HSD, no dysfunction) X 3 (Scene Region: Bodies, Inconsistent Object, Context) interaction for total number of fixations, such that:

- Hypothesis 1a: Women with dyspareunia will look at the semantically-inconsistent object fewer times than no-dysfunction control women.
- Hypothesis 1b: Women with dyspareunia will look at the semantically-inconsistent object fewer times than women with HSD.
- Hypothesis 1c: No-dysfunction control women will look at the semantically-inconsistent object fewer times than women with HSD.
- Hypothesis 1d: Women with dyspareunia will look at the bodies more times than no-dysfunction control women.
• Hypothesis 1e: Women with dyspareunia will look at the bodies more times than women with HSD.

• Hypothesis 1f: No-dysfunction control women will look at the bodies more times than women with HSD.

Hypothesis 2: There will be a 3 (Group: Dyspareunia, HSD, no dysfunction) X 3 (Scene Region: Bodies, Inconsistent Object, Context) interaction for average fixation duration, such that:

• Hypothesis 2a: Women with dyspareunia will have shorter average fixation durations on the semantically-inconsistent object than no-dysfunction control women.

• Hypothesis 2b: Women with dyspareunia will have shorter average fixation durations on the semantically-inconsistent object than women with HSD.

• Hypothesis 2c: No-dysfunction control women will have shorter average fixation durations on the semantically-inconsistent object than women with HSD.

• Hypothesis 2d: Women with dyspareunia will have longer average fixation durations on bodies than no-dysfunction control women.

• Hypothesis 2e: Women with dyspareunia will have longer average fixation durations on bodies than women with HSD.

• Hypothesis 2f: No-dysfunction control women will have longer average fixation durations on bodies than women with HSD.

Hypothesis 3: There will be a 3 (Group: Dyspareunia, HSD, no dysfunction) X 3 (Scene Region: Bodies, Inconsistent Object, Context) interaction for average fixation duration, such that:

• Hypothesis 3a: Women with dyspareunia will have shorter average fixation durations on the semantically-inconsistent object than no-dysfunction control women.

• Hypothesis 3b: Women with dyspareunia will have shorter average fixation durations on the semantically-inconsistent object than women with HSD.

• Hypothesis 3c: No-dysfunction control women will have shorter average fixation durations on the semantically-inconsistent object than women with HSD.

• Hypothesis 3d: Women with dyspareunia will have longer average fixation durations on bodies than no-dysfunction control women.

• Hypothesis 3e: Women with dyspareunia will have longer average fixation durations on bodies than women with HSD.

• Hypothesis 3f: No-dysfunction control women will have longer average fixation durations on bodies than women with HSD.
Region: Bodies, Inconsistent Object, Context) interaction for total gaze time, such that:

- Hypothesis 3a: Women with dyspareunia will look at the semantically-inconsistent object for less time than no-dysfunction control women.
- Hypothesis 3b: Women with dyspareunia will look at the semantically-inconsistent object for less time than women with HSD.
- Hypothesis 3c: No-dysfunction control women will look at the semantically-inconsistent object for less time than women with HSD.
- Hypothesis 3d: Women with dyspareunia will look at the bodies for more time than no-dysfunction control women.
- Hypothesis 3e: Women with dyspareunia will look at the bodies for more time than women with HSD.
- Hypothesis 3f: No-dysfunction control women will look at the bodies for more time than women with HSD.

Hypothesis 4: There will be significant group differences for recall memory for the inconsistent objects, such that:

- Hypothesis 4a: Women with HSD will correctly recall more semantically-inconsistent objects than women with dyspareunia.
- Hypothesis 4b: Women with HSD will correctly recall more semantically-inconsistent objects than no-dysfunction control women.
- Hypothesis 4c: No-dysfunction control women will correctly recall more semantically-inconsistent objects than women with dyspareunia.

Hypothesis 5: There will be significant group differences for recognition memory for the
Hypothesis 5: There will be significant group differences for the recognition of semantically-inconsistent objects, such that:

- Hypothesis 5a: Women with HSD will correctly recognize more semantically-inconsistent objects than women with dyspareunia.
- Hypothesis 5b: Women with HSD will correctly recognize more semantically-inconsistent objects than no-dysfunction control women.
- Hypothesis 5c: No-dysfunction control women will correctly recognize more semantically-inconsistent objects than women with dyspareunia.

Hypothesis 6: There will be significant group differences for intrusions of semantically-inconsistent objects, such that:

- Hypothesis 6a: Women with HSD will have more intrusions than women with dyspareunia.
- Hypothesis 6b: Women with HSD will have more intrusions than no-dysfunction control women.
- Hypothesis 6c: No-dysfunction control women will have more intrusions than women with dyspareunia.
CHAPTER 3

METHOD

Overview

There were three phases in this study. The first two phases consisted of stimulus preparation and participant recruitment to enable the third phase of the study in which our hypotheses were tested. In the first phase, images to be used as stimuli in the eye-tracking protocol were standardized for relevant features by a group of sexually functional women. In the second phase, a screening procedure to recruit women with dyspareunia, hypoactive sexual desire, and no dysfunction controls was implemented. In the third phase, women fulfilling criteria for each of the three groups participated in the eye-tracking protocol that directly tested our hypotheses. For ease of comprehension, participant recruitment and description, methods, and procedure will be discussed separately for each of the three phases.

Phase 1: Stimulus Ratings

Participants

The first phase involved recruitment for participants to standardize the images that would serve as stimuli. Stimulus ratings were gathered in the summer of 2006 through the psychology subject pool. Fifty-five women completed stimulus ratings; 15 of these women did not meet our criteria for sexual functioning (e.g., not sexually active, met criteria for one or more sexual dysfunction, or was within one point of our cutoff for
sexual dysfunction), thus their data was discarded. The mean age of the resulting sample of 40 women was 19.4 years of age (SD = 2.0, range = 18-26). Thirteen women identified as European-American (32.5%), 10 as Asian American (25.0%), 5 as Hispanic American (12.5%), 3 as African American (7.5%), 5 as having mixed ethnic heritage (12.5%), and 4 as “other” (10.0%). Twenty of the 40 women selected Catholic Christian as their religious affiliation (50.0%), 5 identified as Protestant Christian (12.5%), 8 selected “other” (20.0%), and 7 selected “none” (17.5%). There were no significant ethnic group differences in stimulus ratings for any of the original 12 images either when analyzing all 6 ethnic groups or when collapsing them into either “European-American” or “non-European-American.”

These women also completed a short questionnaire on their sexual functioning (Female Sexual Functioning Index, FSFI, see Appendix III) to ensure that no rater was currently experiencing sexual dysfunction. The FSFI was administered after the images were rated to avoid priming effects. The data of any woman whose score indicated a sexual dysfunction was discarded. As the FSFI is the primary measure for Phase 2, it will be discussed in further detail in the following section.

Materials and Design

Stimulus Ratings. The original stimuli for this study consisted of 12 images (obtained from a book of loveplay for heterosexual couples) of heterosexual couples in various states of undress interacting provocatively (Appendix II), as well as 10 objects that would normally not be expected to appear in these images (inconsistent objects). In order to ensure the equivalence of the erotic images used for this study, women in Phase 1 were asked to rate each image on six dimensions using Likert scales: attractiveness,
eroticism, intensity, sexiness/arousal, and appealingness. Each of these six attributes was presented on its own scale from 1-7, with 1 indicating, for example, “Very unattractive”, 4 indicating “Neither attractive nor unattractive”, and 7 indicating “Very attractive”. Phase 1 women were also asked to rate the series of unlikely objects on the likelihood that they would appear in the scene. Ten inconsistent objects were presented with each scene, and the participants rated each object on a scale from 1-7 (1 indicating “Very unlikely”, 4 indicating “Neither likely nor unlikely”, and 7 indicating “Very likely”).

The range of overall erotic stimulus ratings provided by Phase 1 participants was 6 - 42. The three lowest-rated images were discarded; these were the gym scene (\(M = 15.69, SD = 7.03\)), the patio scene (\(M = 15.79; SD = 7.19\)), and the old-fashioned office scene (\(M = 16.51, SD = 7.78\)) (see Appendix II, pages 161-162). The combined ratings of the remaining 9 images ultimately used as stimuli were as follows: bed scene (\(M = 25.08, SD = 6.40\)); bedroom scene (\(M = 29.36, SD = 4.93\)); camera scene (\(M = 25.49, SD = 7.20\)); fireplace scene (\(M = 32.46; SD = 6.63\)); picnic scene (\(M = 29.91, SD = 6.37\)); kitchen scene (\(M = 33.88; SD = 6.23\)); garage scene (\(M = 25.36, SD = 7.43\)); office scene (\(M = 35.85, SD = 5.58\)); and shower scene (\(M = 32.34, SD = 6.00\)) (see Appendix II, pages 157-161).

**Final Stimuli.** The final stimuli for the eye-tracking portion of the experiment consisted of 9 images that approximated one another on levels of attractiveness/eroticism and each had a semantically-inconsistent object electronically inserted into it. As previously described, the inconsistent objects inserted into the images were objects that do not logically belong in the scene although there were no other types of violations (e.g., floating objects, inconsistent foreground and background). All inconsistent objects were
placed a similar distance away from the models in the images so as to standardize the images as much as possible.

The inconsistent objects inserted into each scene were all rated as the object with the least likelihood of appearing in each of the scenes. The objects and their respective scenes were as follows: bed scene (squirrel), bedroom scene (graduation balloon), camera scene (alien blow-up doll), fireplace scene (oxygen tank), picnic scene (softball player cut-out), kitchen scene (graduation mortarboard), garage scene (burro), office scene (beach ball), and shower scene (violin). All of these objects were rated near “1”, meaning that they were very unlikely to appear in that particular scene.

Procedure

Participants in Phase 1 first the study procedure described to them and then they completed the informed consent form. Upon completing the form, they were seated in front of a computer and told that they were to rate each of the images and objects on several dimensions. The images and objects appeared on the computer screen, and the ratings were completed in a packet of sheets given to them. They first rated the erotic images on 6 dimensions (attractiveness, eroticism, arousing, sexiness, intensity, and how appealing the images were), and then, after pushing the right arrow key, the 10 inconsistent objects appeared. The participants then rated each of those objects on the likelihood that they would appear in the scene. Upon finishing the ratings, participants completed the FSFI to ensure that none had a diagnosable sexual dysfunction, as well as a brief demographic questionnaire (see Appendix IV).
Phase 2: Screening for Recruitment Into 3 Experimental Groups

Participants

Screening of the psychology subject pool occurred over the course of 5 semesters (i.e., 2 fall semesters, 2 spring semesters, and 1 summer semester). FSFI questionnaires were completed by 941 women, 759 of whom were willing to be contacted for future studies. Only 7 of those not willing to be contacted met criteria for the dyspareunia group, and 13 met criteria for the hypoactive sexual desire group; 4 women met criteria for both. Of those who were willing to be contacted and who had been sexually active during the previous four weeks, 32 met criteria for the dyspareunia group, 42 met criteria for the HSD group, and 176 (over only two semesters) met criteria for the no-dysfunction control group.

Materials and Design

Female Sexual Function Index (FSFI; Rosen et al., 2000). This is a brief measure of sexual function and dysfunction composed of 19 questions pertaining to six domains: desire (items 1 and 2), arousal (items 3 through 6), lubrication (items 7 through 10), orgasm (items 11 through 13), satisfaction (items 14 through 16) and pain (items 17 through 19). Each item represents a separate component of the domain (e.g., frequency, difficulty, and satisfaction) (Appendix III).

The items addressing sexual pain query the frequency of discomfort or pain during vaginal penetration, frequency of discomfort or pain following vaginal penetration, and the pain intensity during or following vaginal penetration. Possible responses to the items on frequency of pain (e.g., “Over the past 4 weeks, how often did you experience discomfort or pain during vaginal penetration?”, “Over the past 4 weeks,
how often did you experience discomfort or pain following vaginal penetration?

included: “Did not attempt intercourse,” “Almost always or always,” “Most times,” “Sometimes,” “A few times,” “Almost never or never.” For the item regarding level of pain (e.g., “Over the past 4 weeks, how would you rate your level of discomfort or pain during or following vaginal penetration?”), options for responding were: “Did not attempt intercourse,” “Very high,” “High,” “Moderate,” “Low,” “Very low or none at all.” Participants were selected if they responded with “Sometimes (about half the time)” or above to items 17 and 18 and “Moderate” to item 19 (weighted score of 3.60 or less).

Items for sexual desire included: “Over the past 4 weeks, how often did you feel sexual desire or interest?” and, “Over the past 4 weeks, how would you rate your level of sexual desire or interest?” Response choices for frequency of sexual desire included: “Did not attempt intercourse,” “Almost always or always,” “Most times,” “Sometimes,” “A few times,” “Almost never or never.” With regard to level of desire, response choices included: “Very high,” “High,” “Moderate,” “Low,” “Very low or none at all.” In concert with Wiegel, Meston, and Rosen (2005), women who scored 3.3 or less on these questions qualified for the HSD group. Finally, women whose total FSFI score was higher than 26 qualified for the no-dysfunction control group (Wiegel, Meston, & Rosen, 2005). The FSFI has been found to have high test-retest reliability (r = .79 - .86), high internal consistency (Cronbach’s alpha values of 0.82 and higher) and acceptable discriminant validity as demonstrated by significant differences between scores of women with female sexual arousal disorder, female orgasmic disorder, hypoactive sexual desire disorder and control groups (Meston, 2003; Rosen et al., 2000). Divergent validity has been found by using the Locke-Wallace Marital Adjustment Test (Meston, 2003).
Procedure

In order to recruit for Phase 2, an experimenter went to Introductory Psychology classes and briefly explained the purpose of the study to the women in the room. They were told that we were screening for women who fulfilled certain criteria for other studies, and that we would appreciate their participation. If they were interested in participating in other studies for experimental credit, they were instructed to complete the contact information sheet included in each packet. Participants who fulfilled criteria for Phase 3 (i.e., dyspareunia, hypoactive sexual desire, no dysfunction controls) and who indicated that they were willing to participate in other studies were contacted for the eye-tracking portion of this study.

Phase 3: Recruitment for Eye-Tracking Manipulation

Participants

Recruitment for phase 3 of the study occurred in three ways. First, women who completed the screening measure (and indicated that they were willing to be contacted for another study) and fulfilled criteria for dyspareunia, hypoactive sexual desire, or no-dysfunction, were contacted to participate in the eye-tracking portion of this study. Second, an advertisement was posted on the university Experimetrix website. This advertisement indicated that we were looking for women with dyspareunia or low sexual desire to participate in a study of sexual functioning; those who were interested were instructed to contact the primary investigator. Only three women with dyspareunia were recruited via this method during the regular academic calendar year. Third, flyers were posted in women’s restroom stalls during the summer of 2007 to advertise for women who experience pain while engaging in intercourse. Three women were recruited in this
manner, two of whom had viable data (the third also met criteria for HSD, and was thus
not included in analyses).

The primary group of interest was 20 women who reported pain most or all of the
time during sexual intercourse. An age-matched group (within 3 years) of 20 women who
reported no pain during intercourse was used as a no-pain control group. A second
control group of 14 women who reported symptoms of Hypoactive Sexual Desire (HSD),
or low sexual desire as indicated by scores on the FSFI, was used as a comparison group
to be able to determine whether hypothesized group differences could be attributed to
sexual pain specifically, rather than sexual dysfunction in general. Our entire sample thus
consisted of 54 women. There was no other pain control group for two reasons: 1)
dyspareunia is unlike any other pain disorder (as it only occurs during sexual activity),
and thus there is no clear analog for it, and 2) individuals with other pain problems (e.g.,
back pain, joint pain) would be more likely to be in pain during the actual testing
situation than the women with dyspareunia, possibly affecting results in some unknown
manner.

The age, ethnic identities, and religious affiliations for the three groups are
presented in Table 1 (Appendix I). Kruskal-Wallis $\chi^2$ tests for multiple independent
groups revealed that there were no overall group differences on ethnic identity, $\chi^2(2, N =
54) = 0.25, p = .883$, or religious affiliation, $\chi^2(2, N = 54) = 5.76, p = .259$. The FSFI
scores for sexual desire, pain during sex, and overall functioning in the final sample was
as follows (see Tables 2 and 3 for all means, SDs, and inter-scale correlations). The three
groups were statistically different on all three variables of interest: desire $[F (2,49) =$
60.70, \( p < .001 \)], pain \( [F (2,49) = 37.78, \ p < .001] \), and FSFI total score \( [F (2,49) = 24.78, \ p < .001] \). Cronbach’s alpha for our entire sample on FSFI total score was .83.

All participants were 18-29 years of age, heterosexual or bisexual, and were required to have normal or corrected to normal vision. Participants were compensated by receiving research participation credit as part of requirements for an introductory psychology course. They were also offered short-term sex therapy for treatment of sexual dysfunction symptomatology. Participants remained naïve with respect to the purpose of the study until debriefing.

**Materials and Design**

**Stimulus Ratings.** As a manipulation check, Phase 3 women also rated the images and inconsistent objects on the aforementioned dimensions as described in Phase 1. A multiple analysis of variance (MANOVA) revealed that there were no overall differences in ratings between Phase 1 and Phase 3 participants, \( F (9,84) = 1.16, \ p = .332 \). To investigate whether the erotic or inconsistent object stimulus ratings varied consistently by ethnic identity (i.e., European American or non-European American) all of the couples in the images were European American) or by having a religious affiliation or not, a two-way MANOVA was conducted [with the dependent variables being: 1) the overall erotic image score that combined ratings on all 6 dimensions and 2) the simple rating of the inconsistent objects]. There was no significant main effect for ethnic identity, \( F (9,42) = 1.35, \ p = .244 \), nor was there a significant main effect for religiosity, \( F (9,42) = 1.09, \ p = .392 \). There was also no significant interaction of ethnicity and religiosity in terms of image and inconsistent object ratings.
Conners' Continuous Performance Test (CPT; Conners, 1992). There is no empirically-supported reason to expect that general attentional processes to non-sexual information vary between women with and without sexual dysfunction. However, we included a test of sustained attention, Conners' Continuous Performance Task (CPT; Conners, 1992), to ensure that there were no differences in basic attention among the groups tested. The CPT is a simple test of vigilance, measuring the capacity to ward off distractions to selective attention; a series of letters appear on a computer screen and participants are instructed to press the space bar for every letter that they see except for the letter “X.” Participants respond as quickly as possible to the letters and must inhibit their response when the letter “X” appears. The CPT provides four measures of attention based on test performance: 1) omissions (i.e., any letter other than “X” appeared and the participant did not press the space bar), considered to be a measure of inattentiveness; 2) commissions (i.e., the letter “X” appeared and the participant pressed the space bar), considered to be a measure of impulsivity; 3) hit rate reaction time, a measure of how long it took the participant to respond; and 4) d', a measure of the balance between errors of omission and errors of commission. All four measures were calculated into T-scores ($M = 50$, $SD = 10$) and were adjusted for age and level of education. The CPT takes approximately 14 minutes to complete, and has proved useful in distinguishing between normal and abnormal attentional function (Lezak, Howieson, & Loring, 2004).

Apparatus

Eye movements were recorded using an ASL Eye Track 6000 series Eye Start system. The Eye Start optics attached to this eye tracker are designed to accurately measure a person's pupil diameter and point of gaze on a stationary (room fixed) scene
space. These optical components are attached to an adjustable chinrest. This chinrest provides a very stable platform for the optics and is designed to be comfortable even with extended use. This eye tracker utilizes the corneal reflection method, which is more accurate than simply tracking the pupil alone because the computer tracks two points of reference rather than just one. The Eye positions were sampled at 120 Hz. Viewing was binocular, although only the position of the left eye was tracked. The stimuli were displayed at a resolution of 1024 X 786 pixels X 256 colors on a True Color monitor using a Radon VE ATI Graphics card operating at a refresh rate of 85 Hz. The GazeTracker program provided by ASL presented the stimuli, synchronized and recorded the eye movement data, and allowed for the analysis and visualization of the data collected.

Eye-trackers vary in design and specifications, but all are designed to measure and record the eye movements of participants presented with visual stimuli. The data they yield provide a continuous and unobtrusive measure of cognitive and visual information processing. Eye movements during scene viewing have typically been divided into two distinct temporal phases: fixations and saccades (Henderson & Hollingworth, 1998). Fixations refer to periods of time when the point of regard is relatively unmoving, and saccades refer to when the eyes are rotating at a relatively rapid rate as they reorient from one visual target to another. Visual attention has generally been defined as the selective orienting to information from one region of the visual field at the expense of other regions in the same field (Henderson, 1992). Thus, the focus in studies of visual attention has been primarily on fixations.
Selective visual attention to informative or semantically-inconsistent scene regions is one of the most supported findings in the scene perception literature. Mackworth and Morandi (1967) presented participants with an intact picture, and later had a different set of participants rate smaller regions (1/64 of the complete scene) for recognizability. Both measures gave high readings for the same areas (i.e., the areas that were rated as the most informative were also the areas that had the highest fixation densities in the first set of participants). Antes (1974) conducted a similar experiment (using pictures from the Thematic Apperception Test) and also found a strong relationship between rated degree of informativeness and fixation density. Loftus and Mackworth (1978) conducted a study to delineate the underlying psychological mechanisms that cause one area of a picture to be both rated as more informative and fixated more often than others. They presented participants with scenes that contained either a consistent object (e.g., a tractor in a farm scene), or an inconsistent object (e.g., an octopus in a farm scene). It was found that observers fixated earlier, more often, and had longer fixation durations on objects that had a lower probability of appearing in a scene (inconsistent/informative), as compared to objects that had a high probability of being in the scene (uninformative). Loftus and Mackworth argued that these results provide evidence that considerably more processing is allotted to inconsistent objects.

The important conceptual question in the eye tracking literature has been the extent to which fixations (overt and measurable eye movements) denote attention (a covert cognitive process). Although it has been demonstrated that individuals can and do attend to targets outside of their foveal fixation (e.g., Posner, 1980), seventy years of eye movement studies support Buswell’s (1935) original finding that fixation positions
cluster in a non-random fashion on scene regions that are either visually informative (stimulus features such as texture, color luminance, depth, or complexity) or semantically inconsistent or meaningful (for a review, see Henderson & Hollingworth, 1998). The consensus interpretation in that literature has been that fixations are related to cognitive processing, suggesting that we simply look longer at regions that take longer to process, for whatever reason.

Visual encoding is suppressed during saccades, causing temporary blindness while the eyes are in motion (termed “saccadic suppression”). Therefore, the visual system must incorporate what amount to a series of snapshots (i.e., fixations) to formulate a coherent scene representation (Hollingworth & Henderson, 2002). Extensive research has been conducted to examine what scene information from these brief snapshots is encoded and retained in memory, as well as how this relates to attention during scene viewing. Though some research suggests that scene representations in memory are sparse and undetailed (Irwin & Zelinsky, 2002), more recent studies support the assertion that memory for visual information can be quite rich and detailed (Castelhano & Henderson, 2005; Hollingworth & Henderson, 2002). In fact, visual information is often encoded and stored in memory during scene viewing whether or not the viewer is anticipating a subsequent memory test for that information, and this memory is often quite accurate, even for objects or scene regions that are not intentionally attended (Castelhano & Henderson, 2005). Not surprisingly, attention to and memory for visual information often shows a positive correlation, such that objects that receive the greatest amounts of attention, or objects that are close in proximity to attended objects in parafoveal vision, are remembered well (Henderson, Williams, Castelhano, & Falk, 2003; Hollingworth &
Henderson, 2002). This finding clearly relates to the semantic diagnosticity of scene regions or objects, such that regions or objects that are relatively informative or inconsistent (such as unexpected or unusual objects) tend to be remembered with greater accuracy than less informative regions (Aginsky & Tarr, 2000; Friedman & Liebelt, 1992; Henderson & Hollingworth, 2003). Thus, the extant research suggests that inconsistent objects should be attended to for greater amounts of time than less-inconsistent objects, and these objects should be remembered with greater accuracy than less-inconsistent objects.

Procedure

For the eye-tracking portion of the study, we asked women who fulfilled our selection criteria if they were willing to participate in an additional study. Once scheduled, these participants began the experiment by reading the informed consent. The CPT was administered first for approximately 14 minutes. Upon completion, and after a short delay, the experimenter orally described the eye-tracking equipment as she positioned the eye-tracking apparatus. Participants were encouraged to ask questions at any time, but were instructed to try to remain still once the eye-tracker had been set up. Once all the questions had been answered, the eye-tracker was calibrated. Calibration consisted of having the participant fixate on nine markers on the display area, and the calibration was checked by having the participant perform the task again. The Eye-Start system was calibrated to each individual until the average error in gaze position was 0.5°. Once the eye-tracker was successfully calibrated, the experimental session began.

In the experimental session, each participant was presented with 9 erotic pictures that included an inconsistent object. Participants were instructed to look at the images...
presented as they normally would. They viewed each image for 10 seconds; the 9 images were presented in a randomized order for each participant. Participants were then given a test of visual acuity, the Snellen Eye Chart (similar to those found at optometrists’ offices), to validate their ability to see detail at a distance. They also completed the demographic questionnaire at this time. After approximately 5 minutes (during which time the visual acuity test and demographic questionnaire were completed), participants were told that they may have noticed that there were some odd objects that did not seem to belong in the images. For the recall test, they were asked to write down as many objects that did not belong in the erotic images (i.e., semantically- inconsistent objects) as they could (out of a possible 9 inconsistent objects, though they were not told how many objects there were to recall). After this was completed, they were seated in front of a computer and told that they would be shown a series of 20 objects, one at a time. They were to identify which objects had been included in the images presented during the eye-tracking paradigm by circling “YES” or “NO” on a sheet of paper for each individual object. Then, participants were shown the complete scenes again and asked to provide ratings for the images and semantically-inconsistent objects. Lastly, participants were debriefed as to the purpose of the study.

**Data Analyses**

The three primary dependent measures of interest in terms of visual attention were total number of fixations, average fixation duration, and total time. These three eye-tracking measures are the most commonly reported dependent variables in the cognitive literature. Total number of fixations was a count of the times the eye landed on any given scene region; it is often theorized that total number of fixations is a measure of drawing
attention, one indication of overall interest in that particular scene region. Average fixation duration was the mean duration (in milliseconds) of viewing time on a given scene region; it is thought to be a measure of attentional capture. Total time was a measure of the total number of milliseconds the individual attended to a particular scene region across the entire stimulus presentation time (in this case, 10 seconds); total time is also thought to be an indication of overall interest in a given scene region (Henderson, personal communication). The fourth and fifth dependent measures were recall and recognition for inconsistent objects, respectively. The assumption here was that women who had devoted more visual attention to inconsistent objects would have higher recall and recognition of these.

For each visual attention dependent variable (number of fixations, average fixation duration, and total time), results were analyzed in 3 (Participant Group: Dyspareunia, Hypoactive Sexual Desire, No Dysfunction) X 3 (Scene Region: Bodies, Inconsistent Object, Context) ANOVAs. One-way ANOVAs were conducted to test for group differences on recall and recognition memory.
CHAPTER 4

RESULTS

Overview

First, we analyzed the viewing patterns of the three groups by conducting separate two-way ANOVAs for each of the three dependent variables (total number of fixations, average fixation duration, total gaze time). Second, we analyzed the results for recall and recognition memory of the inconsistent objects included in the stimulus images.

Data for 10 participants had to be discarded and were not included in the final analyses. Due to either experimenter error or the participant moving to such a degree that no eye movements were recorded, the data for six participants were removed (1 woman with dyspareunia, 3 women with HSD, and 2 no-dysfunction control women). One woman with HSD self-identified as lesbian, one woman was run as a woman with dyspareunia but a second FSFI revealed that she had no sexual dysfunction, one woman was run as a woman with HSD but a second FSFI revealed that she did not meet criteria for the disorder, and one woman’s data was discarded because she met criteria for both dyspareunia and HSD. Because of the difficulty in finding willing participants who met criteria for either of the two dysfunction groups, 2 women with dyspareunia and one woman with HSD who identified as bisexual were included in the final analyses. One-way ANOVAs conducted for each of the three dependent variables on each of the three scene regions revealed no significant group differences between bisexual and
heterosexual women. The results of the Connors' Continuous Performance Test are presented in Table 4. As there were no significant group differences on the CPT dependent variables, these scores were not included as covariates in the final analyses.

**Visual Attention to Erotic Images**

**Total Number of Fixations**

Means and SDs of total number of fixations the three participant groups had on each of the three scene regions (bodies, inconsistent object, context) are shown in Table 5, and visually presented in Figure 1. Mauchley's Test of Sphericity was significant, so Greenhouse-Geisser results have been reported. Results of the omnibus ANOVA for total number of fixations are presented in Table 6. A significant main effect was found for Scene Region \( [F(2, 89.70) = 157.97, p < .001, \eta^2 = .76] \), and a significant Participant Group X Scene Region interaction was also found \( [F(3.52, 89.70) = 5.17, p < .001, \eta^2 = .17] \). Results for between-group and within-group comparisons are presented next.

The between-group differences were analyzed for each individual scene region using tests of simple main effects. A simple main effect was found for Participant Group. Women with dyspareunia looked at the bodies fewer times than both the women with HSD \( (p = .018) \) and the no-dysfunction control women \( (p = .003) \). There was no significant difference between women with HSD and no-dysfunction control women for number of fixations on the bodies. No significant differences were found among the groups for number of fixations on the inconsistent object. Women with dyspareunia looked at the context significantly more times than the no-dysfunction control women, \( p = .013 \); the women with HSD also looked at the context more times than did the no-dysfunction control women, \( p = .019 \).
Within-group differences for each of the three groups were as follows. Women with dyspareunia looked at both the bodies and context significantly more times than at the inconsistent object, $p < .001$ and $p < .001$, respectively. Similarly, women with HSD looked at the bodies and context significantly more times than at the inconsistent object, $p < .001$ and $p < .001$, respectively. However, women with HSD were also found to have looked more times at the bodies than at the context, $p = .005$. The no-dysfunction control women also looked at the bodies and context significantly more times than at the inconsistent object, $p < .001$ and $p < .001$, respectively. Like the women with HSD, the no-dysfunction control women looked at the bodies more times than at the context, $p < .001$.

**Average Fixation Duration**

Means and SDs of the average fixation durations on each of the three scene regions are shown in Table 7, and are visually presented in Figure 2. Mauchley's Test of Sphericity was again significant, so Greenhouse-Geisser results are presented. Results of the omnibus ANOVA for average fixation duration are presented in Table 8. A significant main effect was found for Scene Region $[F(1.52, 77.67) = 37.69, p < .001, \eta^2 = .43]$. The average fixation duration means for the scene regions, regardless of participant group, were as follows: bodies ($M = 223.83$), inconsistent object ($M = 290.16$), and context ($M = 405.44$). Tests of the Scene Region main effect revealed that participants had significantly longer average fixation durations on the context than on both the bodies ($p < .001$) and the inconsistent object, ($p < .001$). Average fixation durations on the inconsistent object were also significantly longer than on the bodies, $p = .007$. The Participant Group X Scene Region interaction was not significant $[F$
(3.05, 77.67) = 0.57, \( p = .637, \eta^2 = .02 \)], so no further analyses were conducted for average fixation duration.

**Total Gaze Time**

Means and SDs for each of the three groups on total gaze time for the three scene regions are shown in Table 9, and visually represented in Figure 3. Results of the omnibus ANOVA for total gaze time are presented in Table 10. A significant main effect was found for Scene Region \( [F (2,102) = 116.21, p < .001, \eta^2 = .70] \), and a significant Participant Group X Scene Region interaction was also observed \( [F (4,102) = 6.83, \eta^2 = .21] \). Between-group and within-group analyses are presented below.

A simple main effect was found for Participant Group. Women with dyspareunia looked at bodies for less time than both the women with HSD \( (p = .024) \) and the no-dysfunction control women \( (p < .001) \). No other group differences were found for the bodies scene region. No group differences were found for total gaze time at the inconsistent object. Women with dyspareunia looked for longer periods of time at the context than did the no-dysfunction control women, \( p = .042 \). Women with HSD also looked at the context longer than did the no-dysfunction control women, \( p = .028 \). No other group differences were found.

Within-group analyses revealed that women with dyspareunia looked longer at both the bodies \( (p < .001) \) and the context \( (p < .001) \) than at the inconsistent object. Women with HSD also looked longer at both the bodies \( (p < .001) \) and the context \( (p < .001) \) than at the inconsistent object. However, women with HSD also looked for longer periods of time at the bodies than at the context, \( p = .028 \). Like the women with HSD, the no-dysfunction control women looked at both the bodies and the context for longer
periods of time than at the inconsistent object, \( p < .001 \) and \( p < .001 \), respectively. The no-dysfunction control women also looked significantly longer at the bodies than at the context, \( p < .001 \).

**Memory for Inconsistent Objects**

**Recall Memory**

Means and SDs for the four memory dependent variables are presented in Table 11, and Figure 4 presents the memory results for each of the three groups. One-way ANOVAs were conducted to test for mean differences for the two recall memory variables (hits, intrusions). Results for recall hits are presented in Table 12. Women with dyspareunia recalled approximately the same number of inconsistent objects as the no-dysfunction control women (3.55 v. 3.60), and both recalled more than the women with HSD (2.93); however, these differences were not significant \([F(2,53) = 0.97, p = .386]\).

Results for recall intrusions are presented in Table 13. Women with HSD had more intrusions than both women with dyspareunia and the no-dysfunction control women (0.64 vs. 0.40 and 0.15, respectively); these differences only approached significance \([F(2,53) = 3.12, p = .053]\).

**Recognition Memory**

One-way ANOVAs were also conducted to test for group differences on the two recognition memory variables (hits, false positives). The results for recognition hits are presented in Table 14. Although women with dyspareunia correctly identified more inconsistent objects \((M = 7.90)\) than did women with HSD \((M = 7.57)\), who correctly identified more inconsistent objects than did no-dysfunction control women \((M = 6.70)\), these differences were not significant \([F(2,53) = 2.81, p = .069]\). Results for recognition
false positives are presented in Table 15. Women with dyspareunia and no-dysfunction control women both had more false positives (1.75 and 1.70, respectively) than did women with HSD (1.50); however, these differences were not significant \( F(2,53) = 0.13, p = .876 \).
CHAPTER 5

DISCUSSION

Overview of Main Findings

The primary aim of this study was to assess visual attention to erotic stimuli in women with dyspareunia to investigate the extent to which they were either distracted away from sexual stimuli by sex-irrelevant aspects of erotic scenes (e.g., inconsistent objects, context) or, alternatively, focused on the sexual aspects (i.e., bodies), which were presumed to have activated thoughts of harm. For two of the three eye-tracking dependent variables, we found that women with dyspareunia attended significantly less to the sexual scene regions than both control groups, and significantly more to the context or background of the scenes. Thus, overall attention to the images differed significantly by group category. Results for recall and recognition memory were not significant, although some trends were evident in the data that were potentially supportive of the attention results.

Dyspareunia is a unique disorder among the sexual dysfunctions in that it incorporates aspects of both pain and deficits in sexual functioning. As previously discussed, a debate in the field currently exists as to whether dyspareunia is better conceptualized as a sexual dysfunction characterized by pain or as a genital pain disorder that negatively impacts sexual functioning. The current direction in the literature appears to be almost entirely supportive of the latter theory. In alignment with the current
momentum in the field, we developed our hypotheses in accordance with the pain syndrome conceptualization. Generally, we hypothesized that depictions of sex would activate thoughts of pain in women with dyspareunia. Consistent with the pain literature, these scene regions (which are acting as pain stimuli) would draw and hold attention, making disengagement difficult. Specifically, we argued that women with dyspareunia would show greater overall attention to the sexual scene regions (i.e., bodies) than women with low sexual desire (HSD) or no-dysfunction control women, and that they would also attend less to the distracter scene regions (e.g., the semantically-inconsistent objects and context).

Our hypotheses were largely unsupported. Contrary to what we expected to find, women with dyspareunia had fewer total fixations on, and looked for less time at, the bodies than both control groups (Hypotheses 1 and 3 unsupported). Women with dyspareunia had more fixations on, and spent greater time looking at, the context of the scenes than the no-dysfunction control group; no significant group differences were found in attention to the inconsistent objects, also failing to support Hypotheses 1 and 3. Although we anticipated significant group differences in attentional capture, as evidenced by average fixation durations on each of the three scene regions, we did not find support for this (Hypothesis 2 unsupported). However, we did find a significant main effect for scene region, such that all participants had significantly longer average fixation durations on the context than on the inconsistent objects, both of which were significantly longer than the average fixation durations on the bodies.

The hypotheses for the recall and recognition tasks were also developed with the idea that women with dyspareunia would attend less to the inconsistent object than to the
bodies or context. Specifically, we hypothesized that women with dyspareunia would recall fewer inconsistent objects, and have a fewer number of intrusions, than both control groups given their hypothesized focus on sexual scene regions. No significant differences were found for either recall memory variable. However, the group differences in number of intrusions approached significance, revealing that women with HSD reported the highest number of intrusions (as hypothesized), followed by women with dyspareunia and the no-dysfunction control women. Similarly, we hypothesized that women with dyspareunia would correctly recognize fewer inconsistent objects, and have a fewer number of false positives, than both control groups. Again, no significant differences were found. However, the group differences for correct recognitions approached significance and revealed that women with dyspareunia correctly identified more inconsistent objects than the women with HSD, who correctly identified more inconsistent objects than the no-dysfunction control women.

**Interpretation of Main Findings**

The major finding of this study is that women with dyspareunia attended less to the sexual aspects of the scenes than either women with low sexual desire or women with no sexual dysfunction. Because eye-tracking is a psychophysiological measure of attention and we have no self-report data about why participants attended to certain scene regions at the expense of others (which would, in any case, have been questionable data at best), we can only infer meaning to these results. We can be relatively confident that these attentional differences were specifically related to sexual information processing (i.e., not simply related to an overall pattern of attentional variation), as no group differences were found for any dependent variables from the Connors’ Continuous
Performance Test. The two most likely explanations for the attention results are: 1) women with dyspareunia were distracted away from the sexual scene regions; or 2) these eye-movement patterns are suggestive of an avoidance response to sexual stimuli. It is also possible that both distraction from and avoidance of sexual stimuli occur when women with dyspareunia are presented with erotic images. A detailed exploration of each of these explanations follows.

As previously discussed, distraction away from sexual information/stimuli (or the erotic components of a sexual situation) has long been considered to play an important role in the development and maintenance of sexual dysfunction. Cognitive distraction caused by neutral or non-sexual information often affects sexual arousal in both sexually functional and dysfunctional men and women, generally serving to reduce physiological sexual arousal (e.g., Abrahamson, 1985; Adams, Haynes, & Brayer, 1985; Barlow, Sakheim, & Beck, 1983; Beck & Barlow, 1986; Elliott & O’Donohue, 1997; Farkas, Sine, & Evans, 1979; Hale & Strassberg, 1990; Palace & Gorzalka, 1990; van den Hout & Barlow, 2000). Several more recent studies have also examined the effects of increasing neutral cognitive distraction tasks (i.e., numbers manipulation) on men and women with and without sexual dysfunction (Salemink & van Lankveld, 2006; van Lankveld & van den Hout, 2004). Women with dyspareunia were included in the sexual dysfunction group in the female study (Salemink & van Lankveld, 2006), although all sexually dysfunctions were collapsed in the final analyses, making it difficult to tease apart any potential differences among the different types of sexual dysfunction. However, the results indicated an increasingly negative impact on physiological arousal with added distraction in both women with and without sexual dysfunction, supporting some
previous findings. Interestingly, this decrease in arousal was not noticed by the women in this sample, as distraction did not decrease subjective arousal.

Some have suggested that this shift in attention away from sexual stimuli, which in some cases appears to reduce physiological sexual arousal, sets the stage for less vaginal lubrication, and thus, painful intercourse (Brauer, ter Kuile, Janssen, & Laan, 2007). The results for sexual arousal in women with dyspareunia are somewhat mixed, and the oft-cited disconnect between physiological and subjective arousal in women is frequently apparent in these data. Brauer, Laan, and ter Kuile (2006) found greater vasocongestion in women with dyspareunia than no-dysfunction control women to depictions of sexual intercourse, but the opposite pattern emerged when these groups viewed videos of noncoital sexual activity. However, Wouda et al. (1998) found lower physiological arousal to videos of vaginal intercourse in women with dyspareunia relative to no-dysfunction control women. Similar to Salemink and van Lankveld (2006), this decrease again went unnoticed by these women, thus there were no differences between the two groups for self-reported sexual arousal.

Although physiological sexual arousal was not measured directly in the present study, the relationship between cognitive distraction and sexual arousal has clear implications for our results. As one might have hypothesized based on the aforementioned literature, the two sexual dysfunction groups attended to the sexual aspects of the stimuli less than the no-dysfunction control women. Our results are the first to show this reduced attention (or increased distraction) with a direct measure of attention, as opposed to the more indirect measures of genital and subjective arousal. We literally can now see what women with dyspareunia are attending to compared to no-
dysfunction control women in an experimental paradigm that contains more ecological validity than a tone-adding or numbers manipulation task. In our study, it appears that they are visually attending to everything more than to the sexual stimuli, at least in comparison to the other two groups. Although we did not see differences in attention to the planted distractor, our version of a “distraction task” in this study, women with dyspareunia were significantly less interested in the couples engaged in foreplay and more interested in the components of the background settings than were the women in the two control groups. If increased cognitive distraction causes reduced physiological arousal, possibly resulting in painful intercourse, our results are a first step in determining the direction of attention in women with sexual dysfunction in a more naturalistic situation than that offered by previous experimental paradigms. Results also may indicate a possible treatment option—re-directing attention back to sexual stimuli in these situations so that physiological sexual arousal can develop as it does in women without sexual dysfunction.

The greater distraction away from sexual stimuli evidenced in the women with dyspareunia in our sample is consistent with the sexual dysfunction conceptualization of the disorder. However, the pattern of results may indicate that cognitive distraction alone may not fully explain attentional differences among these groups. Cognitive distraction intuitively appears to be a better explanatory mechanism for hypoactive sexual desire given that these women report little to no interest in sexual activity (thus one would expect them not to attend to sexual stimuli). We originally hypothesized a greater degree of distraction in the HSD group than in either of the other two groups; this pattern generally held true for the comparison with the no-dysfunction control group (although
not significantly) but it did not hold true at all for the comparison with the dyspareunia
group. It does not make intuitive sense that women with dyspareunia would be more
distracted in these situations than women with HSD, although this is what we found.
What these results may suggest is the presence of an additional component that
influences both attention to sexual stimuli and the avoidance of sexual activity that is
seen in women with sexual pain disorders. After all, lack of interest in an activity is likely
a very different experience than the desire for an activity that, distressingly, is
consistently painful. Also important to remember is that our women with dyspareunia
were specifically screened to ensure a lack of sexual desire problems. Thus, even if
distraction plays a role in the development and/or maintenance of dyspareunia, as it
appears to in low sexual desire, it does not appear to fully explain the pattern of results
for the current study, as the dyspareunia group showed the least amount of attention to
the sexual stimuli.

If the cognitive distraction hypothesis does not seem to provide the most
parsimonious interpretation for our results, what might? When developing our
hypotheses, we considered what we believed to be the two most prominent factors of
dyspareunia: pain and interference with sexual activity. However, we did not directly
consider the cognitive process of fear/anxiety about the pain and its subsequent
consequences on attention, The sexual pain disorder literature supports the existence of
this fear and it is often targeted in treatment strategies (e.g., progressive dilatation and
sensate focus as forms of systematic desensitization).

Brauer et al. (2007) examined the effect of pain-related fear (e.g., shock) on
sexual arousal in women with and without dyspareunia. Results showed a similar
decrease in genital arousal associated with shock threat in both groups, although women
with dyspareunia had greater overall negative affect in response to the increased
probability of shock. The authors theorized that in women with dyspareunia, attention is
initially shifted away from sexually-arousing stimuli and toward non-erotic stimuli during
a sexual encounter, due to the association between sex and pain (and other negative
emotions) that has developed over repeated such experiences. This shift in attention from
arousing stimuli toward anxious and fearful thoughts results in a lack of genital and
subjective sexual arousal, creating insufficient lubrication and contributing to painful
intercourse. When intercourse is attempted and pain does occur, these anxious and fearful
thoughts are reinforced. This reinforcement acts to further perpetuate dysfunctional
sexual responding, possibly including continued avoidance of erotic cues and a
consequent focus on non-erotic cues.

In their review of the sexual pain disorders, Payne et al. (2005) also addressed the
issue of pain-related fear and subsequent behavioral avoidance, albeit more in the context
of vaginismus than dyspareunia. They noted that fear and avoidance are two well-
documented components of non-genital chronic pain conditions. It appears that some
women may be more predisposed toward reacting to painful intercourse with fear,
resulting in behavioral avoidance. Payne et al. (2005) argued that, in these women,
interference with intercourse is likely caused by a phobia-like fear and heightened anxiety
when confronted with the phobic stimulus (i.e., intercourse), which is usually avoided.
Our results suggest that in addition to behavioral avoidance, cognitive avoidance
strategies may be at play as well.
This pattern of cognitive avoidance, however, is not one commonly associated with threat stimuli. From an evolutionary perspective, it is adaptive for threatening information to capture our attention, as our responses for survival are dependent upon our ability to accurately estimate threat levels and quickly choose the most appropriate response for that threat, once it is understood. Thus, attention should be drawn to stimuli that may indicate future danger or harm, and a facilitated processing of these stimuli, in comparison to other types of stimuli, should occur.

Studies investigating the processing of threat have overwhelmingly supported an attentional bias for, or facilitated processing of, threat-related information. Most of the research in this area has utilized samples that have particular anxiety problems (e.g., phobias, worry) for the stimuli presented (e.g., spiders, angry faces). Though threatening stimuli is not always found more quickly by those for whom it is especially relevant (Rinck et al., 2005), threatening images (e.g., spiders) are typically found faster than non-threatening ones (e.g., flowers) (Lundqvist & Ohman, 2005; Ohman, Flykt, & Esteves, 2001). However, difficulty disengaging attention from these objects is more often seen in those who are phobic of them (Ohman, Flykt, & Esteves, 2001; Rinck, Reinecke, Ellwart, Heuer, & Becker, 2005).

Particularly relevant to the current study is research that has shown a difficulty in the disengagement of attention from threatening information, similar to what has been found in studies investigating the cognitive processing of pain. Generally what has been found is a type of attentional capture of threatening information, particularly if the content of that information is self-relevant. Cisler, Ries, and Widner (2007) found that participants exhibited an initial attentional alertness or draw toward images of spiders, an
attentional capture that proceeds to difficulty in attentional disengagement for individuals who are phobic of spiders. Amir, Elias, Klumpp, and Przeworski (2003) also found that people with social phobia had difficulty disengaging from socially-threatening material to a greater degree than individuals without social phobia. These authors argued that the attentional bias toward threatening information is not facilitated attention toward threat, but rather a difficulty disengaging from threat. This pattern of attention (i.e., attentional bias, lack of disengagement) to erotic information (i.e., threat information) was what we anticipated seeing in our women with dyspareunia, as this would have been consistent with studies investigating pain. However, our women with dyspareunia were quite able to disengage from the threat-relevant stimuli presented, so overall hypervigilance to these stimuli was not observed in this study.

Although the lack of attentional disengagement to erotic information we expected was not observed, a more detailed analysis of the time-course of the processing of threatening or fear-related information may help to elucidate the pattern of results found in the current study. Several studies have shown an initial hypervigilance toward threatening information, which is followed quickly by visual avoidance of those scene regions, a type of vigilance-avoidance sequence as has been hypothesized by some anxiety researchers (Mathews & Mackintosh, 1998; Mogg & Bradley, 1998). This pattern of visual attention has been seen when individuals were exposed to phobic objects such as spiders (Miltner, Krieschel, Hecht, Trippe, & Weiss, 2004; Rinck & Brecker, 2006) as well as threatening or angry faces (Mogg, Millar, & Bradley, 2000; Rohner, 2002). Therefore, one often sees fixations on these scene regions during the early phases of scene viewing, but shorter overall gaze durations on them due to the subsequent
avoidance. Similar to other studies, the shifting of attention away and avoidance of these stimuli is even more evident in high trait anxiety individuals, or in those for whom the threatening information is self-relevant. Rinck and Brecker (2006) argued that both automatic and strategic processes are at work to produce this phenomenon. The automatic processing of threatening stimuli acts through a quick, reflexive attentional bias toward this information. After approximately one second, strategic or motivational processes take over and move the eyes away from this information, so we see disengagement and ultimately avoidance. These authors contended that this overall process serves to reinforce the person’s experienced anxiety in two ways: 1) the attentional bias toward threatening information makes it even more likely to be perceived, in turn increasing anxiety and distracting attention away from other tasks and stimuli; and 2) the avoidance behavior reduces anxiety, thus reinforcing avoidance but consequently preventing the exposure time necessary to desensitize to it. Thus, the anxiety is maintained.

It is also worthy of note that several studies have specifically compared attention to threatening information vs. harm information, with interesting patterns emerging. In an initial eye-tracking study, Calvo and Lang (2004) presented participants with neutral, positive, and two types of negative (threat, injury) images for 3 seconds each. Similar to previous studies, an initial drawing of attention was found for both threat and injury pictures, however viewing time in the first 500ms of scene presentation was longer for threat than for injury pictures. They concluded that the unpleasant valence of information may bias the initial orienting of attention because it produces distress; later attention is affected more by motivational processes, which have been found to affect visual attention patterns (Balcetis & Dunning, 2006), typically on a nonconscious level (Arndt,
Greenberg, Pyszczynski, & Solomon, 1997). Thus, we see continued attentional engagement to threat information and attentional avoidance of injury or harm information. Calvo and Avero (2005) also found this initial orienting of attention toward emotional information, as well as the continued bias toward threat information and later avoidance of harm information. They hypothesized that this occurred because threatening images correspond to fear, anxiety, and danger, but with some possibility for the use of a coping strategy to reduce or avoid the danger. Images of harm were considered to elicit feelings of sadness associated with already-inflicted physical damage with no coping potential (as it has already occurred). Thus, attentional engagement for threat information allows additional time to determine the appropriate course of action in terms of evading possible injury, whereas images depicting injury that is a foregone conclusion are better avoided.

This distinction between attention to threat vs. harm information may further help explain our results. We expected sexual information to act as pain stimuli for women with dyspareunia, as sex and pain have become intertwined for these women. However, what we may be evidencing is sexual stimuli acting as harm stimuli instead. If pain has become so closely associated with sex in women with dyspareunia that they can no longer de-couple them, negativity toward sex would be high whereas potential coping strategies would be scarce. As this research suggests, these women should be avoidant of this type of stimuli because it elicits thoughts of injury with no hope to prevent or stop it, and this is exactly what we found in our attention results (i.e., avoidance of sexual stimuli).
One of the interesting features of dyspareunia that makes it a qualitatively different phenomenon from specific phobias and other types of anxieties is that sex is supposed to be enjoyable. It is supposed to feel good and there are clear societal and relational pressures to engage in it. Few would argue that the same line of reasoning holds true for interacting with snakes and spiders. Although the percentages of people with true, diagnosable phobias for snakes or spiders is probably quite low, images of these animals still act as a type of threat stimulus for those with no particular fear of them (as these studies have shown). The same cannot be said for sex. Sex typically is generally a pleasurable activity and is part of our base instinctual behavior.

So what is known about appetitive stimuli that are either feared or avoided with regard to attention? Two studies bear directly on this issue: one examining social interaction (social phobia) and the other investigating food (restrained eaters). Social phobia, a disorder in which social relationships are desired but avoided due to fear of criticism or rejection, is often characterized by the avoidance of eye contact in social interactions. Men and women with social phobia had their eye movements tracked while they looked at pictures of faces; results indicated extensive hyperscanning of non-facial features (with a particular avoidance of the eyes) as compared to non-social phobics (Horley, Williams, Gonsalvez, & Gordon, 2003). It was suggested that this cognitive avoidance technique is an adaptive strategy to reduce overall anxiety. Boon, Vogelzang, & Jansen (2000) conducted Emotional-Stroop and dot-probe tasks on restrained eating individuals with food and weight/shape words as stimuli. Attention results suggested neither an attention bias toward nor avoidance of these words compared to neutral words. The authors interpreted this as possible evidence of an ironic process (in that one has to
attend to something before it can be subsequently avoided), and suggested that the participants likely looked at the words before avoiding them. Supportive evidence for this idea was found in their memory results—the restrained eaters took less time in the recognition task than the unrestrained eaters. It has been hypothesized previously that the E-Stroop and dot-probe paradigms do not provide for the level of detail in the time-course of attention to be able to make these finer distinctions (Rinck et al., 2005), so this interpretation may be accurate. Thus, cognitive avoidance can be seen even when an object or activity is desired, which may have been the case in our dyspareunia women. This is further supported by the fact that none of the women in our dyspareunia sample had sexual desire problems, so they continued to want sexual activity at the same time as they were motivated to avoid it. This would make sense given the additional reasons people engage in intercourse other than pure desire (e.g., to please the person's partner, to preserve the relationship).

The main differences we found in this study were that women with dyspareunia attended less to the sexual regions and more to the non-sexual regions of the images than the control women. Taken together, the literature on distraction in sexual dysfunction, combined with the avoidance processes seen related to anxiety-producing or feared stimuli, may explain our main attention findings. Specifically, women with dyspareunia do appear to be distracted away from sexual stimuli, which was posited specifically by Brauer et al. (2007). There also appears to be an additional component of avoidance, suggesting an anxiety-type response that possibly explains why this group looked at the sexual stimuli even less than the women who simply were not interested in them (e.g., the HSD women). It is interesting that we can now add cognitive avoidance to the already
empirically supported behavioral avoidance of sex in these women. It appears that the most parsimonious explanation would be that both distraction from and avoidance of sexual stimuli is taking place, though only future research will be able to tease these apart more effectively.

It is possible that a few minor modifications to our protocol might have produced even more pronounced results if this interpretation is correct. First, we may have seen the attentional hypervigilance toward sexual stimuli we anticipated had we looked at early viewing time measures (e.g., first 500ms of stimulus presentation) rather than overall attention over 10 seconds. Future studies could either break down viewing time into different segments (e.g., first 500ms, second 500ms, and so on) or present the stimuli for shorter periods of time to see if this effect would emerge. Additionally, we may have evidence stronger results had we shown more explicit images of vaginal intercourse, as this has been shown to negatively affect physiological arousal in women with dyspareunia to a greater degree than images of foreplay (e.g., Wouda et al., 1998). Lastly, since avoidance is a key theme emerging in these data, and behavioral avoidance seems to be even more prominent in women with vaginismus than those with dyspareunia, our results may have been even stronger had we specifically recruited women with vaginismus.

**Interpretation of Other Results**

Some additional results in the current study bear potential interpretation. In line with the two dependent variables in which we did see group variation, we also anticipated significant group differences for average fixation durations on the three scene regions. No significant interaction was found, suggesting that all the participants showed similar
patterns of attention with regard to average fixation duration. Although at first glance this result seems inconsistent with the results for the other two dependent variables, it is perhaps not that surprising that we did not find differences for this variable. Average fixation duration is considered to be a measure of attentional capture, thus a measure of how difficult it is for people to disengage attention from a particular scene region. The inconsistent objects were clearly odd and unexpected, and they did capture attention more so than did the bodies. However, the longest average fixation durations were found to be on the context scene region. Our results suggest that there was no consistent group variation in average fixation durations on these scene regions, which reflects findings in a previous study found for first gaze duration, another measure of attentional capture (see Lykins, Meana, & Kambe, 2006).

Although not our primary group of interest, the attention results for the women with HSD were rather interesting as well. We did find some evidence of distraction from sexual stimuli in this group, although not to the degree we anticipated. The dependent measures we chose to analyze were generally indicators of overall interest, so to find that women with low interest in sexual activity were generally less interested in sexual stimuli was both expected and realized. However, women with HSD resembled the no-dysfunction control women (in terms of attentional patterns) more than women with dyspareunia, leaving us to wonder what this may mean. As previously stated, not being interested in sexual activity may be quite different than sex being an unpleasant experience, despite both being considered sexual dysfunctions. Although women with HSD in our sample reported little desire for sex, this lack of interest did not appear to reach levels of aversion that would involve greater motivation toward avoidance. Clearly
with the experience of these women appears to be of a different nature than that of women with dyspareunia.

The lack of significant memory differences was somewhat curious as well. Previous studies have shown that memory for objects is dependent on the degree to which they are attended, occurs whether or not a person is motivated to remember them, shows little decay over short or long periods of time, and is best for objects that do not belong in the presented scenes. Given these findings, it was somewhat surprising that we found no differences in recall or recognition memory for the inconsistent objects in our stimuli. There are several possible explanations for these results. First, because we were interested in overall attention to the sexual aspects of the stimuli and the degree to which participants were distracted by the inconsistent objects, we did not ask about the features of the other scene regions. Perhaps if we had tested memory for other aspects of the scenes, such as the settings or the faces of the models in them, we would have found group differences. Our lack of results for memory could also be due to methodological issues. It is possible that our memory task was not substantially difficult for group differences to emerge, as it was not a standardized test of memory. It is also possible that the delay time was not long enough or the interim tasks were not complex enough to distract participants. Finally, on one level the lack of group differences for memory for the inconsistent objects is not at all surprising given the lack of significant group differences in attention to the objects.
Limitations

As with any experiment, there were several limitations to this study that could be addressed in future research. These limitations generally fall under one of two categories: problems with the study sample and issues concerning the visual stimuli. Sampling concerns revolve primarily around the women with HSD. First, the HSD sample was incomplete. Despite two years of active recruitment, we were unable to collect usable data from twenty women with low desire, as was originally proposed. This was somewhat unanticipated, given that the estimated prevalence of problematic low sexual desire in women is around 30% (DSM-IV-TR; APA, 2000). Though the results for this group were generally in the expected directions, group differences may have been more substantial if this group had reached the twenty women originally targeted.

It is also possible that the women with HSD did not experience clinical levels of low sexual desire. Desire for sexual activity is an exceptionally complex issue and has been the object of much debate as to how much desire is “enough,” how to properly characterize “low” sexual desire, and what the most valid and reliable ways to assess sexual desire comprise. We are quite confident in the diagnostic reliability of our dyspareunia sample, as self-report of persistent pain during intercourse is essentially the only requirement for a clinical diagnosis of dyspareunia (other than distress which is ubiquitous). However, given the complexity of sexual desire, it is possible that the two FSFI questions targeting desire were not appreciably comprehensive to establish diagnostic levels of low desire. We did find results in the expected direction for this group, but they did not always significantly differ from the no-dysfunction control group. Perhaps if we had conducted interviews or used questionnaires with more in-depth
questions in the recruitment process, our results for the HSD group would have shown
greater divergence from the women with no sexual dysfunction.

Third, although we believed that depictions of sexual activity would activate
thoughts of pain for women with dyspareunia, it is not clear that this actually occurred. In
fact, women with dyspareunia were no more likely to report that the stimuli presented
made them think of pain than were the other two groups of women (although self-report
is not always a reliable indicator of cognitive processing). Ultimately, we do not know
the extent to which our sexual stimuli also served as pain stimuli for the women with
dyspareunia. It may be useful for future studies to manipulate the facial expressions of
the female models in the images so that they look like they are experiencing pain. As
previously discussed, we also may have found stronger results if our stimuli depicted
more graphic scenes of vaginal intercourse, the activity that actually causes women with
dyspareunia the pain they experience.

Lastly, our overall sample was quite young. The group differences we found in
women who are just starting their sexual lives are quite striking, considering their
experiences with sex are probably quite limited in comparison to those of older women. It
is likely that we would have found even bigger differences in an older sample, as
increased experience with painful intercourse would likely have taken its toll on the
sexual lives of older women in ways not yet experienced by our relatively young sample.

Future Directions

Future research could first target the limitations of the current study (e.g., more
in-depth screening process, manipulations of facial affect expressions, utilizing more
explicit images, recruiting older samples). It would also valuable to have participants
undergo a standardized pelvic exam to determine which of the four types of dyspareunia the participants had (i.e., vestibulodynia, vulvar or vaginal atrophy, mixed etiology group, no physical findings group), and to explore any potential attentional differences among those groups. We can hypothesize that most of the women had vestibulodynia, as this is the most common type of dyspareunia in young women (Meana et al., 1997a), but it would be beneficial to know this for specificity purposes.

Manipulating aspects of the memory test would also be constructive, such as increasing the time delay between stimulus presentation and recall memory tests, as well as to increase the complexity of tasks during that delay, such as counting down from 100 by 7's or using the Digits Forward and Digits Backward subtests of the Wechsler Adult Intelligence Scale-III. Manipulating the physical features of the objects (e.g., luminance, rotation) may also increase task difficulty. Future studies could also ask for recall of the scene setting details, which may reveal group differences in memory considering there were group differences in attention to the context scene region. One could also show the scenes a second time without the inconsistent objects embedded into them to explore whether this would affect recall memory (see Henderson et al., 2003).

It would also be interesting to utilize this distraction paradigm in women with other types of sexual dysfunction (e.g., Sexual Aversion Disorder, Female Sexual Arousal Disorder, Female Orgasmic Disorder), to see if these attentional patterns emerge in those groups. Further, future studies should also include men with and without sexual dysfunction to examine attention in men with sexual problems, as well as to explore potential sex differences in the cognitive patterns of sexual dysfunction in regard to attention and memory.
Testing the visual correlates of pain catastrophizing might also be a useful endeavor in groups of women with dyspareunia. Future studies could utilize standardized images (e.g., images from the International Affective Picture System) that are explicitly designed to elicit thoughts of pain, fear of harm, or threat, to explore whether these attentional patterns are specifically related to sexual activity or are part of a more global pattern of harm avoidance, which could also speak to additional etiological issues in dyspareunia. One could also employ a priming protocol to determine how priming of positive (e.g., good, happy, fun, enjoyable) vs. negative (e.g., pain, hurt, harm) information might affect the subsequent eye-movement patterns of the three groups in this study when presented with sexual stimuli.

There are a multitude of dependent variables in eye-tracking that we could have analyzed in this study. We selected those dependent variables based on our goals of exploring overall interest in and distraction from the sexual aspects of the images presented. To further explore the relationship between our results and those in the anxiety literature, it would be useful to examine measures of earlier scene perception, such as first fixation and first gaze duration. If we found that women with dyspareunia focused on the sexual scene regions earlier in stimulus presentation or had longer first gaze durations on the sexual scene regions than other control women, it would further support our contention that an avoidance process is taking place in these women when exposed to sexual information. Additionally, one could analyze pupilometry data as an indirect measure of physiological arousal. It would be unclear as to whether increased pupil size signified sexual arousal or some other type of physiological arousal (e.g., fear, anxiety, shock), but it is certainly a variable worth exploring in future studies.
Lastly, it is important to explore whether and how eye-tracking methodology could be used in the multidisciplinary treatment of these disorders. For example, if women with dyspareunia are more avoidant of sexual information (which likely affects overall sexual functioning on its own), utilizing the moving window paradigm to specifically direct attention toward sexual aspects of images (and blurring out the rest), as a type of forced exposure, may serve to decrease overall avoidance or fear of sexual activity. As the attentional patterns found in this study appear to be similar to those found in the anxiety literature, increasing exposure through systematic desensitization (either using eye-tracking or not) may serve to positively affect the sexual functioning of women with dyspareunia.
REFERENCES


Binik, Y. M. (2005). Should dyspareunia be retained as a sexual dysfunction in DSM-


experimental approach. *Archives of Sexual Behavior, 35*, 201-216.


Harlow, B. L. (2004). Prevalence and etiological predictors of vulvodynia: Key


APPENDIX I

TABLES AND FIGURES
### Table 1

**Demographic Characteristics of Final Sample (N = 54)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Dyspareunia Women</th>
<th>HSD Women</th>
<th>Control Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M )</td>
<td>( SD )</td>
<td>( M )</td>
</tr>
<tr>
<td>Age</td>
<td>19.65</td>
<td>2.85</td>
<td>19.21</td>
</tr>
<tr>
<td>n</td>
<td></td>
<td></td>
<td>( n )</td>
</tr>
<tr>
<td>Ethnicity</td>
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<td></td>
</tr>
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<td>European-American</td>
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<td>55.0</td>
<td>3</td>
</tr>
<tr>
<td>Hispanic-American</td>
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<td>20</td>
<td>4</td>
</tr>
<tr>
<td>African-American</td>
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<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Asian-American</td>
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<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Pacific Islander</td>
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<tr>
<td>Other</td>
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<td>10</td>
<td>2</td>
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<tr>
<td>Religious Affiliation</td>
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<tr>
<td>Catholic Christian</td>
<td>8</td>
<td>40</td>
<td>7</td>
</tr>
<tr>
<td>Protestant Christian</td>
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<td>0</td>
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<tr>
<td>Church of Latter-Day Saints</td>
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<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
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<td>30</td>
<td>0</td>
</tr>
<tr>
<td>None</td>
<td>5</td>
<td>25</td>
<td>4</td>
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Table 2

Female Sexual Function Index Scores for Participants

<table>
<thead>
<tr>
<th>FSFI Score</th>
<th>Dyspareunia Women</th>
<th>HSD Women</th>
<th>Control Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Desire</td>
<td>4.20</td>
<td>0.78</td>
<td>2.36</td>
</tr>
<tr>
<td>Arousal</td>
<td>4.47</td>
<td>1.06</td>
<td>3.75</td>
</tr>
<tr>
<td>Lubrication</td>
<td>4.89</td>
<td>1.08</td>
<td>4.71</td>
</tr>
<tr>
<td>Orgasm</td>
<td>3.96</td>
<td>1.38</td>
<td>3.43</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>4.24</td>
<td>1.23</td>
<td>4.43</td>
</tr>
<tr>
<td>Pain</td>
<td>2.92</td>
<td>0.91</td>
<td>5.14</td>
</tr>
<tr>
<td>Total</td>
<td>24.68</td>
<td>4.56</td>
<td>23.82</td>
</tr>
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</table>
Table 3

Correlations Between FSFI Scores for All Participants

<table>
<thead>
<tr>
<th>FSFI Scale</th>
<th>Desire</th>
<th>Arousal</th>
<th>Lubrication</th>
<th>Orgasm</th>
<th>Satisfaction</th>
<th>Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desire</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arousal</td>
<td>.57**</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubrication</td>
<td>.33*</td>
<td>.69**</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orgasm</td>
<td>.44**</td>
<td>.73**</td>
<td>.59**</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>.35**</td>
<td>.55**</td>
<td>.52**</td>
<td>.57**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td>.01</td>
<td>.33*</td>
<td>.51**</td>
<td>.41**</td>
<td>.48**</td>
<td>--</td>
</tr>
</tbody>
</table>

Note. ** p < .01, * p < .05.
Table 4

*T-Values for Connors' Continuous Performance Test Scores of Participants*

<table>
<thead>
<tr>
<th></th>
<th>Dyspareunia Women</th>
<th>HSD Women</th>
<th>Control Women</th>
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</thead>
<tbody>
<tr>
<td><strong>CPT Scale Score</strong></td>
<td><strong>M</strong></td>
<td><strong>SD</strong></td>
<td><strong>M</strong></td>
</tr>
<tr>
<td>Omissions</td>
<td>48.42</td>
<td>4.16</td>
<td>51.69</td>
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<tr>
<td>Commissions</td>
<td>54.19</td>
<td>10.74</td>
<td>54.39</td>
</tr>
<tr>
<td>Hit Rate</td>
<td>47.30</td>
<td>6.72</td>
<td>44.38</td>
</tr>
<tr>
<td>Response Time</td>
<td>53.00</td>
<td>7.12</td>
<td>54.72</td>
</tr>
<tr>
<td><strong>D'</strong></td>
<td>53.00</td>
<td>7.12</td>
<td>54.72</td>
</tr>
</tbody>
</table>

140
Table 5

*Means and Standard Deviations for Total Number of Fixations*

<table>
<thead>
<tr>
<th>Scene Region</th>
<th>Dyspareunia Women</th>
<th>HSD Women</th>
<th>Control Women</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Bodies</td>
<td>8.19</td>
<td>2.78</td>
<td>10.47</td>
</tr>
<tr>
<td>Inconsistent Object</td>
<td>2.04</td>
<td>1.26</td>
<td>1.84</td>
</tr>
<tr>
<td>Context</td>
<td>7.41</td>
<td>3.25</td>
<td>7.49</td>
</tr>
</tbody>
</table>
Table 6

*Analysis of Variance on Total Number of Fixations for 2-Way Interaction (Group X Scene Region)*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>F</th>
<th>η²</th>
<th>p</th>
</tr>
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<tbody>
<tr>
<td><strong>Between Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group of Participant (G)</td>
<td>2</td>
<td>2.22</td>
<td>.08</td>
<td>.080</td>
</tr>
<tr>
<td>G within-group error</td>
<td>51</td>
<td>(3.32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Within Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scene Region (SR)</td>
<td>2</td>
<td>157.97</td>
<td>.76</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>G X SR</td>
<td>3.52</td>
<td>5.17</td>
<td>.17</td>
<td>.001</td>
</tr>
<tr>
<td>SR within-group error</td>
<td>89.70</td>
<td>(6.17)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 7

*Means and Standard Deviations for Average Fixation Duration*

<table>
<thead>
<tr>
<th>Scene Region</th>
<th>Dyspareunia Women</th>
<th>HSD Women</th>
<th>Control Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Bodies</td>
<td>200.44</td>
<td>53.67</td>
<td>230.46</td>
</tr>
<tr>
<td>Inconsistent Object</td>
<td>310.56</td>
<td>157.58</td>
<td>271.03</td>
</tr>
<tr>
<td>Context</td>
<td>406.36</td>
<td>120.95</td>
<td>397.84</td>
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</table>
Table 8

*Analysis of Variance on Average Fixation Duration for 2-Way Interaction (Group X Scene Region)*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>F</th>
<th>$\eta^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Between Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group of Participant (G)</td>
<td>2</td>
<td>.16</td>
<td>.01</td>
<td>.854</td>
</tr>
<tr>
<td>G within-group error</td>
<td>51</td>
<td>(16060.17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Within Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scene Region (SR)</td>
<td>1.52</td>
<td>37.69</td>
<td>.43</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>G X SR</td>
<td>3.05</td>
<td>0.57</td>
<td>.02</td>
<td>.637</td>
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<tr>
<td>SR within-group error</td>
<td>77.67</td>
<td>(15449.68)</td>
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</tr>
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</table>
Table 9

Means and Standard Deviations for Total Gaze Time

<table>
<thead>
<tr>
<th>Scene Region</th>
<th>Dyspareunia Women</th>
<th>HSD Women</th>
<th>Control Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Bodies</td>
<td>2973.28</td>
<td>1015.63</td>
<td>3887.10</td>
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<tr>
<td>Inconsistent Object</td>
<td>1010.04</td>
<td>896.71</td>
<td>789.51</td>
</tr>
<tr>
<td>Context</td>
<td>2842.83</td>
<td>1132.34</td>
<td>2952.58</td>
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</table>
Table 10

*Analysis of Variance on Total Gaze Time for 2-Way Interaction (Group X Scene Region)*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>F</th>
<th>$\eta^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group of Participant (G)</td>
<td>2</td>
<td>2.00</td>
<td>.07</td>
<td>.146</td>
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<tr>
<td>G within-group error</td>
<td>51</td>
<td>(611907.31)</td>
<td>(611907.31)</td>
<td></td>
</tr>
<tr>
<td><strong>Within Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scene Region (SR)</td>
<td>2</td>
<td>116.21</td>
<td>.70</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>G X SR</td>
<td>4</td>
<td>6.83</td>
<td>.21</td>
<td>&lt;.001</td>
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<tr>
<td>SR within-group error</td>
<td>102</td>
<td>(990248.49)</td>
<td>(990248.49)</td>
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Table 11

*Means and Standard Deviations for Recall and Recognition Memory of Inconsistent Objects*

<table>
<thead>
<tr>
<th></th>
<th>Dyspareunia Women</th>
<th>HSD Women</th>
<th>Control Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Recall Memory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hits</td>
<td>3.55</td>
<td>1.43</td>
<td>2.93</td>
</tr>
<tr>
<td>Intrusions</td>
<td>0.40</td>
<td>0.60</td>
<td>0.64</td>
</tr>
<tr>
<td>Recognition Memory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hits</td>
<td>7.90</td>
<td>1.33</td>
<td>7.57</td>
</tr>
<tr>
<td>False Positives</td>
<td>1.75</td>
<td>1.41</td>
<td>1.50</td>
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</table>
Table 12

*Analysis of Variance on Recall Memory (Hits) for Inconsistent Objects*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>4.36</td>
<td>2.18</td>
<td>0.97</td>
</tr>
<tr>
<td>Within group</td>
<td>51</td>
<td>114.68</td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>119.04</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. **p < .01, *p < .05.**
Table 13

*Analysis of Variance on Recall Memory (Intrusions) for Inconsistent Objects*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>2.03</td>
<td>1.01</td>
<td>3.12</td>
</tr>
<tr>
<td>Within group</td>
<td>51</td>
<td>16.56</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>18.59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. **p < .01, *p < .05.**
<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>15.16</td>
<td>7.58</td>
<td>2.81</td>
</tr>
<tr>
<td>Within group</td>
<td>51</td>
<td>137.43</td>
<td>2.70</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>152.59</td>
<td></td>
<td></td>
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</tbody>
</table>

Note. **$p < .01$, * $p < .05$.**
Table 15

*Analysis of Variance on Recognition Memory (False Positives) for Inconsistent Objects*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>.55</td>
<td>0.28</td>
<td>0.13</td>
</tr>
<tr>
<td>Within group</td>
<td>51</td>
<td>105.45</td>
<td>2.07</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>106.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. **p < .01, * p < .05.
Figure 1

Results for Total Number of Fixations

Total Number of Fixations

- Dyspareunia
- HSD
- Control

<table>
<thead>
<tr>
<th>Scene Region</th>
<th>Dyspareunia</th>
<th>HSD</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bodies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inconsistent Object</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Context</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 2

Results for Average Fixation Duration

Average Fixation Duration

- Dyspareunia
- HSD
- Control

Average Fixation Duration (ms)

Bodies Inconsistent Object Scene Region Context
Figure 3

Results for Total Gaze Time

Total Gaze Time

- Dyspareunia
- HSD
- Control

Scene Region

Bodies

Inconsistent Object

Context
Figure 4

Results for Recall and Recognition Memory

Recall and Recognition Memory Results

<table>
<thead>
<tr>
<th>Memory Dependent Variable</th>
<th>Dyspareunia</th>
<th>HSD</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recall Hits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recall Intrusions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognition Hits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognition False Positives</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX II

STIMULUS IMAGES
Images Not Used in Final Stimulus Set
**Instructions:** These questions ask about your sexual feelings and responses during the past 4 weeks. Please answer the following questions as honestly and clearly as possible. Your responses will be kept completely confidential. In answering these questions, the following definitions apply:

**Sexual activity** can include caressing, foreplay, masturbation, and vaginal intercourse.  
**Sexual intercourse** is defined as penile penetration (entry) of the vagina.  
**Sexual stimulation** includes situations like foreplay with a partner, self-stimulation (masturbation), or sexual fantasy.

**CHECK ONLY ONE BOX PER QUESTION.**

**Sexual desire or interest** is a feeling that includes wanting to have a sexual experience, feeling receptive to a partner’s sexual initiation, and thinking or fantasizing about sex.

1. Over the past 4 weeks, how often did you feel sexual desire or interest?  
   Almost always or always  
   Most times (more than half the time)  
   Sometimes (about half the time)  
   A few times (less than half the time)  
   Almost never or never

2. Over the past 4 weeks, how would you rate your level (degree) or sexual desire or interest?  
   Very high  
   High  
   Moderate  
   Low  
   Very low or none at all

Sexual arousal is a feeling that includes both physical and mental aspects of sexual excitement. It may include feelings of warmth or tingling in the genitals, lubrication (wetness), or muscle contractions.

3. Over the past 4 weeks, how often did you feel sexually aroused (“turned on”) during sexual activity or intercourse?  
   No sexual activity  
   Almost always or always  
   Most times (more than half the time)  
   Sometimes (about half the time)  
   A few times (less than half the time)  
   Almost never or never

4. Over the past 4 weeks, how would you rate your level of sexual arousal (“turn on”) during sexual activity or intercourse?  
   No sexual activity  
   Very high  
   High  
   Moderate  
   Low  
   Very low or none at all
5. Over the past 4 weeks, how confident were you about becoming sexually aroused during sexual activity or intercourse?
   No sexual activity
   Very high confidence
   High confidence
   Moderate confidence
   Low confidence
   Very low or no confidence

6. Over the past 4 weeks, how often have you been satisfied with your arousal (excitement) during sexual activity or intercourse?
   No sexual activity
   Almost always or always
   Most times (more than half the time)
   Sometimes (about half the time)
   A few times (less than half the time)
   Almost never or never

7. Over the past 4 weeks, how often did you become lubricated ("wet") during sexual activity or intercourse?
   No sexual activity
   Almost always or always
   Most times (more than half the time)
   Sometimes (about half the time)
   A few times (less than half the time)
   Almost never or never

8. Over the past 4 weeks, how difficult was it to become lubricated ("wet") during sexual activity or intercourse?
   No sexual activity
   Extremely difficult or impossible
   Very difficult
   Difficult
   Slightly difficult
   Not difficult

9. Over the past 4 weeks, how often did you maintain your lubrication ("wetness") until completion of sexual activity or intercourse?
   No sexual activity
   Almost always or always
   Most times (more than half the time)
   Sometimes (about half the time)
   A few times (less than half the time)
   Almost never or never
10. Over the past 4 weeks, how **difficult** was it to maintain your lubrication ("wetness") until completion of sexual activity or intercourse?
   - No sexual activity
   - Extremely difficult or impossible
   - Very difficult
   - Difficult
   - Slightly difficult
   - Not difficult

11. Over the past 4 weeks, when you had sexual stimulation or intercourse, how **often** did you reach orgasm (climax)?
   - No sexual activity
   - Almost always or always
   - Most times (more than half the time)
   - Sometimes (about half the time)
   - A few times (less than half the time)
   - Almost never or never

12. Over the past 4 weeks, when you had sexual stimulation or intercourse, how **difficult** was it for you to reach orgasm (climax)?
   - No sexual activity
   - Extremely difficult or impossible
   - Very difficult
   - Difficult
   - Slightly difficult
   - Not difficult

13. Over the past 4 weeks, how **satisfied** were you with your ability to reach orgasm (climax) during sexual activity or intercourse?
   - No sexual activity
   - Very satisfied
   - Moderately satisfied
   - About equally satisfied and dissatisfied
   - Moderately dissatisfied
   - Very dissatisfied

14. Over the past 4 weeks, how **satisfied** have you been with the amount of emotional closeness between you and your partner?
   - No sexual activity
   - Very satisfied
   - Moderately satisfied
   - About equally satisfied and dissatisfied
   - Moderately dissatisfied
   - Very dissatisfied
15. Over the past 4 weeks, how satisfied have you been with your sexual relationship with your partner?
   - Very satisfied
   - Moderately satisfied
   - About equally satisfied and dissatisfied
   - Moderately dissatisfied
   - Very dissatisfied

16. Over the past 4 weeks, how satisfied have you been with your overall sexual life?
   - Very satisfied
   - Moderately satisfied
   - About equally satisfied and dissatisfied
   - Moderately dissatisfied
   - Very dissatisfied

17. Over the past 4 weeks, how often did you experience discomfort or pain during vaginal penetration?
   - Did not attempt intercourse
   - Almost always or always
   - Most times (more than half the time)
   - Sometimes (about half the time)
   - A few times (less than half the time)
   - Almost never or never

18. Over the past 4 weeks, how often did you experience discomfort or pain following vaginal penetration?
   - Did not attempt intercourse
   - Almost always or always
   - Most times (more than half the time)
   - Sometimes (about half the time)
   - A few times (less than half the time)
   - Almost never or never

19. Over the past 4 weeks, how would you rate your level (degree) of discomfort or pain during or following vaginal penetration?
   - Did not attempt intercourse
   - Very high
   - High
   - Moderate
   - Low
   - Very low or none at all

Were your responses random, or did you answer truthfully (circle one)?
   Answered truthfully OR Randomly
APPENDIX IV

DEMOGRAPHIC QUESTIONNAIRE
Demographic Questionnaire

1. What is your age? ________

2. What is your ethnicity?
   - African American
   - Asian
   - Caucasian
   - Hispanic
   - Native American
   - Pacific Islander
   - Other (please specify) ____________

3. What is your religious affiliation?
   - Catholic
   - Christian
   - Church of Latter Day Saints
   - Muslim
   - None
   - Other (please specify) ____________

4. Are you right or left-handed? (please circle one)  R   L

5. What is your sexual orientation? (optional—you do not have to answer this question)
   - Heterosexual/Straight
   - Homosexual/Gay
   - Bisexual
   - Other

6. Today you’ve seen a lot of pictures. How much did these pictures make you think of pain?
   - Not at all
   - Somewhat
   - Very much
VITA
Graduate College
University of Nevada, Las Vegas
Amy Dianne Lykins

Local Address:
2120 Ramrod Ave. Apt. 121
Henderson, NV 89154

Home Address:
544 Huron St. Apt. 4
Toronto, Ontario M5R 2R7

Degrees:
Bachelor of Arts, Psychology and Sociology, 2001
Indiana University

Master of Arts, Clinical Psychology, 2004
University of Nevada, Las Vegas

Special Honors and Awards:
2008 Best Student Manuscript Award
International Academy of Sex Research (plane ticket to Belgium = $1300)

2008 International Academy of Sex Research Annual Conference Poster Award
International Academy of Sex Research

2007 Graduate Research Training (GREAT) Assistantship
University of Nevada, Las Vegas ($4000)

2007 Regents’ Graduate Scholar Award
 Excellence in academics, leadership, and potential for continued success
State of Nevada Board of Regents ($5000)

2006 Graduate Research Training (GREAT) Assistantship
University of Nevada, Las Vegas ($4000)

2006 Graduate Student Excellence in Teaching Award
University of Nevada, Las Vegas ($500)

2005 Graduate Research Training (GREAT) Assistantship
University of Nevada, Las Vegas ($4000)

2005 Outstanding Graduate Student of the Year Award
2004  Graduate Research Training (GREAT) Assistantship
       University of Nevada, Las Vegas ($4,000)

2003  Thesis Research Award: Department of Psychology
       University of Nevada, Las Vegas ($3,333)

Publications:
Blanchard, R., Lykins, A. D., Wherrett, D., Kuban, M. E., Cantor, J. M., Blak, T.,

Meana, M., & Lykins, A. D. (accepted for publication). Negative affect and somatically focused anxiety in young women reporting pain during intercourse. *Journal of Sex Research*.


Dissertation Title: Avoiding the Sexual: Visual Attention and Distraction in Dyspareunia

Dissertation Examination Committee:
   Chairperson, Dr. Marta Meana, Ph.D.
   Committee Member, Dr. Dan Allen
   Committee Member, Dr. Murray Millar
   Graduate Faculty Representative, Dr. Gerald Weeks