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Affective and Autonomic Responses to Erotic Images among Young Women with and without Sexual Difficulties

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AFFECTIVE AND AUTONOMIC RESPONSES TO EROTIC IMAGES AMONG YOUNG WOMEN WITH AND WITHOUT SEXUAL DIFFICULTIES

by

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ABSTRACT

Existing models of female sexual dysfunction (FSD) are broad and do not provide information about how to improve existing interventions. The purpose of the current study is to extend the empirical application of a disgust model of FSD (de Jong, van Overveld, & Borg, 2013) to a population of young women reporting difficulties with sexual desire and/or arousal and related distress. Sixty college-aged females participated in the study and were placed into two groups based upon their reports of sexual functioning and sexual distress: a control group (i.e., no sexual difficulties or distress) and a clinical group (i.e., difficulties with sexual desire and/or arousal and accompanying distress). Participants were attached to physiological equipment and shown images displaying neutral, positive, disgusting, and erotic content. It was hypothesized that the clinical group would show more evidence of disgust (via affective and autonomic responses) than the control group.

Consistent with hypotheses, no group differences were found in any of the affective or autonomic measures during presentation of the neutral, positive, or disgust images. Group differences during presentation of the erotic images (i.e., in facial EMG, heart rate, and self-report affective ratings) and follow-up analyses provided preliminary evidence for generalizing the disgust model of female sexual dysfunction beyond disorders of sexual pain, at least among some women. Exploratory analyses implicated a relationship between a history of sexual victimization and self-report disgust ratings of erotic images. Future research should further explore these relationships in order to shed more light on how disgust-based mechanisms impact the onset and maintenance of female sexual dysfunction.

This project is in dedication to my parents who have instilled in me values of hard work, perseverance, and commitment to academic endeavors. Without these values, I would not have been as driven to overcome adversity to get to where I am today. I am forever grateful to have had such a positive influence from such wonderful parents and seek to do right by the values they have nurtured in me.

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INTRODUCTION AND LITERATURE REVIEW

Research examining the role of disgust in female sexual dysfunction (FSD) has recently advanced. Existing models of FSD broadly include cognitive/behavioral and excitatory/ inhibitory processes (Bancroft, Graham, Janssen, & Sanders, 2009; Beck & Barlow, 1984), but fail to elaborate specific processes that contribute to the development and maintenance of FSD. These specific processes are particularly helpful to practitioners in the conceptualization, assessment, and intervention of FSD, all areas for growth. In response to this need, de Jong, van Overveld, and Borg (2013) have proposed a model of disgust-based mechanisms of FSD. While this model has solid theoretical support, it has yet to be subjected to much empirical scrutiny. Preliminary studies have produced some evidence for the role of disgust in sexual pain disorders (Borg, de Jong, & Schultz, 2010). The purpose of the current study is to extend the empirical application of the disgust model of FSD to a population of young women reporting difficulties with sexual desire and/or arousal and related distress.

Disgust and Female Sexual Dysfunction

Disgust is considered one of the core universal emotions, hypothesized to serve an evolutionary advantage by motivating an individual to avoid sources of potential contamination. Disgust is conceptualized as a negative and briefly experienced emotion state that triggers defensive reflexes (e.g., gagging), facilitates negative appraisals, and tends to result in avoidant behavior (Rozin & Fallon, 1987). Like the other universal emotions, disgust is found to correspond with a distinct facial expression that is thought to reflect the body's defense against contamination (e.g., wrinkling the nose may inhibit entry of contaminants into the nasal passage; Ekman, 1972). Additionally, disgust is associated with specific autonomic changes, such as heart rate deceleration and increased electrodermal activity (Bradley, Codispoti, Sabatinelli, & Lang, 2001; Levenson, 1992; Vrana, 1993). Heart rate deceleration is correlated with attentional processing and distinguishes disgust vs. fear responses, while increased electrodermal is a general marker of autonomic arousal (Stark, Walter, Schienle, & Vaitl, 2005).

Given that bodily orifices (e.g., mouth, penis, vagina) are most sensitive to contamination, that bodily fluids (e.g., semen, sweat, vaginal fluids) are among the strongest elicitors of disgust, and the heightened disgust sensitivity present in females, the potential role of disgust in female sexual dysfunction appears promising (Fleischman, 2014; de Jong et al., 2013). Indeed, subjective disgust has been found to correlate negatively with positive feelings and sexual arousal and to correlate positively with anxiety (de Jong & Peters, 2009). These relatively stronger negative and weaker positive forces may be seen as a motivating factor in the avoidance of sexual engagement (de Jong, et al., 2013).

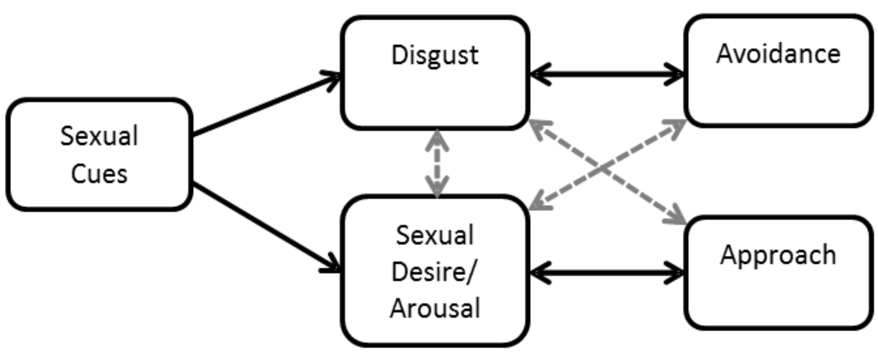

Figure 1. The role of disgust in sexual (dys)function (adapted from the model described by de Jong, van Overveld, and Borg). The solid black and dashed gray lines represent excitatory and inhibitory pathways, respectively.

The theoretical model developed by de Jong, van Overveld, and Borg (2013) parallels the dual control model (Bancroft et al., 2009) and highlights the relationship between disgust and sexual functioning. Figure 1 depicts the relationships between sexual cues, feelings of disgust and desire/arousal, and subsequent approach or avoidance behavior highlighted by de Jong and colleagues.[1] In short, sexual cues may simultaneously elicit feelings of disgust and sexual desire/arousal. Based on the relative impact of disgust and arousal, a (dys)functional pattern of sexual behavior may emerge. According to the model, feelings of sexual desire and arousal may attenuate or overpower feelings of disgust as well as motivate approach behavior (i.e., sexual engagement). Sexual engagement may then further attenuate the effects of disgust while facilitating the maintenance of sexual desire and arousal. On the other hand, feelings of disgust may interfere with sexual desire and arousal as well as motivate avoidance behavior. This avoidance behavior reinforces the feelings of disgust and further interferes with the development of sexual arousal and desire. Over time, this second pattern of behavior is hypothesized to lead to problematic sexual functioning.

Supporting Literature

Portions of the disgust model of FSD have received support from various correlational and experimental research among sexually healthy individuals. Consistent with this model, females have been shown to more readily make automatic associations between sex and disgust (Grauvogl et al., 2014). Perhaps in relation, one fMRI study of females found neural activity in response to disgusting images to be similar to images depicting sexual penetration (Borg, de Jong, & Georgiadis, 2014). Disgust also appears to have impact on subjective sexual arousal. Women who rated more disgust in response to an erotic film also rated lower arousal (Koukounas & McCabe, 1997). Also, women who were primed with disgust images reported significantly lower arousal in response to erotic images than women primed with neutral images (Andrews, Crone, Cholka, Cooper, & Bridges, 2015). Conversely, self-induced sexual arousal

[1] Although de Jong and colleagues originally did not include desire into their theoretical model, they suggested that the same or similar processes described in the model are likely to contribute to low sexual desire. In light of this and the intricate link between sexual desire and arousal in females described later, desire is included in the explanation of the model to facilitate its application for the current study.

has been shown to be related to lower disgust sensitivity ratings among women (Lee, Ambler, & Sagarin, 2014). Finally, one study found that sexual arousal (induced by a female-oriented erotic film) resulted in more engagement in both sex-related (e.g., lubricate a vibrator) and non-sex related (e.g., drink from a cup with an insect inside) behaviors, suggesting that self-report sexual arousal motivates approach behavior despite the presence of disgusting stimuli (Borg & de Jong, 2012). Considering that these same links do not appear to apply to males, disgust appears to be particularly implicated in female sexual dysfunction (Andrews, et al., 2015; Grauvogl et al., 2014; Lee, et al., 2014; Stevenson, Case, & Oaten, 2011).

Very few empirical studies applying the disgust model of FSD have been conducted with a clinical sample. One study conducted in the Netherlands compared disgust responses to sexual stimuli in women with diagnoses of vaginismus (n = 24) or dyspareunia (n = 24) to women without sexual dysfunction (n = 31; Borg, et al., 2010). Results suggested that women with vaginismus and dyspareunia made more automatic associations between sexual penetration and disgust than the healthy controls. In addition, women with vaginismus had a greater disgust reaction than healthy controls to both images of sexual penetration and an erotic film clip, as evidenced by facial electromyographic (EMG) activity and subjective self-report data. Women with vaginismus did not differ from the healthy controls in their disgust responses to disgust images, however. Taken together, this study suggested that women with sexual pain disorders appear to have a heightened disgust response that is specific to erotic stimuli (Borg et al., 2010).

Female Sexual Interest and Arousal

One of the most commonly reported sexual difficulties among females is low sexual interest or desire, with prevalence estimates in the U.S. beginning at approximately 10.1%. (Bitzer, Giraldi, & Pfaus, 2013; Shifren et al., 2008). Low sexual desire (including desire for sexual engagement both with the self and with others) accompanied by clinically relevant levels of distress was formerly referred to as Hypoactive Sexual Desire Disorder (HSDD). Given the high comorbidity of HSDD and Female Sexual Arousal Disorder as well as the general lack of construct clarity between sexual desire and sexual arousal among women with sexual dysfunction, the single diagnostic label of Female Sexual Interest/Arousal Disorder (FSIAD) was recently introduced (American Psychological Association, 2013; Brotto, 2010; Graham, 2010). Current clinical knowledge of this disorder is broad and underdefined. It is generally agreed that potential etiologies of FSIAD are heterogeneous and likely involve varying combinations of physiological, psychological and relationship factors (Burri, Cherkas, & Spector, 2009; Lewis, et al., 2010). Unsurprisingly, there is much room for improvement among psychological interventions for these types of sexual complaints (Frühauf, Gerger, Schmidt, Munder, & Barth, 2013). Insights into specific cognitive and/or affective processes involved in FSIAD, such as disgust-based responses and attributions, may contribute to the advancement of interventions for these women.

The disgust model of FSD has not yet been applied beyond disorders of sexual pain; however, de Jong and colleagues suggested that application of the model to other sexual dysfunctions would be logically and theoretically supported (2013). Specifically, they argued that feelings of disgust may motivate avoidance of sexual engagement and that cognitions may confirm negative attitudes toward sex, which may inhibit future sexual interest and arousal. In order to begin exploring the application of the disgust model to FSIAD, it must be demonstrated that sexual cues elicit a disgust response among women with these types of difficulties.

Current Study

The current study contributes to the current literature by expanding the application of the disgust model of sexual functioning to a clinically relevant sample. A group of women with sexual difficulties (i.e., in terms of desire and/or arousal) along with sexual distress and a group of women without sexual difficulties or sexual distress were compared in their affective responses (i.e., facial EMG and self-report affective responses) and autonomic responses (i.e., heart rate and electrodermal activity) to disgusting, erotic, positive, and neutral images. No significant differences between the groups were predicted on any of the measures while viewing the neutral, positive, and disgust images. However, in line with de Jong and colleagues' model of disgust and sexual functioning, it was predicted that the groups would significantly differ on these measures while viewing the erotic images, as follows.

1. Participants in the clinical group will display significantly greater *corrugator supercilii* activation (i.e., general negative affect) than participants in the control group.
2. Participants in the clinical group will display significantly greater *levator labii* activity (i.e., signifying a disgust expression) than participants in the control group.
3. Participants in the clinical group will report significantly greater subjective disgust and lower amusement than participants in the control group.
4. Participants in the clinical group will show significantly greater decreases in heart rate than participants in the control group.
5. Participants in the clinical group will show significantly greater increases in electrodermal activity than participants in the control group.

Should the link between the erotic images and disgust response be apparent, planned exploratory hypotheses will be tested. Specifically, variables that predict disgust responses to erotic images will be explored in the service of further explaining the relationship. In addition, it will be explored whether disgust responses appear to indicate a clinical subgroup and whether disgust responses are related to sexually dysfunctional behaviors (i.e., avoidance) and sexual distress.

RESEARCH DESIGN AND METHODOLOGY

Participants

Sixty female undergraduate participants were screened and recruited for the current study through an online research system in exchange for course credit. The Sexual Function Questionnaire (SFQ) and the Female Sexual Distress Scale (FSDS) were used in order to classify the clinical and control groups (see Measures, below, for detailed scale information). Females met inclusion criteria for the clinical group if their SFQ scores indicated a high probability of dysfunction in the desire and/or arousal domains and if they reported clinically significant sexual distress on the FSDS. Females met inclusion criteria for the control group if they did not report clinical levels of sexual distress on the FSDS and if their SFQ scores indicated a low probability of dysfunction in the desire, arousal, and pain domains. Given the wide variability and normative latency in development of orgasmic responsiveness in young women (Mah & Binik, 2001), females met inclusion criteria for the control group if their SFQ orgasm domain score fell anywhere outside of the range indicating a high probability for dysfunction. A summary of group differences in sexual function scores can be found in Table 1. Participants were not screened for the study if they reported current or recent pregnancy (i.e., within the past 3 months), that they were being treated for a chronic disease (e.g., diabetes), that they were exclusively homosexual (as erotic stimuli displayed heterosexual content), or if they did not complete the sexual function measures. Of the 1,184 participants who were screened, 134 and 176 participants met criteria for the clinical and control group, respectively. Figure 2 displays the sampling and recruitment process for the current study.

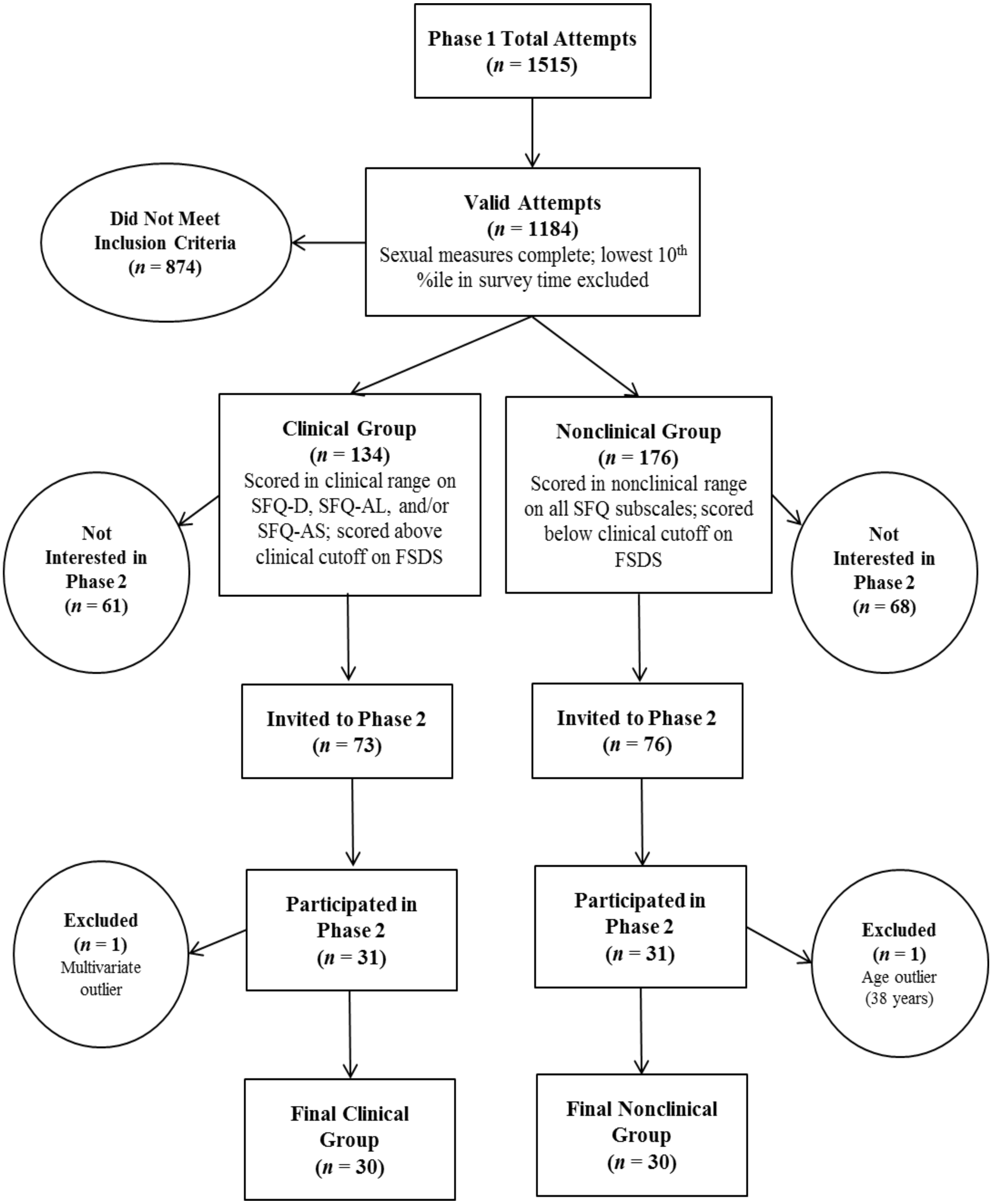

Figure 2. Flow of sampling and participant recruitment.

Measures

Screening (Phase 1) Measures

Demographics

Participants’ age, ethnicity, religious affiliation, sexual orientation, and relationship status were assessed using single self-report items.

Sexual Functioning

Sexual Function Questionnaire (SFQ)

The SFQ consists of 34 items that assess female sexual functioning over the past 4 weeks and yields domain scores in seven areas (desire, arousal-lubrication, arousal-sensation, enjoyment, orgasm, pain, and partner relationship; Quirk, et al., 2002). The SFQ has demonstrated reliability, validity, and sensitivity. The SFQ has been validated as a screening tool to identify women with a high probability of sexual dysfunction. Specifically, the SFQ was demonstrated to reliably classify women with HSDD, FSAD, FOD, and dyspareunia in accordance with DSM-IV-TR classification criteria (Quirk, Haughie, & Symonds, 2005). Higher domain scores indicate better sexual function. The desire domain scores (SFQ-D) range from 5 to 31; scores ranging from 5-16 and 23-31 indicate high and low probability of HSDD, respectively. The arousal-lubrication domain scores (SFQ-AL) range from 2 to 10; scores ranging from 2-5 and 8-10 indicate high and low probability of FSAD, respectively. The arousal-sensation domain scores (SFQ-AS) range from 4 to 20; scores ranging from 4-10 and 14-20 indicate high and low probability of FSAD, respectively. The orgasm domain scores (SFQ-O) range from 3 to 15; scores ranging from 3-8 and 12-15 indicate high and low probability of FOD, respectively.

Female Sexual Distress Scale (FSDS)

The FSDS consists of 12 items measuring distress associated with sexual dysfunction over the past 30 days (Derogatis, Rosen, Leiblum, Burnett, & Heiman, 2002). Higher scores indicate more distress. A cutoff score of 11 has been determined to reliably identify women with clinically relevant levels of sexual distress (Derogatis, Clayton, Lewis-D'Agostino, Wunderlich, & Fu, 2008).

Reproductive and Sexual Health

Reproductive and sexual health data were derived from a questionnaire designed for the study. Individual items measured self-reported: age at menarche, menstrual status, age of sexual debut, total number of sexual partners, condom use, STI status, and history of pregnancy.

Sexual Experiences Survey- Revised (SES)

The SES contains 7 items that assess an individual's recent and past experiences (after age 14) with sexual victimization (Koss et al., 2007). If a participant endorsed any of the experiences, they were considered to have a history of sexual victimization. For the current study, childhood sexual abuse was determined if a participant indicated that any of the experiences occurred before age 14.

Sexual Dysfunctional Beliefs Questionnaire (SDBQ)

The SDBQ is a 40-item questionnaire that assesses an individual's degree of concordance with various beliefs that have been shown to correspond with greater incidence of sexual dysfunction in both men and women (Nobre & Pinto-Gouveia, 2006). The female version consists of six subscales (sexual conservatism, sexual desire and pleasure as a sin, age-related beliefs, body image beliefs, affection primacy, and motherhood primacy). Higher scores indicate more/stronger dysfunctional beliefs.

Psychological Health

Beck Depression Inventory II (BDI)

The BDI is a 21-item self-report inventory designed to assess for the severity of common symptoms of depression over the past two weeks. A score of 20 or higher indicates moderate to severe depression.

Generalized Anxiety Disorder 7-item Scale (GAD)

The GAD is a brief questionnaire commonly used in medical settings designed to screen for general anxiety problems (Spitzer, Kroenke, Williams, & Lowe, 2007). Scores of 5, 10, and 15 indicate mild, moderate, and severe levels of anxiety, respectively.

Alcohol Use Disorders Identification Test (AUDIT)

The AUDIT is a 10-item questionnaire commonly used to detect alcohol problems experienced in the last year (Saunders, Aasland, & Babor, 1993). A score of 8 or higher indicates hazardous or harmful drinking.

Experimental (Phase 2) Measures

Affective Measures

Facial Electromyography (EMG)

Facial EMG activity was recorded using two Ag-AgCl facial surface electrodes placed over each of the *corrugator supercilii* (CS), the *zygomaticus major* (ZM), and the *levator labii* (LL) regions of the left side of the participant's face in addition to one ground electrode at the participant's midline 3-4 cm above the inner brow. Mean EMG at each muscle cite (measured in µV) was recorded for analysis. Positive and negative affective expressions correspond with increases in ZM and CS activity, respectively (Cacioppo, Berntson, Larsen, Poehlmann, & Ito, 2000). Increases in LL activity, along with increased CS activity, have been shown to distinguish expressions of disgust from other negative affective expressions (Reisenzein, Studtmann, & Horstmann, 2013; Vrana, 1993). The EMG signals were carried through shielded cables to a BioNex chassis (Model 3711-08) where the signals were amplified at a gain of 2000, digitized at a sample rate of 500, rectified, and integrated using BioLab Acquisition Software Version 3.1.1 (equipment and software provided by MindWare Technologies, Inc.).

Self-Report Affective Ratings

Participants provided ratings of their subjective affective responses after the presentation of each stimulus. For each emotion label (i.e., amused, afraid, disgusted, surprised, sad, angry, and sexually aroused), participants rated their affective response on a Likert scale ranging from 1 (*Not at all*) to 4 (*Moderately*) to 7 (*Extremely*).

Autonomic Measures

Electrodermal Activity (EDA)

Two foam palmar transducers were placed on the participant's left hand to measure electrical fluctuations on the surface of the skin (i.e., EDA) during stimulus presentation. Changes in skin conductance level (SCL; measured in μS) and number of event-related skin conductance responses (SCRs) were used in present analysis. Greater change in SCL and number of SCRs indicate greater general autonomic activation.

Electrocardiogram (ECG)

Three Ag-AgCl electrodes were placed on the torso in standard Lead-II configuration to measure ECG. The average time between R peaks [inter-beat interval (IBI); measured in milliseconds (ms)] was used in the present analysis. An increase in IBI corresponds with a decrease in heart rate.

Post-Experiment (Phase 2) Measures

Disgust Scale- Revised (DS-R)

The DS-R is a 27-item scale with established reliability and validity that measures an individual’s sensitivity to disgust (Olatunji et al., 2007).

Difficulties in Emotion Regulation Scale (DERS)

The DERS is a 36-item scale that measures difficulties with several dimensions of emotion regulation, such as awareness and understanding of emotions and acceptance of emotions (Gratz & Roemer, 2004). Higher scores indicate greater difficulties.

Recent Sexual Behavior

Using items developed for the study, participants reported the frequency of separate episodes of sexual activity (both alone and with a partner) in the past four weeks (i.e., sexual approach behavior). In addition, participants also reported the frequency of occasions they purposefully avoided situations in which sexual activity was likely to occur (e.g., a date) and occasions they declined their partner’s wish to engage in sexual activity (i.e., sexual avoidance behavior).

Quality of Sexual Experience Scale (QSE)

The QSE is a brief scale with good psychometric properties that is designed to measure the quality of an individual’s most recent sexual event (Sanders, et al., 2013). The QSE consists of seven 7-point bipolar items and was normed separately with both men and women. Higher scores indicate better quality of experience.

Stimuli Selection

Seven images from each of four emotional categories (i.e., disgust, erotic, positive, and neutral) were chosen from the International Affective Picture System (IAPS) for use in the current study. Images in the “disgust” and “positive” categories were selected based on research by Mikels and colleagues (2005) that empirically derived categorical emotion labels for IAPS images. Stimuli that were found to significantly differ by gender were excluded. In each category, images with the highest arousal ratings were selected, as indicated in the IAPS technical manual (Lang, Bradley, & Cuthbert, 2005). Some stimuli were excluded in order to provide a variety of content (e.g., multiple images depicting corpses originally fell into the disgust category), in which case the images with the next highest arousal ratings were chosen. Images in the “erotic” category were selected based on content (i.e., displayed a nude couple) and high arousal ratings indicated in the IAPS technical manual (Lang, et al., 2005). Finally, images in the “neutral” category were selected to contain images that have low arousal (< 2.5) and neutral valence ($5 \pm .5$) ratings (Lang, et al., 2005). Information about the stimuli used in the final protocol can be found in Appendix A.

Procedure

The experimental procedure was conducted in a research laboratory in which a female graduate student researcher and female undergraduate research assistant were present. Upon arrival, participants received a brief description of the data collection procedure and were offered an opportunity to ask questions before providing informed consent. The physiological sensors were then attached to participants in accordance with established guidelines after careful preparation of the skin at the attachment sites (Boucsein et al., 2012; Fridlund & Cacioppo, 1986). Impedance between electrodes was verified to be within acceptable levels before beginning the experiment to ensure signal clarity.

Experimental stimuli were presented to participants via ePrime while seated in front of a computer screen and keyboard. Before experimental stimuli were presented, participants received instructions via an audio recording and partook in two practice trials to ensure that they understood the procedure. Upon beginning the protocol, a habituation period was recorded for 300 seconds before the presentation of any stimuli, after which all 28 stimuli were displayed in random order for 8 seconds each. After each stimulus, participants rated their subjective affective responses. A blank screen was then displayed for a random interval varying between 25 and 35 seconds before the next image appeared. Subsequent to completing the experimental protocol, participants were detached from physiological sensors and asked to complete remaining self-report measures. Once the participant completed all parts of the study, they were debriefed and provided with the opportunity to ask questions.

Data Extraction and Analysis

All physiological data were extracted using MindWare acquisition software. In order to ensure data integrity, video recordings of participants were reviewed for each 8 second period that an image was displayed along with the one second prior. Values were excluded for segments in which data were compromised (e.g., participant yawned during image presentation). Consistent with previous psychophysiological research, change scores were created in order to capture changes in EMG, IBI, and SCL during image presentation (Lang, Greenwald, Bradley, & Hamm, 1993; Vrana, 1993). For each image, the mean values of the one second prior to displaying the image were subtracted from the mean values of the 8 seconds during image presentation. The resulting change scores were then averaged to create a single mean change score for each physiological channel (i.e., CS, ZM, LL, IBI, and SCL) for each image type (i.e., neutral, positive, disgust, erotic). Values were excluded from this average if they were removed during video review or if the values were statistical outliers (i.e., were more than four standard deviations from the mean value within an image category). An SCR is defined within the

MindWare acquisition software as an increase ≥ .5 μS that occurs between 1 and 3 seconds after the initial display of a stimulus. SCRs were summed for each participant for each image type and included in analysis. In order to assess for baseline differences between groups in all of the physiological measures, an 8 second segment was recorded from the habituation period (i.e., first 8 seconds of the final minute) for analysis. In the event that video review indicated unexpected activity (e.g., yawning, adjusting in chair), the next 8 second period without extraneous activity was recorded.

Prior to analysis, data were screened for outliers. One participant was removed from final analysis due to being a multivariate outlier. Another participant was removed from analysis due to being significantly older (i.e., 38 years old) than the remainder of the sample. The main hypotheses were tested using mixed two- and three-way repeated measures ANOVAs. All assumptions were tested before and during analysis. All dependent variables were found to be normally distributed with the exceptions of self-report disgust ratings of erotic images (positively skewed) and SCR (a count variable). No transformations were made. The assumption of sphericity was assessed using Mauchly's test. In the event of a violation, reported degrees of freedom and *p* values reflect Greenhouse-Geisser corrections. Levene's test was used to assess the assumption of equality of error variances. No significant violations were noted. Linear regressions were used in follow-up and exploratory analyses. All assumptions were tested and no significant violations were noted. In the event of post hoc tests and multiple/pairwise comparisons, Fisher's LSD test was used.

RESULTS

Sample Description

The final sample consisted of 60 participants (n = 30 per group) ranging in age from 18 to 28 years (M = 19.12, SD = 1.97). An independent samples t- test indicated no significant difference between groups in age, $t(58) = 0.07$, $p = .95$. The sample primarily consisted of Caucasian (n = 27) and Latina (n = 20) females. The remaining participants identified themselves as African-American (n = 4), Asian/Pacific Islander (n = 1), Middle Eastern (n = 1), Native American (n = 1), and being of mixed ethnicity (n = 6). The majority of the sample identified as Christian or Catholic (n = 43). The remaining participants identified as Atheist or Agnostic (n = 13), Jewish (n = 2), and Other (n = 2). Chi-square tests indicated no significant differences in the proportion of various ethnic or religious identities between groups (all ps $\geq .17$).

A summary of reproductive/sexual health variables and recent sexual behavior for each group, along with flagged significant differences, can be found in Table 1. Consistent with recruitment criteria, the clinical group scored significantly higher on measures of sexual dysfunction, sexual distress, and sexual dysfunctional beliefs. The majority of the clinical group consisted of participants reporting difficulties with sexual arousal (n = 24); the remaining six participants reported difficulties with desire or desire and arousal. Though there was a difference in age of first intercourse, there were no significant differences in numbers of sexual partners, condom use, or STI status (see Table 1). A chi-square test indicated that there were significant differences in relationship status between the two groups ($\chi^2(2, N = 60) = 14.29$, $p = .001$); the control group had a larger proportion of participants in a casual or committed relationship (n = 25) than the clinical group (n = 11).

Table 1: *Group Comparison of Reproductive and Sexual Health Variables*

	Control Group (n = 30)		Sexual Difficulties (n = 30)	
	n (%)	*M (SD)*	*n* (%)	*M (SD)*
Age of menarche		11.97 (1.59)		12.43 (1.55)
Reported menstrual regularity	30 (100)		27 (90.00)	
Age of first intercourse**	26 (87.50)	15.81 (1.36)	27 (86.36)	16.78 (1.22)
Total # of partners (intercourse)	26 (87.50)	4.92 (4.35)	27 (86.36)	3.70 (3.64)
Condom use				
All/Most of the time	11 (42.31)		15 (55.56)	
Some of the time/Occasionally	5 (19.23)		4 (14.81)	
Never/Almost never	6 (23.08)		6 (22.22)	
Previously tested for STI	13 (43.33)		11 (36.67)	
History of STI/ Suspected STI	8 (26.67)		6 (20.0)	
History of childhood sexual abuse (<14)	6 (25.00)		5 (19.23)	
History of sexual victimization (14+)**	10 (35.71)		21 (70.00)	
SFQ: Desire***		27.63 (2.31)		20.07 (5.52)
SFQ: Arousal-Sensation***		16.40 (1.57)		8.70 (2.41)
SFQ: Arousal-Lubrication***		9.33 (0.76)		6.60 (1.81)
SFQ: Orgasm***		12.31 (1.47)		8.74 (2.30)
SFQ: Pain**		13.75 (1.27)		11.90 (2.26)
Sexual distress (FSDS)***		2.10 (2.70)		19.93 (8.55)
Sexual dysfunctional beliefs (SDBQ)**		48.55 (6.59)		56.17 (9.80)
Sexual activity alone+		3.17 (3.73)		3.23 (4.93)
Sexual activity with a partner+*		9.00 (6.13)		3.17 (3.40)
Avoided situations with potential for sex (e.g., date)+*		0.77 (1.57)		2.03 (2.06)
Declined partner's wish for sex+		0.90 (1.67)		1.43 (1.38)
Quality of most recent sexual experience*		6.54 (0.72)		4.84 (1.69)
Occurred within past month*	29 (96.67)		16 (53.33)	

Note. Menstrual regularity is based on report of having a regular menstrual cycle or taking a pill/shot that prevents menstruation. Higher scores on the SFQ scales indicate better function. Means for items with + indicate the number of event in the past four weeks. The QSE ranges from 1 to 7; higher numbers indicate better quality. Significant differences between groups, as indicated by independent samples t-tests or chi-square test, are marked with an * at the $p < .05$ level, ** at the $p < .01$ level, and *** at the $p < .001$ level.

Means for each of the mental health and emotion measures for each group are reported in Table 2. The clinical group endorsed significantly greater depression and anxiety than the control group as indicated by higher scores on the BDI ($t(58) = -5.49$, $p < .0005$) and the GAD ($t(58) = -5.12$, $p < .0005$). Notably, the mean depression and scores fell within the mild ranges for the clinical group and the minimal ranges for the control group. There were no significant differences in alcohol use between the clinical and control group as indicated by the AUDIT, $t(58) = -0.62$, $p = .54$; both means fell below the clinical cutoff indicating problematic alcohol use. T-tests also revealed that there were significant differences between the groups on the DERS total score, indicating that the clinical group reported greater difficulties in emotion regulation than the control group, $t(55) = -4.02$, $p < .0005$. Finally, there were no significant group differences in disgust sensitivity as measured by the DS, $t(58) = -1.48$, $p = .15$.

Table 2: *Group Comparison of Mental Health and Emotion Variables*

	Control Group (n = 30) *M (SD)*	Sexual Difficulties (n = 30) *M (SD)*
Depression (BDI)***	5.87 (4.97)	17.50 (10.49)
Anxiety (GAD)***	2.53 (2.47)	8.10 (5.42)
Alcohol Use (AUDIT)	3.40 (3.38)	4.00 (4.11)
Difficulties in Emotion Regulation (DERS)*	63.93 (17.48)	86.04 (23.84)
Disgust Sensitivity (DS)	55.50 (14.70)	60.77 (12.84)

Note. Significant differences between groups, as indicated by independent samples t-tests, are marked with an * at the p < .05 level and *** at the p < .001 level.

Baseline Measures and Experimental Manipulation

A series of independent samples t-tests were conducted in order to assess for baseline differences between groups in all physiological measures during the habituation period. There were no significant differences in activity in any of the three muscles or mean IBI (all *p*s ≥ .27). There was a marginally significant difference in mean SCL, $t(58) = -1.954$, $p = -.056$. SCL was tested for use as a covariate; however, it did not meet the accompanying assumptions (i.e., there was no significant relationship between baseline SCL and SCL changes). As such, baseline physiological activity was not included in any further analyses. Baseline values are included in Table 3 to facilitate interpretation of change scores.

Table 3: *Group Comparison of Baseline Physiological Values*

	Control Group (n = 30) *M (SD)*	Sexual Difficulties (n = 30) *M (SD)*
Mean CS activity (μV)	3.92 (2.36)	4.38 (2.44)
Mean ZM activity (μV)	0.74 (0.26)	0.81 (0.56)
Mean LL activity (μV)	1.63 (0.90)	1.88 (0.84)
Mean SCL (μS)$^{+}$	5.56 (5.48)	8.97 (6.97)
Mean IBI (ms)	742.39 (129.60)	729.16 (81.72)

Note. The + indicates a marginally significant difference between the two groups (p = .056).

A 2 (group) x [4 (image)] x [3 (muscle)] three-way mixed repeated measures ANOVA was conducted in order to verify the effects of the experimental manipulation on EMG activity. Results indicated that there was a significant main effect of image ($F(2.054, 119.11) = 13.20$, $p < .0005$), a marginally significant main effect of muscle ($F(1.60, 92.66) = 3.24$, $p = .055$), and a significant image by muscle interaction ($F(2.08, 120.66) = 43.21$, $p < .0005$). This indicated that the three facial muscles varied as a function of the image that was being viewed. There was no significant main effect of group, nor were there any significant group interactions, indicating that EMG response patterns were similar across groups. Mean change in ZM, CS, and LL activity for neutral, positive, and disgust images are represented in Figure 3. In general, positive images were associated with an increase in ZM and LL activity and a decrease in CS activity, disgust images were associated with an increase in CS and LL activity, and neutral images were not associated with any significant changes is ZM, CS, or LL activity. The EMG activity during presentation of the erotic images is detailed in the next section. Taken together, these results indicated that, across participants, facial EMG responses were consistent with the affective content of the positive, disgust, and neutral images.

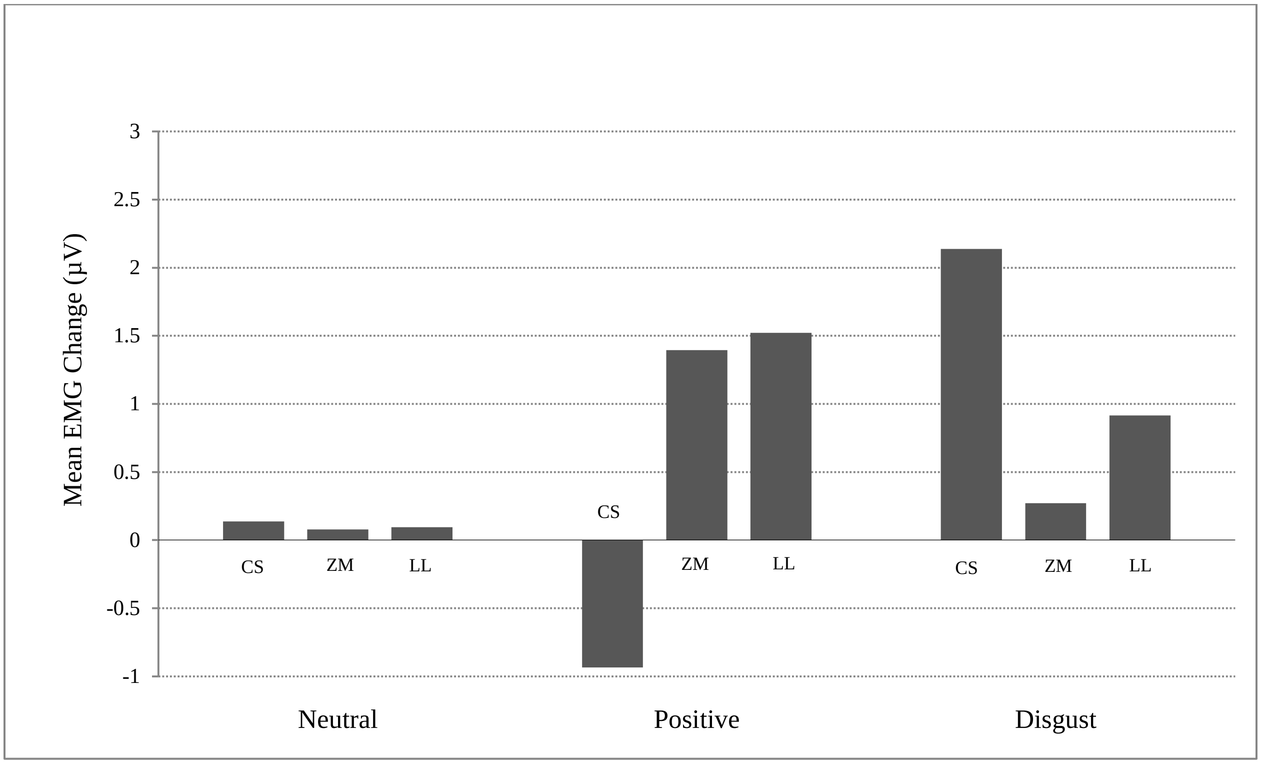

Figure 3. Mean EMG changes in response to neutral, positive, and disgust stimuli across participants.

A 2 (group) x [4 (image)] x 3 [(emotion)] three-way mixed repeated measures ANOVA was conducted in order to verify the effects of the experimental manipulation on self-report affective ratings. Results indicated that there was a significant main effect of image (F(2.34, 135.90) = 114.86, $p < .0005$), a significant main effect of emotion (F(1.78, 102.99) = 71.94, $p < .0005$), and a significant image by emotion interaction (F(2.90, 168.40) = 244.51, $p < .0005$). This indicated that the affective ratings varied as a function of the image that was being viewed. There was no significant main effect of group, nor were there any significant group interactions, indicating that affective ratings were similar across groups. Ratings were consistent with the affective content of the positive, disgust, and neutral images, across participants. Disgust images were associated with elevated ratings of disgust (*M* = 4.88, *SD* = 1.60) and relatively low ratings of amusement (*M* = 1.35, *SD* = 0.92), positive images were associated with elevated ratings of amusement (*M* = 4.51, *SD* = 1.11) and low ratings of disgust (*M* = 1.06, *SD* = 0.20), and neutral images were not associated with any notable elevations in any of the 7 subjective ratings of emotion (means ranged from 1.00 to 1.47).

A 2 (group) x [4 (image)] two-way mixed repeated measures ANOVA was conducted in order to test for group differences in mean IBI change in response to the images. There was a specific main effect for image ($F(3, 174) = 6.74$, $p < .0005$) and no significant main effect of group or group by image interaction. Pairwise comparisons indicated that IBI change was significantly greater (meaning heart rate decreased) during presentation of the erotic (*M* = 20.97, *SD* = 3.74) and disgust images (*M* = 18.94, *SD* = 3.48) in comparison to the neutral (*M* = 8.00, *SD* = 2.84; $p = .02$) and positive (*M* = 4.49, *SD* = 3.75; $p = .007$) images. IBI change during the erotic and disgust and during the neutral and positive images did not significantly differ.

A 2 (group) x [4 (image)] x [2 (EDA measures)] three-way mixed repeated measures ANOVA was conducted in order to test for group differences in EDA in response to the images. There was a significant main effect of both image ($F(2.66, 132.85) = 25.27$, $p < .0005$) and EDA measure ($F(1, 50) = 136.78$, $p < .0005$) and an image by EDA measure interaction, $F(3, 150) = 11.60$, $p < .0005$. There were no significant main effects for group nor were there any group by image interactions. Separate 2 (group) x [4 (image)] two-way ANOVAs were conducted in order to test for the simple effects of each EDA measure. There was a significant main effect of image for both SCL change ($F(2.34, 117.17) = 14.67$, $p < .0005$) and number of SCRs ($F(3, 150) = 20.10$, $p < .0005$). There were no significant main effects for group nor were there any group by image interactions for either of the individual measures. Pairwise comparisons indicated that SCL change was significantly greater during presentation of the erotic (*M* = 0.54, *SD* = 0.08) and disgust images (*M* = 0.55, *SD* = 0.11) in comparison to the neutral (*M* = 0.10, *SD* = 0.04; $p < .0005$) and positive (*M* = 0.13, *SD* = 0.05; $p < .0005$) images. SCL during the erotic and disgust and during the neutral and positive images did not significantly differ. Similarly, there were a greater number of SCRs during presentation of the erotic (*M* = 3.73, *SD* = 0.27) and disgust images (*M* = 2.90, *SD* = 0.31) in comparison to the neutral (*M* = 1.88, *SD* = 0.26; $p < .0005$) and positive (*M* = 2.17, *SD* = 0.27; $p \leq .01$) images. There were a significantly greater number of SCRs during the erotic than disgust images ($p = .003$). SCRs during the neutral and positive images did not significantly differ. In general, these findings indicated that the greatest autonomic changes occurred while viewing the erotic and disgust images and that these changes did not significantly differ by group.

Group Differences in Affective and Autonomic Responses to Erotic Stimuli

A 2 (group) x [3 (muscle)] two-way mixed repeated measures ANOVA was conducted to more closely examine group differences in EMG activity in response to erotic images. There was a significant main effect of muscle ($F(1.74, 100.91) = 4.04$, $p = .025$) and a marginally significant muscle by group interaction ($F(1.74, 100.91) = 3.15$, $p = .054$). There was no significant main effect of group. Follow up analysis indicated that there was a marginally significant difference in CS activity between the two groups, $t(58) = -1.93$, $p = .059$, $d = .35$. The pattern of EMG response to erotic images in each group is displayed in Figure 4.

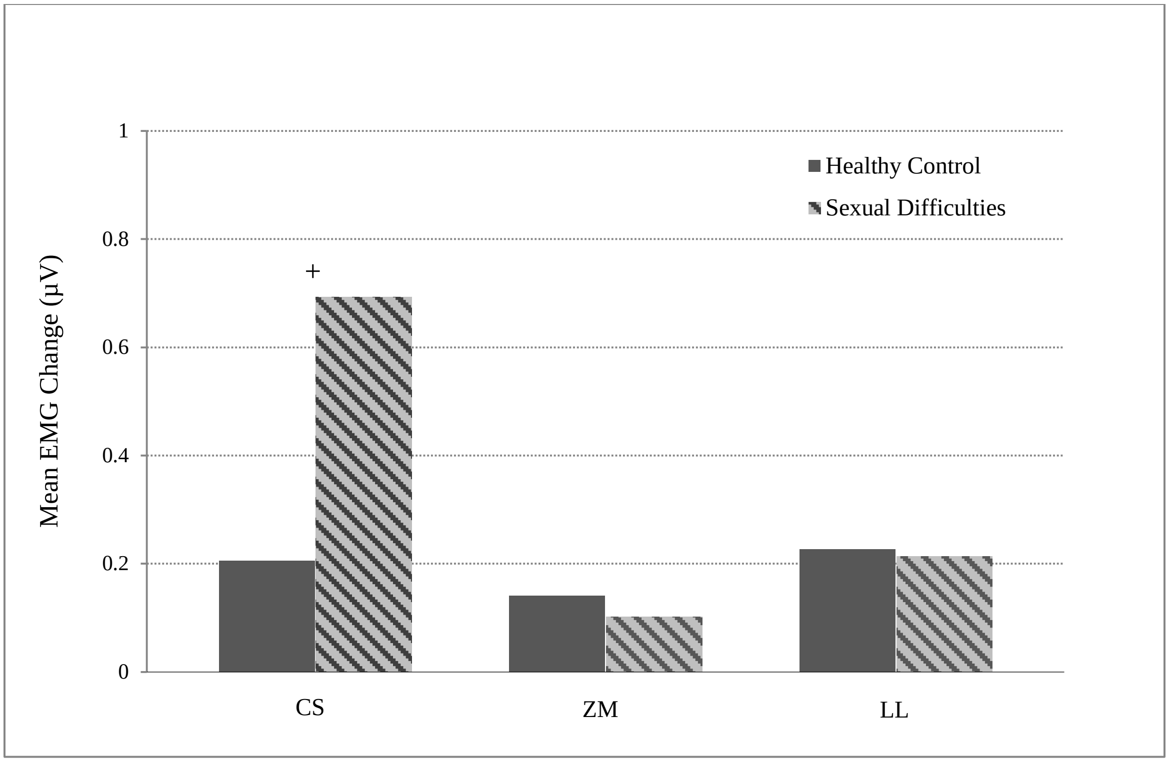

Figure 4. Group differences in mean EMG changes in response to erotic stimuli. Group differences in mean EMG changes in response to erotic stimuli. The + indicates a marginally significant group difference (*p* = .059).

A 2 (group) x [3 (emotion)] two-way repeated measures ANOVA was conducted to more closely examine group differences in affective ratings of erotic images. There was a significant main effect of emotion ($F(2, 116) = 55.99$, $p < .0005$) and a significant emotion by group interaction ($F(2, 116) = 6.30$, $p = .003$). There was no significant main effect of group. Post hoc analyses indicated that the clinical group reported significantly more disgust ($t(58) = 12.47$, $p = .015$, $d = .46$) and less amusement ($t(58) = 10.74$, $p = .027$, $d = .42$) than the control group. There was a small difference in self-report sexual arousal, but this difference was not statistically significant, $t(58) = 12.71$, $p = .072$, $d = .34$. Group means for each emotion are depicted in Figure 5.

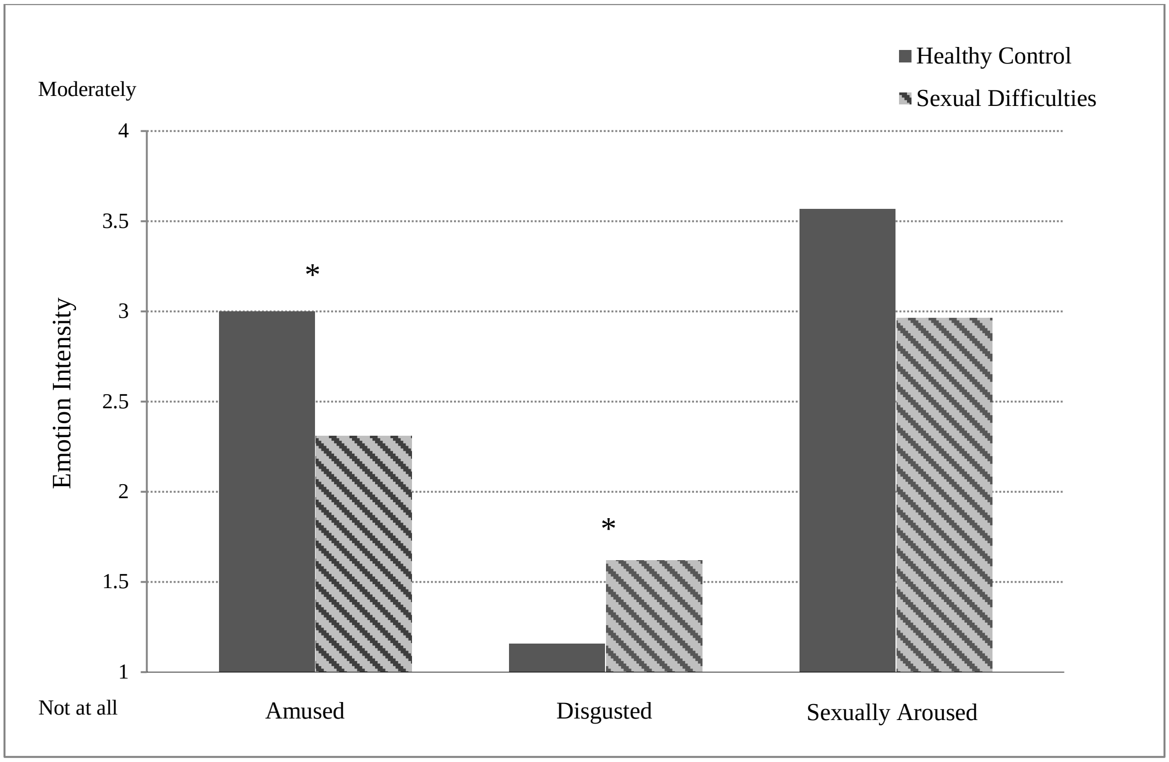

Figure 5. Group differences in mean self-report affective ratings in response to erotic stimuli. Significant group differences are marked with an * ($p < .05$).

Separate one-tailed independent samples t-tests were conducted comparing IBI change, SCL change, and number of SCRs between groups during the erotic images. The difference in IBI change was significant ($t(58) = -1.92$, $p = .03$, $d = .25$) with a greater change in the clinical group ($M = 28.13$, $SD = 23.16$) than the control group ($M = 13.81$, $SD = 33.79$). There was also a slightly greater change in SCL in the clinical group ($M = 0.65$, $SD = 0.73$) than the control group ($M = 0.43$, $SD = 0.38$); however, this difference was not statistically significant, $t(50) = -1.36$, $p = .09$, $d = .19$. The number of SCRs during presentation of the erotic images did not significantly differ between groups, $t(50) = 0.22$, $p = .83$, $d = .05$.

Overall, there were significant group differences in some of the experimental measures during presentation of the erotic images; effect sizes suggested small to moderate effects.

Predictors of Self-Report Disgust

Self-report disgust in response to the erotic images was used as the indicator of disgust response in subsequent analyses. All participants were dichotomized by median split into disgust response (n = 19; M = 2.13, SD = 0.98) and no disgust response (n = 41; M = 1.05, SD = 0.07) for descriptive purposes. Notably, 15 participants from the clinical group and only 4 from the control group fell into the disgust response category.

Self-report disgust was also examined continuously in order to examine potential predictors of a disgust response across participants using univariate linear regressions. Of the physiological measures, IBI change ($F(1, 58) = 7.59$, $p = .008$, $R^2 = .12$), CS change ($F(1, 58) = 6.72$, $p = .012$, $R^2 = .10$), and LL change ($F(1, 58) = 9.53$, $p = .003$, $R^2 = .14$) during presentation of erotic images significantly predicted disgust response. SCL change and ZM change did not significantly predict disgust response. A multivariate model, containing the significant physiological predictors was found to be significant, $F(3, 56) = 7.92$, $p < .0005$, $R^2 = .30$. IBI ($t = 3.05$, $p = .003$, partial $\eta^2 = .12$) and LL ($t = 3.05$, $p = .003$, partial $\eta^2 = .12$) change continued to significantly predict disgust response while CS change did not.

Of the cognitive and emotional variables, FSDS significantly predicted disgust response ($F(1, 58) = 12.78$, $p = .001$, $R^2 = .18$) whereas DS, DERS, SDBQ were not significant predictors. The FSDS score was added into a regression model including the significant physiological predictors. The resulting model accounted for more variance in disgust response than the physiological model alone, $F(4, 55) = 11.01$, $p < .0005$, $R^2 = .45$. Mean LL change ($t = 3.70$, $p < .0005$, partial $\eta^2 = .14$), IBI change ($t = 2.47$, $p = .017$, partial $\eta^2 = .06$), and FSDS ($t = 3.81$, $p <$

.0005, partial η^2 = .15) continued to uniquely and significantly predict disgust response. Mean CS change was not a significant predictor. All variables were predictive in a positive direction, indicating that increased LL activity, heart rate deceleration, and increased sexual distress were associated with greater self-report disgust ratings of erotic images.

Planned Exploratory Analyses

In order to examine whether disgust response to erotic images characterizes a clinical subgroup, 3 groups were formed for comparison: the control group (n = 30), the clinical group with no disgust response (n = 15), and the clinical group with a disgust response (n = 15). Multiple one-way ANOVAs were conducted with planned group comparisons on several mental health and emotional variables. Results indicated that the control group differed from both clinical subgroups on the FSDS, QSE, DERS, SDBQ, BDI, and GAD (all ps $\leq$ .014); the clinical subgroups were not significantly different from one another. In terms of DS, the clinical group with a disgust response (M = 64.60, SD = 10.32) scored significantly higher than the control group (M = 55.50, SD = 14.70; p = .039) and was not significantly different from the other clinical subgroup (M = 56.93, SD = 14.28). Chi-square tests were conducted to test for differences in group distribution of relationship status and history of sexual victimization. As there were pre-existing group differences in relationship status, only the two clinical subgroups were compared and no significant difference was found, $\chi^2(1, N = 30) = 0.14$, p = .71. There was a significant difference between the three groups in terms of history of sexual victimization, $\chi^2(2, N = 58) = 10.19$, p = .006. The prevalence of sexual victimization in each subgroup is depicted in Figure 6.

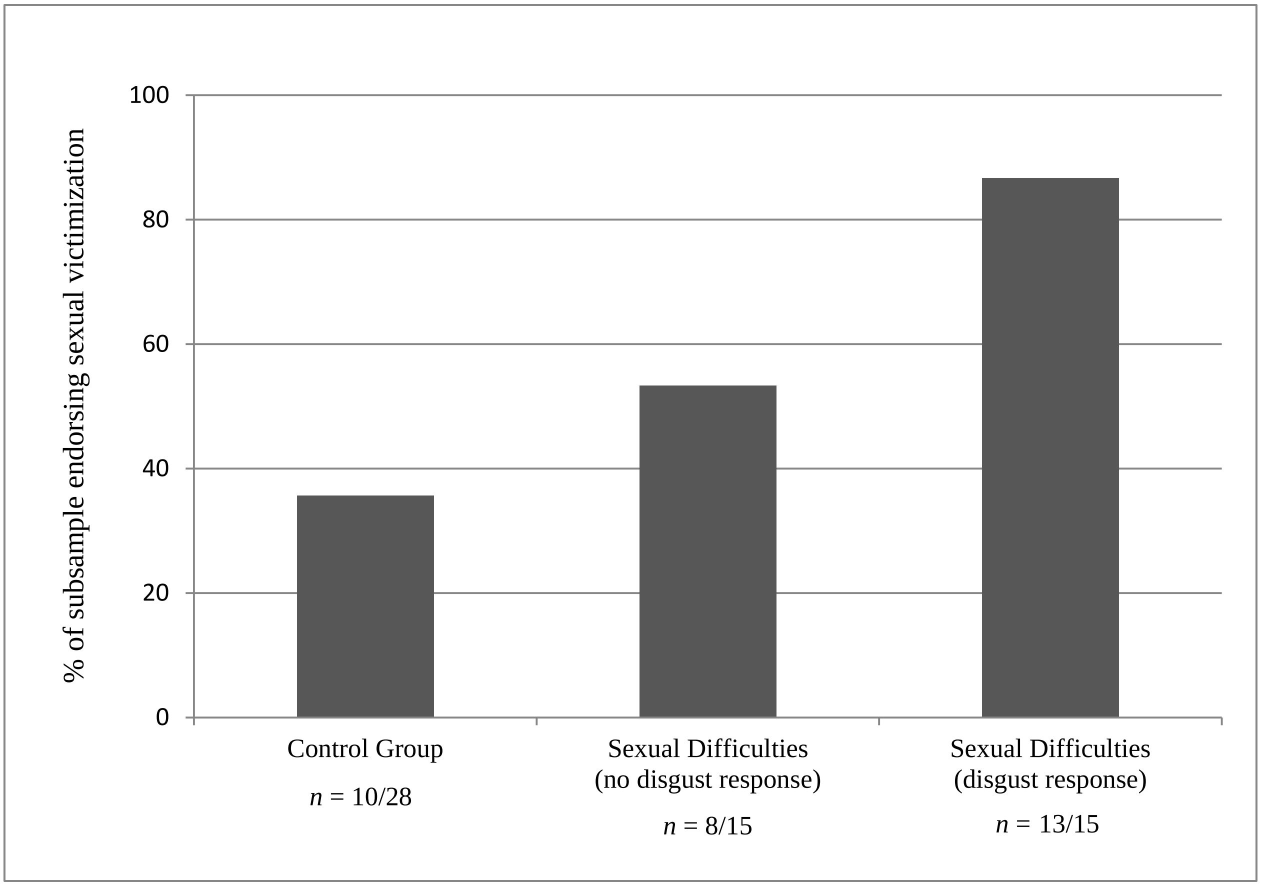

Figure 6. Percent of participants in each subgroup who report a history of sexual victimization.

In addition, sexual approach and sexual avoidance variables were created by summing the two recent sexual approach (i.e., engaged in activity alone or with a partner) and avoidance (i.e., avoided situation with potential for sex or declined partner's wish for sex) behaviors. These variables were regressed separately onto self-report disgust in order to explore whether disgust response is related to sexual approach and avoidance behavior. The relationship between sexual approach and disgust response approached significance ($F(1, 58) = 3.69$, $p = .060$, $R^2 = .06$) where less approach behavior was associated with a greater disgust response. More sexual avoidance behavior significantly predicted a greater disgust response, $F(1, 58) = 6.17$, $p = .016$, $R^2 = .10$. Self-report sexual arousal was not significantly related to self-report disgust, sexual approach, or sexual avoidance behavior and, therefore, was not examined further.

DISCUSSION

The purpose of this study was to examine affective and autonomic responses to erotic images among young women with and without sexual difficulties. Sixty college-aged females participated in the study and were placed into two groups based upon their reports of sexual functioning and sexual distress: a control group (i.e., no sexual difficulties or distress) and a clinical group (i.e., difficulties with sexual desire and/or arousal and accompanying distress). Participants were attached to physiological equipment and shown images displaying neutral, positive, disgusting, and erotic content. Using a recently proposed model of disgust-based mechanisms in female sexual functioning (de Jong et al., 2013), it was hypothesized that the clinical group would show more evidence of disgust (via affective and autonomic responses) than the control group. Consistent with hypotheses and previous studies, no group differences were found in any of the affective or autonomic measures during presentation of the neutral, positive, or disgust images (Borg & de Jong, 2012). There were group differences during presentation of the erotic images in terms of electromyographic (EMG) activity, subjective affective ratings, and autonomic activity (i.e., changes in heart rate). Follow-up analyses helped characterize disgust responses in order to further explore the application of the disgust model of sexual dysfunction in this sample.

In terms of EMG, there was a marginally significant group difference in *corrugator supercilii* (CS) activity, indicating that the clinical group on average displayed slightly more general negative affect than the control group (see Figure 4). The effect size was small, suggesting that the differences in facial responses were subtle. Although group comparisons did not show significantly increased *levator labii* (LL) muscle activity in response to erotic images, it is noteworthy that follow-up analyses showed LL activity to continuously predict subjective disgust ratings. Specifically, both CS and LL activity significantly predicated self-report disgust in univariate linear regressions; however, in a multivariate regression, CS (a general indicator of negative affect) ceased to be a significant predictor while LL (a specific indicator of disgust) continued to predict self-report disgust. Taken together, the EMG results suggest that a disgust response is not clearly present at the group level; however, there is some evidence for differences in general negative affect and for the relevance of EMG in detecting disgust responses to erotic images. The lack of strong group-level differences in EMG activity may reflect the presence of an unidentified moderating variable or that differences may be limited to a clinical subgroup.

Subjective affective ratings of erotic images resulted in more robust findings with mild to moderate effect sizes. The clinical group endorsed significantly less amusement and significantly more disgust than the control group (see Figure 5). Although the overall level of disgust reported by the clinical group was relatively low, it is noteworthy that any level of disgust was reported. As there were no apparent demand effects that would have resulted in the differential rating of disgust, this small significant difference appears to reflect subtle group differences in cognitive-emotional evaluation of erotic images. Follow-up analyses indicated that subjective disgust ratings from half (n = 15) of participants in the clinical group, and only four in the control group, fell above the sample median. This supports the notion that disgust responses to erotic images may characterize a clinical subgroup.

Autonomic activity across participants was greatest during the presentation of the erotic and disgust images; both images were associated with heart rate deceleration (i.e., increased interbeat interval) and increased electrodermal activity (EDA; i.e., increased skin conductance level and skin conductance responses). There were significant group differences in heart rate changes during presentation of the erotic images, such that heart rate deceleration was greatest in the clinical group. Heart rate deceleration has been shown to be consistent with a disgust response as well as attentional processing (Levenson, 1992; Vrana, 1993). Notably, heart rate deceleration in the control group was greatest during presentation of the disgust images while heart rate deceleration in the clinical group was greatest in response to the erotic images. There were no group differences in EDA during presentation of either of the images; both groups showed significant arousal compared to neutral images. This is consistent with previous findings that indicated that women displayed similar levels of EDA in response to images depicting mutilation as to images depicting erotic couples (Bradley, Codispoti, Sabatinelli, & Lang, 2001). Additionally, in follow-up analyses, heart rate deceleration, but not skin conductance level, predicted subjective disgust ratings of erotic images in both univariate and multivariate regression analysis. Taken together, these results suggest that the erotic images resulted in general autonomic arousal across participants. The clinical group displayed an autonomic response most consistent with a disgust response (Bradley, et al., 2001; Levenson, 1992; Reisenzein, et al., 2013; Vrana, 1993).

Follow-up analyses were conducted in order to identify predictors of subjective disgust ratings of erotic images. A multivariate regression model indicated that LL activity, heart rate deceleration, and sexual distress significantly and uniquely predicted subjective ratings of disgust. The total model accounted for 45% of the variance in disgust ratings. This suggested that subjective disgust may be a product and/or trigger of several different processes (e.g., physiological reactivity, prior experiences, cognitive evaluations) rather than any single process.

In order to explore whether disgust response to erotic images characterized a clinical subgroup, the clinical group was divided into two subgroups (i.e., disgust or no disgust response) for comparison. The two clinical subgroups were similar on most measures. One major difference between the groups, depicted in Figure 6, was the significantly greater prevalence of a history of sexual victimization among the clinical subgroup with a disgust response (*n* = 13/15) than the clinical subgroup without a disgust response (*n* = 8/15) and the control group (*n* = 10/28). This finding suggests that aversive sexual events may impact the way that women respond to future sexual cues and has potentially important implications for targeting intervention among women experiencing sexual difficulties with and without a history of sexual victimization. One recent study found that self-focused disgust related to sexual trauma predicted mental contamination, or a feeling of internal uncleanliness (Badour, Feldner, Babson, Blumenthal, & Dutton, 2013). Additionally, one review cited young age and strong emotional reactions (e.g., shame and guilt) as predictive of sexual difficulties after sexual assault (van Berlo & Ensink, 2000). It may be that feelings of disgust correspond with cognitive and emotional patterns that impact sexual functioning among women with a history of sexual victimization.

Finally, in an effort to further apply current findings to the disgust model of FSD, the link between subjective disgust response and sexual approach and sexual avoidance behavior was explored. Our analysis resulted in a significant link between recent sexual avoidance behavior and subjective disgust responses to erotic images. These results are exploratory in nature, and are consistent with the model proposed by de Jong and colleagues (2013).

Several limitations to this study merit acknowledgement. First, the current sample consists only of young women and likely does not represent all women with difficulties with sexual desire and arousal. Though young women clearly face sexual difficulties, it is unclear which difficulties may be entwined with normal development (e.g., development of sexual identity). Also, women who identify as exclusively homosexual were excluded in the current study due to limitations in image content (only images depicting heterosexual couples were available). It is important to examine sexual functioning in all women so that interventions can be adapted to be relevant to all. In addition, though groups were defined based on well-established measures of both sexual functioning and distress, it is noted that self-report is not always reliable and does not replace the expertise of an individual who is licensed to diagnose sexual dysfunction. The control group was defined using strict criteria, which may not represent all nonclinical women.

In terms of statistical limitations, the relatively small sample size may have impacted the power to detect some significant effects. Alternatively, the less conservative approach taken in post hoc analysis and in making multiple comparisons may have increased the likelihood of chance findings. Further, the experimental manipulation simply consisted of erotic images, which do not represent all sexual cues. It would be interesting to examine responses to other sexual stimuli (e.g., video recordings or imaginal scenarios) in order to observe how results may differ. Finally, no causality can be inferred from any of the analyses. Therefore, the temporal relation of disgust responses and sexual difficulties remains unclear.

In summary, the current study expands the literature by supplying preliminary evidence for generalizing the disgust model of female sexual dysfunction beyond disorders of sexual pain, at least among some women. The current study examined the difference in affective and autonomic responses to erotic images between young women with and without difficulties with sexual desire and/or arousal. Subjective ratings of disgust and heart rate deceleration were the most robust indicators of group-level differences. In examining a potential clinical subgroup who endorsed subjective disgust in response to erotic images, it became apparent that the majority (85%) of the participants in the subgroup reported a history of sexual victimization. It is clear that sexual victimization is correlated with sexual difficulties (van Berlo & Ensink, 2000);

however, it is unclear how these experiences impact women’s responses to erotic cues. Future research should continue to examine subjective disgust responses to erotic stimuli among women with and without sexual difficulties and among women with and without a history of sexual victimization to further explain this relationship. This may help shed more light on how disgust-based mechanisms impact the onset and maintenance of female sexual dysfunction.

APPENDIX A: IAPS CONTENT AND STANDARDIZATION DATA

IAPS #	Mean Valence	Mean Arousal	Content Description
		Disgust Stimuli	
3000	1.21	7.77	dead face
3010	1.29	7.44	dead person
3400	2.06	7.12	severed hand
3110	1.47	6.98	dead body
3150	1.98	6.94	meat grinder
3250	3.67	6.45	open heart
9570	1.47	6.45	dead dog
		Erotic Stimuli	
4659	6.15	6.47	erotic couple
4810	5.98	6.44	erotic couple
4670	6.4	6.42	erotic couple
4800	5.45	6.39	erotic couple
4672	5.60	6.17	erotic couple
4658	6.08	6.16	erotic couple
4680	6.91	6.07	erotic couple
		Positive Stimuli	
2058	8.24	5.45	baby
1340	7.63	5.25	women with birds
1811	7.95	5.21	monkeys
2550	8.14	5.16	older couple
1463	7.81	5.11	kittens
2655	7.06	4.87	baby and dog
2091	8.26	4.77	kids and kittens
		Neutral Stimuli	
7175	4.95	1.87	lamp
7004	5.14	1.94	spoon
7010	4.92	1.97	basket
7000	5.06	2.15	rolling pin
7020	4.94	2.19	fan
7491	4.79	2.24	building
7950	5.17	2.27	tissue

Note. IAPS standardization data (i.e., mean valence and arousal ratings) are those reported within the IAPS technical manual (Lang, Bradley, & Cuthbert, 2005). Ratings range from 1 to 9. Valence ratings reflect the unpleasant-pleasant dimension while Arousal ratings range from low-high arousal.

APPENDIX B: IRB APPROVAL OF HUMAN RESEARCH

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Natasha S. De Pesa**

Date: **February 08, 2014**

Dear Researcher:

On 2.8.2014, the IRB approved the following human participant research until 2/7/2015 inclusive:

Type of Review:	UCF Initial Review Submission Form
Project Title:	Women's Health and Emotions Study
Investigator:	Natasha S De Pesa
IRB Number:	SBE-14-09943
Funding Agency: Grant Title:	
Research ID:	N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 2/7/2015, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Signature applied by Joanne Muratori on 02/08/2014 01:36:40 PM EST

Joanne Muratori

IRB Coordinator

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