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ORIGINAL PAPER

The Effect of Pre-Existing Affect on the Sexual Responses of Women With and Without a History of Childhood Sexual Abuse

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Abstract Women with a history of childhood sexual abuse (CSA) are at greater risk for experiencing sexual problems in their adult lives. Yet, little is known about the possible role of cognitive and affective mechanisms in the development of sexual arousal difficulties in this population. This study investigated the role of pre-existing affect (affect prior to exposure to sexual stimuli) on genital responses, subjective sexual arousal, and affect elicited during the presentation of erotic film excerpts in a community sample of 25 women with and 25 women without a history of CSA. The CSA group showed greater pre-existing negative affect and smaller genital responses to the erotic film stimuli compared to the NSA group. Findings support a moderating effect of CSA, in that pre-existing negative affect was associated with strength of genital responses in the NSA but not in the CSA group. The results did not support a mediation model of pre-existing negative affect as an explanation for smaller physiological sexual responses in the CSA group. Taken together, the findings suggest that pre-existing affect may be more relevant for women with no history of CSA and call for more research on factors implicated in impaired sexual responses in women with a history of CSA.

Keywords Child sexual abuse · Sexual arousal · Vaginal photoplethysmography · Affect · Female sexuality

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Introduction

Childhood sexual abuse (CSA) is associated with an increased risk for a variety of sexual problems in the adult lives of women (Leonard & Follette, 2002; Mullen, Martin, Anderson, Romans, & Herbison, 1994). For example, women with a history of CSA report more problems becoming mentally sexually aroused and maintaining sexual arousal during sexual activities with a partner (DiLillo, 2001; Leonard & Follette, 2002; Meston, Rellini, & Heiman, 2006). In addition, psychophysiological studies have found smaller genital responses to sexual stimuli in women with as compared to women without a history of CSA (Laan & Everaerd, 1995; Rellini & Meston, 2006; Schacht et al., 2007). The current empirical literature provides little insight into the mechanisms underlying such impaired responses in women with a history of CSA.

Based on recent findings showing an association between negative affect and sexual stimuli in women with a history of CSA (Meston & Heiman, 2000; Rellini & Meston, 2007a) and on theoretical and empirical evidence of the relationship between affect and sexual arousal (Barlow, 1986; Laan & Everaerd, 1995; Peterson & Janssen, 2007), it may be proposed that impairments in the subjective and physiological sexual responses of women with a history of CSA are mediated by affective mechanisms. Consistent with this idea, some theoretical models have been introduced that specifically attribute sexual arousal problems in women with a history of CSA to a negative response to sexual stimuli, established during, or following, the abuse (for a review, see Rellini, 2008). Such models suggest that a child exposed to a traumatizing sexual experience may learn to pair sex with negative affect. Indeed, the literature on posttraumatic stress disorder (PTSD) provides support for an association between trauma-related cues and negative affective responses. For example, women with PTSD, as compared to women with no trauma or abuse history, will experience activation

of the hypothalamic–pituitary–adrenal axis (a biological marker of stress responses) shortly after exposure to trauma-related stimuli (Yehuda, 2003). The role of negative affect in the development and maintenance of sexual dysfunction is highlighted in Barlow's (1986) model, which suggests that when sexual situations activate negative affect, an individual may become predisposed to focus his or her attention towards nonsexual cues. That is, negative affect derived from expectations and worries about the sexual encounter becomes the center of attention and creates a distraction from processing the sexual content of relevant stimuli, thus interfering with the activation of sexual responses.

Studies have shown that women with a history of CSA, in comparison to women with no such history, demonstrate a stronger association between negative affect and sexual function and sexual thoughts (Meston et al., 2006; Meston & Heiman, 2000) as well as more negative and less positive affect in response to sexual stimuli (Ellis, Atkeson, & Calhoun, 1981; for a review, see Rellini, 2008). Such findings are consistent with research showing that, compared to individuals with no sexual problems, individuals with sexual dysfunction report more negative expectations prior to and more negative thoughts during exposure to sexual stimuli (e.g., Barlow, Sakheim, & Beck, 1983; Heiman & Rowland, 1983; Nobre & Pinto-Gouveia, 2008). Similarly, reports of anger and irritability have been associated with reduced subjective and physiological sexual response to subsequent sexual stimuli (ter Kuile, Vigeveno, & Laan, 2007). Thus, it is feasible that negative affect instigated by sexual stimuli (event-related affect) may explain the lower sexual responsivity observed in women with a history of CSA compared to women with no history of abuse.

Not all research supports a negative association between negative affect and sexual responses (Delizonna, Wincze, Liz, Brown, & Barlow, 2000; Heiman, 1980; Laan & Everaerd, 1995; Lykins, Janssen, & Graham, 2006). For example, in some questionnaire studies between 10 and 20% of women reported experiencing increased sexual desire and arousal when feeling anxious or depressed (e.g., Lykins et al., 2006). Moreover, a meta-analysis of predictors of genital sexual arousal in women found that, opposite to what one might expect, negative affect was the single strongest *positive* predictor of genital vasocongestion (Laan & Everaerd, 1995). Studies that focused on different types of negative affect reported a positive association between disgust and physiological sexual arousal (Heiman, 1980) and also a positive association between anxiety and both genital and subjective sexual responses (Beggs, Calhoun, & Wolshik, 1987; Elliott & O'Donohue, 1997; Hoon, Wincze, & Hoon, 1977; Laan, Everaerd, Van-Aanhold, & Rebel, 1993; Palace & Gorzalka, 1990). In addition, one study found a curvilinear relation between anxiety and genital arousal (Bradford & Meston, 2006), while others found no significant negative association between anxiety and sexual arousal (e.g., Heiman, 1980).

To further add to the complexity of the relationship between affect and sexual arousal, in a recent psychophysiological study, a majority of women (62–80%, depending on condition) reported experiencing both positive and negative affect during exposure to sexual stimuli. The combination of negative and positive (or "ambivalent") affect was associated with greater physiological sexual arousal than the absence of positive and negative affect ("indifference;" Peterson & Janssen, 2007). These findings suggest that complex processes are at play in the relationship between affect and sexual arousal, requiring a more sophisticated model that takes into consideration the potential additive or cumulative effects of different affective responses.

Some studies on the cumulative effects of positive and negative affect have emphasized the importance of taking into consideration pre-existing affective states when studying acute affective responses to specific stimuli (e.g., Murphy, Monahan, & Zajonc, 1995; Neumann, Seibt, & Strack, 2001). Specifically, pre-existing affect is defined as the affective state experienced prior to exposure to a stimulus that is expected to change affective responses. Pre-existing affective states have been shown to intensify or dampen affective responses to specific events, known as event-related affective responses. A study measuring the intensity of induced pride after participants were pre-exposed to a mood induction (manipulation of pre-existing affect) reported that participants in the positive mood condition indicated stronger feelings of pride in response to a specific event (event-related affect) in comparison to individuals in the negative mood condition (Neumann et al., 2001). The mechanisms elucidated by this research may be equally relevant to the relationship between affect and sexual responses. For example, it is feasible that pre-existing negative affect may dampen or augment sexual responses independently from the emotional responses induced by sexual stimuli (event-related affect), which have been the focus of most studies. In other words, the mood of a person prior to exposure to a sexual stimulus may influence affective responses to the sexual stimulus. Since negative affectivity is usually high in women with a history of CSA (Chorpita & Barlow, 1998), the impaired sexual responsivity previously observed in these women could thus be the result of pre-existing negative affect.

The present investigation departs from previous research on the impact of affect on sexual responses by focusing on the role of pre-existing affect, rather than exclusively focusing on experimentally manipulated or stimulus-specific affect (i.e., affective responses to the sexual stimuli), on women's sexual responses. For Hypothesis 1, we expected to replicate prior studies that found lower physiological sexual arousal but not lower subjective sexual arousal to erotic video stimuli in women with a history of CSA compared to women with no history of sexual abuse (Laan & Everaerd, 1995; Rellini & Meston, 2006; Schacht et al., 2007). For Hypothesis 2, we expected that, compared to the NSA group, the CSA group would report greater negative affect prior to exposure to erotic stimuli (pre-existing negative affect). This hypothesis was based on prior studies indicating high negative affectivity in women with a history of CSA (Chorpita & Barlow, 1998). For Hypothesis 3, we hypothesized that pre-existing affect would

predict affective response to sexual stimuli (event-specific affect). This hypothesis was based on prior studies showing that pre-existing affect can potentiate event-specific affect (Neumann et al., 2001). We did not make specific predictions regarding a history of CSA and the relationship between pre-existing affect and event-specific affect because of lack of literature on this topic; however, we did not have any reason to believe that the effect of pre-existing affect on event-specific affect would be different because of a history of CSA, meaning that we expected more negative pre-existing affect to be associated with a greater negative affect in response to the erotic videos and we did not expect this relationship to be different between groups.

While cross-sectional studies do not allow for the identification of the mechanisms underlying the hypothesized relationship between CSA, pre-existing affect, and sexual responses, statistical procedures can be used to test mediation and moderation effects. In particular, Hypothesis 4 proposed the mediation of pre-existing affect in the relationship between CSA and sexual responses would be supported if we found evidence that CSA was associated with more negative pre-existing affect and if pre-existing affect explained the difference in physiological sexual arousal between the CSA and the NSA groups. This hypothesis was based on findings that women with a history of CSA have smaller sexual arousal compared to women with no history of abuse (Laan & Everaerd, 1995; Leonard & Follette, 2002; Rellini & Meston, 2006; Schacht et al., 2007), on evidence that negative affect can impair sexual responses (Barlow, 1986), and on evidence that women with a history of CSA have greater negative affectivity (Chorpita & Barlow, 1998). However, it is also feasible that negative affect may not be associated with CSA and that affect prior to exposure to sexual stimuli is only a minor problem compared to the more severe and pervasive changes that women with a history of CSA endured in their sexual lives. This conceptualization presumes a moderating model in which the relationship between pre-existing affect and sexual responses would be different based on group. Specifically, for Hypothesis 5, we predicted that pre-existing negative affect would be significantly associated with physiological sexual responses for the NSA group but not for the CSA group.

Method

Participants

A total of 25 women with a history of CSA and 25 women without a history of sexual abuse (NSA) were recruited through newspaper advertisements and flyers, posted throughout the urban area of two medium-size cities. The advertisement invited women with and without a history of unwanted sexual experiences to participate in a study on sexuality. Women were eligible if they were fluent in English, sexually active with a partner (or partners) during the 4 weeks prior to the study, and between the ages of 25 and 35 years. During the phone screening, CSA was defined as any unwanted sexual experience prior to the age of 16 in which the genitals were either touched or penetrated by somebody five or more years older (Finkelhor, Hotaling, Lewis, & Smith, 1989). Exclusion criteria for the NSA group included reports of any unwanted sexual experience (at any age) and a sexual experience prior to age 16 with someone five or more years older. Exclusion criteria for both groups included self-reported experience of a traumatic event in the previous three months (i.e., an event that caused fear for one's life or integrity—or of those of a beloved one–such as a car accident, witnessing the death of a significant other, a forced sexual experience), currently being in an abusive relationship (i.e., being in a relationship with a partner who uses or used physical violence), taking medications known to affect cardiovascular function, and reporting a diagnosis of a psychotic disorder (e.g., schizophrenia, schizoaffective disorder, any delusional disorder and any bipolar disorder that required hospitalization). Women on antidepressants were included in the study as long as they reported being on the same medication and the same dose for 3 months or longer and having experienced no changes in any aspects of sexual function, including sexual desire and/or sexual arousal. Excluding individuals on antidepressants would severely affect the generalizability of the results to women with a history of CSA; therefore, to compensate the potential confounds caused by the medication, analyses were computed first with and then without individuals on antidepressants to assess potential biases of medications.

NSA Group

The data of two women in the NSA group were excluded from analysis because they reported at the end of the study that they had experienced sexual abuse after age 16. The average age of the remaining 23 women was 27.7 years (SD = 2.77). All women in the NSA group had at least two years of college and the majority (78.3%) reported a household income of $25,000 or less. Of the 23 women, 13.0% checked more than one ethnic background, 69.6% identified as Caucasian, 17.4% as Hispanic/Latina, 4.3% as Asian American or Pacific Islander, 8.7% as African American, 8.7% as Pacific Islander, and 8.7% as other. The majority of the women within this group were in a committed relationship (69.6%) or married (13.0%), while the remaining women were either single and dating (8.7%) or single and not dating (8.7%).

CSA Group

The average age of women in the CSA group was 29.8 years (*SD* = 4.4) and the majority (73.6%) of these women had at least 2 years of college. Most (88.9%) had an income of less than $25,000. Of the 25 women in this group, 7.4% checked more than

one ethnicity, 84.0% identified as Caucasian, 12.0% as Hispanic/Latina, 8.7% as African American, and 4.0% as Native American. In terms of relationship status, most women indicated being in a committed relationship (44.0%) or married (24.0%), 20.0% were single and dating, and 12.0% were single and not dating. Four individuals in this group were on antidepressants. Based on the Child Sexual Abuse Measure (see below), women reported that unwanted fondling was the most common form of sexual abuse, with 71% of women with a history of CSA endorsing this type of experience. An estimated 13% experienced this type of behavior once, 13% experienced it 2–4 times, and 44% experienced it 5 or more times. Unwanted vaginal penetration was experienced by 23% of the CSA sample; 8% experienced it once, 5% experienced it 2–4 times, and 11% experienced it more than 5 times. Unwanted anal penetration was the second most common form of sexual abuse, and it was experienced once by 18% of the CSA sample, 2–4 times by 5% and more than 5 times by 32%.

Measures

Film Sequence

Participants viewed a film sequence consisting of a 1-min presentation of the word "Relax" followed by 3 min of a non-sexual travelogue (neutral film) and 10 min of an erotic film. The erotic film was chosen from a collection of erotic videos directed and produced by women for women. Prior studies have shown that women report higher levels of positive affect and lower levels of negative affect during the viewing of these films in comparison to erotic films made by and for men (Laan, Everaerd, van Bellen, & Hanewald, 1994).

Affect

The Positive Affect and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) was used to measure affect. The PANAS consists of 10 positive affect items (PA) that reflect a state of high energy, full concentration, and pleasurable engagement (e.g., enthusiastic, active, and alert), and 10 negative affect items (NA) referring to subjective distress and lack of pleasure (e.g., anger, contempt, and disgust). The sum of the 10 positive and the 10 negative items produces two factors (PA and NA), which have been shown to be independent from each other ($r = -.09$) are associated with individual differences in positive and negative emotional reactivity, and have been linked to individual differences in sensitivity to signals of reward and punishment (Watson & Clark, 1984; Watson & Tellegen, 1985). The PANAS can be administered utilizing different time frames. For state affect, participants are asked to indicate how they feel in the present moment. The validity of these instructions to measure trait affect has been demonstrated in previous studies (Polka, Cohena, Doyleb, Skonerc, & Kirschbaumd, 2005). The PANAS has shown adequate internal consistency, independent from the frame of reference, with Cronbach's alpha typically exceeding 0.84. Test–retest-reliability reported by Watson and Clark (1984) was .69 for negative affect and .72 for positive affect. In this study, we asked participants to answer questions based on how they felt at the beginning of the study (pre-existing positive affect = Pre-PA, and pre-existing negative affect = Pre-NA) and during the erotic film (event-related affect Film-PA for positive affect, and Film-NA for negative affect). In the present study, Cronbach's alphas were .82 for Pre-NA, .90 for Pre-PA, .82 for Film-NA, and .92 for Film-PA.

Subjective Sexual Arousal

In agreement with previous studies on CSA (e.g., Rellini & Meston, 2006), a modification of Heiman and Rowland's (1983) Film Scale was used to measure subjective sexual responses to sexual stimuli. This 16-item scale was administered at the beginning of the study, prior to exposure to the film sequence, and after the erotic film. The version administered prior to the film sequence asked participants to answer the items based on how they felt at that moment, while the scale completed after the film asked them to base their responses on how they felt during the erotic film. Modified versions of this scale have been used in prior studies to assess self-reported sexual arousal (McCall & Meston, 2007; Rellini & Meston, 2006; ter Kuile et al., 2007) although no study has reported on the psychometrics of the instrument. To overcome this limitation, we computed a principal component analysis and calculated inter-item correlations (Direct Oblim, delta = 0; Kline, 1994). Inspection of the scree plots and the item-loading matrix for both pre-film and post-film scores revealed that the data were best described by one factor (60.4% of variance explained). Based on Kline's (1994) suggestion that items with loadings lower than .3 are not meaningfully related to the underlying construct, six of the original 16 items were eliminated (faster breathing, warmth in the genitals, breast sensations, faster heart beat, and genital tenseness and tightness). Consistent with the single-factor interpretation of the data, high inter-item reliability of the 10 items was observed ($\alpha = .94$). Based on these findings, we did not differentiate between self-reported physiological and subjective sexual arousal because the relevant items were highly intercorrelated and could not be statistically distinguished. Subjective sexual arousal (SubjSA) was measured by subtracting scores from the film scale computed after the film sequence to the scores on the film scale completed prior to the film sequence.

Physiological Sexual Arousal

Vaginal photoplethysmography was used to assess genital responses during the viewing of the film sequence (for a review of this methodology, see Prause & Janssen, 2006). The photoplethysmograph is a device that can be used to measure vaginal

pulse amplitude (VPA), which reflects changes in blood flow in the vaginal wall. VPA was monitored, at a sampling rate of 80 Hz, during both the neutral and sexual film segment and recorded on an HP personal computer using AcqKnowledge, Version 3.5 (BIOPAC systems, Inc., Santa Barbara, CA) and a Model MP150 data acquisition unit (BIOPAC systems, Inc.) for amplification and analog/digital conversion. The amplitude of each pulse wave (trough-to-peak) was recorded in millivolts (mV). The signal was bandpass filtered (0.5–30 Hz). Data were analyzed through the use of waves for all trough-to-peaks over 30 s segments during the erotic film, then averaged over the neutral and erotic segments separately, resulting in two data points per participant. These two data points were then used to calculate percentage of VPA increase from neutral to sexual video. Depth of the probe and orientation of the light-emitting diode were controlled by a device (a 9 × 2 cm plate) attached to the photoplethysmograph (Laan & Everaerd, 1998).

Sexual Abuse

We utilized the Child Sexual Abuse Measure (adapted from Finkelhor, 1979). This is a 13-item survey based on Finkelhor's (1979) description of the different types of sexually abusive behaviors. Responders are prompted to indicate their relationship with the perpetrator, the frequency of the behavior and the age of abuse onset for each of the item. This scale was specifically developed for this study to collect information that is not covered by the Childhood Trauma Questionnaire. This measure was used for descriptive purposes only.

Procedure

Eligible women were invited for a one-hour laboratory session, which was scheduled to take place during the luteal phase of the menstrual cycle, calculated by asking women to report the first day of their last menstrual cycle. After obtaining informed consent, the female experimenter instructed the woman on how to insert the photoplethysmograph and then left her alone in the private internally locked room to insert the probe. This experimental room was furnished with a comfortable recliner, a television and a VCR/DVD player, and an intercom system that allowed communication with the experimenter in the adjacent room. After a 10 min habituation period during which the woman rested in the recliner chair, she completed the PANAS (pre-existing affect) and the Film Scale and then watched the film sequence. After the sexual film presentation, the participant completed the second PANAS (event-specific affect) and Film Scale, and removed the photoplethysmograph. At the end of the session, the participant completed the demographics questionnaire and a short interview to ensure that participants were correctly assigned to the CSA and NSA groups. Each participant was compensated $50 for her time.

Results

Group Differences

No significant differences were observed between the CSA and NSA groups in age, education, or income (see Table 1). A test for likelihood ratio also indicated no significant differences in relationship status (single vs. not single) between groups, $L.R. = 1.39$.

Consistent with prior studies and in support of Hypothesis 1, we found significantly smaller physiological sexual responses (VPA) in the CSA group as compared to the NSA group, $t(32.1) = 2.16$, $p < .05$ (because of a significant difference in group variance, Levene's test $F = 6.01$, $p < .05$, variances between the two groups were pooled, reducing the *df* from 46 to 32.1). Also in agreement with findings of prior studies, no significant group differences were observed in self-report of sexual arousal (SubjSA, see Table 1).

To test Hypothesis 2 that pre-existing negative affect would be higher in the CSA group compared to the NSA group, we used *t*-tests to assess group differences in both pre-existing negative (Pre-NA) and positive (Pre-PA) affect. Consistent with our predictions, the CSA group experienced greater pre-existing negative affect (Pre-NA) than the NSA group (CSA: $M = 13.60$, $SD = 3.52$, NSA: $M = 11.70$, $SD = 2.55$), $t(46) = -2.17$, $p < .05$. The scores in pre-existing negative affect (Pre-NA) ranged between 10 and 22 for the CSA group and 10–19 for the NSA group, indicating substantial variability for both groups. The effect size indicated a medium to large difference between groups, Cohen $d = .63$. No differences were observed for positive affect (Pre-PA), $t(46) = 1.01$.

Table 1 Means and SDs for demographic characteristics and pre-existing affect for women in the CSA and the NSA groups

	NSA ($N = 23$)		CSA ($N = 25$)		*t*	Cohen's *d*
	M	*SD*	*M*	*SD*		
Age	27.7	2.78	29.8	4.43	−1.91	0.57
Education	1.0	0.00	0.9	0.28	1.38	0.51
Income	0.2	0.42	0.1	0.33	0.89	0.26
Pre-PA	26.3	8.68	23.8	7.91	1.01	0.30
Pre-NA	11. 7	2.55	13.6	3.52	−2.17*	0.62
Film-PA	25.9	8.81	23.4	8.88	0.95	0.28
Film-NA	11.7	2.53	12.2	2.34	−0.78	0.21
VPA (mVolt)	2.3	1.94	1.3	0.99	2.16*	0.65
SubjSA	25.3	18.0	23.7	13.86	0.35	0.10

Note: Education: 0 = high school or less, 1 = a few years of college or higher. Income: 0 < $50,000/year, 1 = between $51,000 and $100,000/year, 2 > $101,000/year

Pre-PA Pre-existing positive affect, *Pre-NA* Pre-existing negative affect, *VPA* Physiological sexual arousal, measured in millivolts, *SubjSA* Subjective sexual arousal (range, 0–100)

*$p < .05$

Group Differences in the Effect of Pre-existing Affect on Event-specific Affect

In support of Hypothesis 3 that pre-existing affect would have an impact on event-specific affect, results from zero-order Pearson's correlations showed a significant association between Pre-PA and Film-PA, $r = .72$, $p < .001$, and between Pre-NA (pre-existing negative affect) and Film-NA (event-specific negative affect), $r = .56$, $p < .001$ (see Table 2).

To test the association between pre-existing affect and event-specific affect during exposure to sexual stimuli, a multivariate regression was computed with Film-PA and Film-NA serving as dependent variables, and Pre-NA, Pre-PA, and Group (CSA = 1; NSA = 0) serving as predictors. In addition to the main effects of Pre-PA, Pre-NA, we also tested interaction effects for Group X Pre-PA and Group X Pre-NA (Table 3). The multivariate model was significant, $F(2, 41) = 4.26$, $p < .05$, partial η^2 ($_p\eta^2$) = .18, and univariate follow-up analyses showed that Pre-NA, Pre-PA, and Group, significantly explained both Film-PA, $F(5, 42) = 9.64$, $p < .001$, $_p\eta^2 = .54$, and Film-NA, $F(5, 42) = 5.51$, $p < .001$, $_p\eta^2 = .40$. An analysis of the univariate statistics revealed a significant main effect of Pre-PA, which predicted Film-PA, $F(1, 42) = 42.24$, $p < .001$, $_p\eta^2 = .51$, and of Pre-NA, which predicted Film-NA, $F(1, 42) = 23.7$, $p < .001$, $_p\eta^2 = .37$, further corroborating the previous findings that pre-existing affect predicted affective responses to the erotic videos. Group did not have a significant effect on either Film-PA, $F(1, 42) < 1$, $_p\eta^2 < .001$, or Film-NA, $F(2, 42) = 3.32$, $p = .08$, $_p\eta^2 = .07$, suggesting that the affective responses to the erotic stimuli (event-specific affect) were comparable between the two groups although negative affect was slightly higher (not significant) in the CSA group. The interaction effects were not significant (see Table 3), indicating that the relationship between pre-existing affect and event-specific affect was similar for both CSA and NSA groups during exposure to erotic stimuli. Results remained the same when the four individuals taking antidepressants were removed from the analyses Table 4.

Table 2 Zero-order correlations for sexual responses, pre-existing affect, event-specific affect, and history of childhood sexual abuse (CSA)

Variables	1	2	3	4	5	6	7
1. VPA	–	.12	−.31*	.04	−.30*	.06	−.21
2. SubjSA		–	−.10	.11	−.08	.41**	.03
3. Group			–	−.15	.31*	−.14	.12
4. Pre-PA				–	−.09	.72***	.13
5. Pre-NA					–	−.18	.56***
6. Film-PA						–	.15
7. Film-NA							–

VPA physiological sexual arousal, *SubjSA* Subjective sexual arousal; Group is a dichotomous variable (NSA = 0, CSA = 1), *Pre-PA* pre-existing positive affect, *Pre-NA* pre-existing negative affect, *Film-PA* positive affect during the erotic film (event-specific affect), *Film-NA* negative affect reported during the erotic film (event-specific affect)

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 3 Univariate results for event-specific affect (Film-PA and Film-NA) as explained by pre-existing affect, history of CSA and the interaction between a history of CSA and pre-existing affect

Dependent variable	Independent variable	F	p	$_p\eta^2$
Film-PA	Group	<1	ns	<.01
	Pre-PA	42.24	<.001	.51
	Pre-NA	<1	ns	.02
	Group X Pre-PA	<1	ns	.01
	Group X Pre-NA	<1	ns	<.01
Film-NA	Group	3.32	.076	.07
	Pre-PA	2.07	ns	.05
	Pre-NA	23.73	<.001	.38
	Group X Pre-PA	2.31	ns	.05
	Group X Pre-NA	1.87	ns	.04

Note: $df = 1, 42$. $_p\eta^2$ partial eta square, *Film-PA* event-specific positive affect, *Film-NA* event-specific negative affect. Group: NSA = 0, CSA = 1. *Pre-PA* pre-existing positive affect, *Pre-NA* pre-existing negative affect, *Group* × *Pre-PA* interaction effect for Group and Pre-PA, *Group* × *Pre-NA* interaction effect for Group and Pre-NA

Mediation Effect of Pre-existing Affect on the Sexual Response

To test Hypothesis 4 that pre-existing negative affect mediated the relationship between a history of CSA and sexual responses (VPA and SubjSA), we first computed zero-order correlations to establish that all variables in the model were significantly correlated. As shown in Table 2, VPA, Pre-NA, and CSA were significantly associated. Since SubjSA was not significantly correlated with pre-existing affect (Table 2), and groups did not differ in levels of SubjSA (Table 1), the mediation model for SubjSA variable was not tested. A Sobel test with bootstrapping was performed to test the mediation of Pre-NA on the relationship between a history of CSA and VPA model (see Fig. 1 for a graphic representation of the tested model). We observed significantly smaller VPA in the CSA group compared to the NSA group, $t = -2.21$, $p < .05$, and greater Pre-NA in the CSA group compared to the NSA group, $t = 2.17$, $p < .05$. However, no significant relationship was observed between Pre-NA and VPA, $t = -1.56$. These findings did not support a mediation effect of pre-existing negative affect on VPA. Results remained the same when the four individuals taking antidepressants were removed from the analyses.

Moderation of CSA in the Relationship Between Pre-existing Affect and Sexual Responses

To test Hypothesis 5, regarding a possible moderation effect of pre-existing affect, we followed recommendations by Baron

Table 4 Results from a 3-step hierarchical regression where VPA is regressed on Group (CSA vs. NSA), pre-existing affect, and the interactions between group and pre-existing affect

	SS	SS residuals	F	R^2	ΔF	ΔR^2	β	t
Step 1	11.4	106.8	4.90*	.096				
Group							−0.310	−2.21*
Step 2	17.0	101.2	2.46	.144	1.22	.048		
Group							−0.243	−1.65
Pre-PA							−0.020	−0.14
Pre-NA							−0.229	−1.56
Step 3	30.1	88.0	2.87*	.255	3.13*	.111		
Group							−1.905	−2.54*
Pre-PA							−0.119	−0.63
Pre-NA							−0.739	−2.98**
Group × Pre-PA							0.228	0.53
Group × Pre-NA							1.700	2.48*

* $p < .05$; ** $p < .01$

and Kenny (1986) for statistical tests for moderation, and computed a three-step hierarchical linear regression to predict VPA utilizing Group (Step 1), Pre-PA and Pre-NA (Step 2), and the interactions Group X Pre-PA and Group X Pre-NA (Step 3). This model was selected because it allows one to determine whether the relationship between pre-existing affect and sexual responses differed depending on Group (CSA = 1 vs. NSA = 0). Zero-order correlations (see Table 2) were significant for VPA and Group ($r = -.31$, $p < .05$), and VPA and Pre-NA ($r = -.30$, $p < .05$).

In Step 1 of the regression, Group (CSA vs. NSA) significantly predicted VPA levels, $F(1, 47) = 4.90$, $p < .05$, with CSA showing smaller VPA responses to the sexual video compared to the NSA group, $\beta = -.310$, $p < .05$. Group alone explained 10% of variance in VPA. Adding Pre-PA and Pre-NA (Step 2) did not significantly add to the prediction of VPA, but adding the interaction between Group and pre-existing affect (Step 3) explained an additional 11% of the model, $\Delta F\ (2, 43) = 3.13$, $p < .05$. Inspection of the regression coefficients for Step 3 revealed significant effects for Group, $\beta = -1.91$, $t(43) = -2.54$, $p < .05$, Pre-NA, $\beta = -0.74$, $t(43) = -2.98$, $p < .01$, and for Group X Pre-NA, $\beta = 1.70$, $t(43) = 2.48$, $p < .05$. These findings were supportive of a potential moderation effect. Results remained the same after exclusion of the four individuals taking antidepressants.

To help interpret the significant interaction, a post-hoc regression analysis was computed separately for CSA and NSA where VPA was regressed on Pre-NA and Pre-PA. Since only the interaction Group X Pre-NA was significant, only the β coefficients for Pre-NA were interpreted in the post-hoc regression. For the NSA group, Pre-NA was negatively and significantly associated with VPA, $\beta = -0.48$, $t(20) = -2.40$, $p < .05$. No significant effects were found for the CSA group, $\beta = .011$, $t(23) < 1$, (see Fig. 2).

Since SubjSA was not significantly correlated with any of the variables that pertained to pre-existing affect, Group, and the interaction between pre-existing affect and group, no regression was computed for SubjSA. The results were not different when the four women on antidepressants were removed from the analyses.

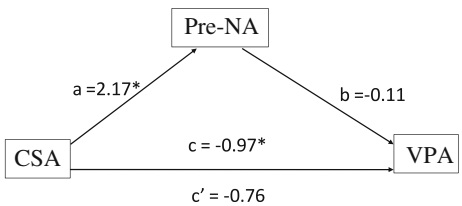

Fig. 1 Direct and indirect effects computed with a Sobel test for mediation where negative affect prior to exposure to a sexual stimulus (Pre-NA) is tested as potential mediator of the relationship between a history of childhood sexual abuse (CSA) and physiological sexual responses (VPA). *Note*. *a* is the direct effect of independent variable on the mediator, *b* is the direct effect of mediator on the dependent variable, *c* is the direct effect of independent variable on the dependent variable, *c′* is the total effect of independent variable on dependent variable. *$p < .05$

Discussion

This study examined the effects of pre-existing affect on the sexual and affective responses to erotic stimuli in women with and without a history of CSA. The findings revealed, consistent with previous research, that physiological but not subjective sexual responses were smaller in women with a history of CSA as compared to women with no history of abuse. In agreement with prior studies showing greater negative affectivity in women with a history of CSA (Chorpita & Barlow, 1998), we found greater pre-existing negative affect in the CSA group. According to a mediation model, we expected that the smaller

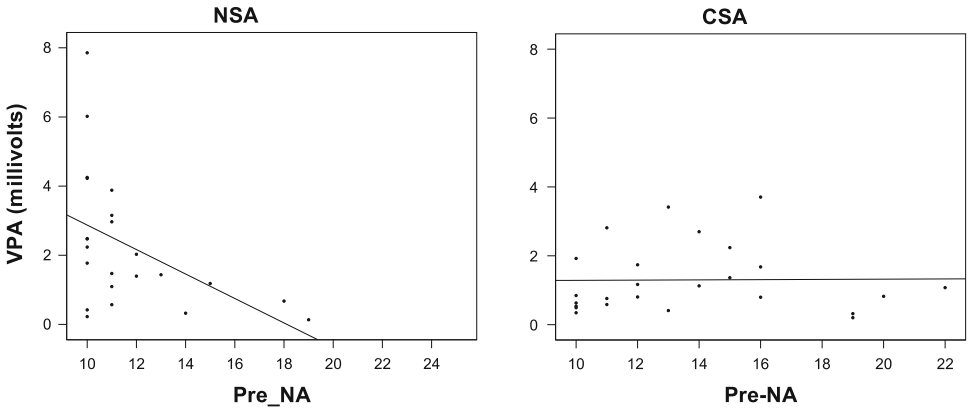

Fig. 2 Illustration of the interaction effect between a history of childhood sexual abuse (CSA) and negative affect prior to exposure to sexual stimuli (Pre-NA) on physiological asexual arousal (VPA)

physiological sexual responses of the CSA group would be explained by their greater pre-existing negative affect; however, findings from a Sobel test of mediation did not support this model. On the other hand, results supported a moderation model that found an association between pre-existing negative affect and physiological sexual responses, but only in the group of women with no prior history of sexual abuse. In summary, while the CSA group had greater pre-existing negative affect, this did not explain why they had smaller VPA than the NSA group and, differently from the NSA group, their pre-existing negative affect was not associated with their VPA.

Given the purported automatic nature of physiological sexual responses in women (e.g., Laan & Everaerd, 1995), the smaller VPA response observed in the CSA group may be a reflection of a modification of a more "biologically prepared" sexual response, which could be a long-term product of aversive sexual experiences. Indeed, previous studies have found that increasing sympathetic activity does not facilitate sexual responses in women with a history of CSA (Rellini & Meston, 2006), a potential indication of an impaired physiological mechanism. However, if biological impairments were part of the explanation for the reduced sexual responses, we would expect that more severe forms of abuse (e.g., multiple vs. single abusive experiences, or younger age of abuse onset) would cause more severe biological and functional impairments and therefore would show the greatest impairments in VPA. Future studies would benefit from collecting more information on the relationship between VPA responses and type and severity of the abusive events experienced by the participants with a history of CSA.

Prior studies have generally focused on affect in reaction to erotic stimuli presentations (event-specific affect) or actively manipulated affect prior to exposure to erotic stimuli (Heiman, 1980; Hoon et al., 1977; Laan et al., 1994; Palace & Gorzalka, 1990; Peterson & Janssen, 2007). To our knowledge, the current study was the first to explore the relationship of pre-existing affect (i.e., affect measured prior to the presentation of an erotic stimulus) with the sexual responses of women with a history of CSA. While pre-existing negative affect did not appear to explain why women with a history of CSA had smaller physiological sexual responses compared to the NSA group, data supported a moderation hypothesis, indicating that the relationship between pre-existing negative affect and physiological sexual responses was significant, but only for the NSA group. This finding suggests that, while models of sexual arousal dysfunction that address the inhibitory role of negative affect prior to sexual activities may be adequate to understand sexual arousal problems in women in general, this model may not be able to capture the complexity of the impaired sexual responses of women with a history of CSA. Also, it is important to note that the results on the relationship between affect and sexual responses are mixed in the literature. Since studies on female sexual responses rarely screen for a history of CSA, and a history of CSA is common among participants in sex studies (e.g., see Rellini & Meston, 2007b), we wonder whether variations in how many women with a history of CSA are included in study samples could explain some of the inconsistencies.

Alternative explanations for the lack of a significant relationship between pre-existing affect and sexual responses should be considered. For example, the possibility of a floor effect for VPA cannot be ruled out. That is, the VPA response in the CSA group may have been so low to restrict our observation of a potential linear relationship between VPA and pre-existing affect. Indeed an analysis of skewness of our data showed that the VPA skewness for the CSA group was substantial (Skewness = 1.31, $SD = 0.40$). Future studies that manipulate pre-existing affect and assess the effects of this on VPA may be better suited to address this research question. Moreover, it is feasible that our measure of affective response failed to capture the aspects of affect more salient to sexual arousal for CSA survivors. It is also possible that due to our relatively small sample size we were unable to capture a significant but small association between affect and sexual response. Of course, this would not change the fact that the NSA group *did* show evidence of a significant relationship, which can be expected to only have been stronger if we had used a larger sample size.

We also need to take into consideration that our sample was not a random, representative sample. It is conceivable that women with more severe forms of CSA and women with more severe sex-

ual dysfunctions would not want to participate in a study of this kind. In women with more severe forms of CSA, the relationship between affect and sexual arousal might be different, and stronger. Finally, it is feasible that our results may not extend to sexual arousal during sexual activities with a partner. The nature of the affective response in anticipation to sexual activities with a partner and the role of pre-existing affect prior to the sexual approaches of a partner may impact the sexual responses of CSA survivors and our laboratory measures of sexual arousal may be limited in their ability to capture such responses.

A question that was not addressed in much depth in the current study involves the distinction between pre-existing and trait affect. We measured affect in reference to the current moment, what is known as state affect. However, we did not measure more stable levels of positive and negative affect, also known as trait affect, which could have differed for the two groups. Future studies could include measure of trait affect and manipulate pre-existing affect to examine the possible interaction between state and trait affect and their impact on responses to sexual stimuli.

The finding that that pre-existing negative affect was not negatively associated with VPA in the CSA group may also point to a possible impairment in inhibitory sexual mechanisms in this group. That is, pre-existing negative affect may have interfered with a *reduction* of sexual responses in women with a history of CSA. Indeed, a prior study in which women were asked to try to inhibit or increase their sexual arousal during exposure to sexual stimuli found that VPA did not change in response to such instructions in women with a history of CSA, whereas women with no such history were successful at reducing VPA when asked to do so (Schacht et al., 2007). Given theoretical models of sexual arousal that point to inhibitory and excitatory processes that impact sexual arousal (e.g., Janssen & Bancroft, 2007), these findings could indicate that women with a history of CSA have problems with the regulation (be it at a voluntary or involuntary level) of their sexual responses and, in particular, with inhibitory processes. A well-documented phenomenon in trauma survivors (especially in individuals with a history of childhood maltreatment) is their tendency to experience difficulties with inhibiting behavioral impulses, a construct commonly operationalized in terms of impulsivity, sensation seeking, or sexual risk-taking (Bornovalova, Gwadz, Kahler, Aklin, & Lejuez, 2008; Brodsky et al., 2001). At the present time, it is unclear whether decreased inhibitory capacity is associated with neurophysiological impairments that precede (and possibly are exacerbated by) abuse, or whether it is the product of changes that occur in response to traumatizing situations. Our findings would not explain the smaller physiological sexual responses (potentially a product of weaker excitatory forces), but would be in agreement with evidence from correlational studies reporting higher frequency of risk taking sexual behaviors and higher frequencies of casual sex, as forms of impaired inhibition of sexual responses (Browning & Laumann, 1997; NIMH Multisite HIV Prevention Trial Group, 2001). This interpretation is further supported by studies showing that some individuals may experience increases in sexual desire and risk taking tendencies when feeling sad or depressed and stressed or anxious (Bancroft et al., 2003; Lykins et al., 2006).

The findings of previous studies suggest that sexual problems of women with a history of CSA may be the result of negative affect elicited by sexual stimuli (Meston & Heiman, 2000; Meston et al., 2006), but, to our knowledge, no studies have tested the role of pre-existing affect on physiological, subjective and affective responses to sexual stimuli in women with CSA experiences. Also, our results are in agreement with the findings of a previous study that failed to observe greater negative affect in response to sexual stimuli shown in the laboratory among women with a history of CSA (Schacht et al., 2007). Our findings provide preliminary support for the idea that reducing negative affectivity in women who experience low physiological sexual responses may be a useful objective for treatment, since there is indeed a relationship between these two constructs. However, for women exposed to CSA this approach may not yield the expected results, given a much less salient relationship between pre-existing negative affect and sexual responses for these women.

There are a number of possible explanations for these results. It is feasible that early traumatizing sexual experiences may have changed primary cognitive and psychological networks that control the perception and processing of sexual stimuli (Meston & Heiman, 2000). The role of these impaired processes may have been so pervasive that the effects of mood fade in comparison. If future studies would replicate our findings, this would reinforce the possibility that models of sexual dysfunction need to more specifically address processes and factors relevant to understanding and treating sexual problems in women with a history of CSA. However, it is important to note that these interpretations rely on the presumed existence of a causal, or at the very least temporal relationship, between sexual abuse and the development of sexual problems. Clearly, it is not possible for cross-sectional studies to provide evidence for such directionality. In the case of CSA, even longitudinal designs would have limitations, as sexual function, in terms of genital responses and the experience of sexual arousal, most detectably manifests itself after childhood. Thus, although we can make assumptions on the relationship between childhood abuse and adult sexual function, the measurement of sexual functioning before abuse or the random assignment to such abuse raises both scientific and ethical challenges.

Pre-existing affect predicted affect reported during the presentation of sexual stimuli (event-related affect): Greater positive affect during the sexual film was associated with higher pre-existing positive affect, and greater negative affect during the video was associated with higher levels of pre-existing negative affect. These findings are in line with studies pointing to a significant additive effect of pre-existing affect on event-specific affect (Murphy et al., 1995; Neumann et al., 2001). Future research on

affective responses to sexual stimuli could benefit from taking into consideration individual differences. In particular, it would be relevant to know whether individuals who utilize sexual stimuli to modify their pre-existing negative affect show differences in the relationship between pre-existing affect and stimulus-specific affect.

A different pattern emerged for subjective sexual arousal. Pre-existing affect did not predict levels of subjective sexual arousal, but an increase in positive affect during exposure to the sexual stimuli predicted greater subjective sexual arousal, suggesting that the ability of sexual stimuli to modify positive affect is related to feelings of subjective sexual arousal. Unfortunately, these findings did not allow us to discriminate between changes in subjective sexual arousal that were due to increased positive affect and changes in subjective sexual arousal that happen to co-occur with increases in positive affect. Future studies that would explore this more systematically in CSA and NSA groups could be relevant to further development of treatments of female sexual arousal disorder.

Consistent with prior studies (Rellini & Meston, 2006; Schacht et al., 2007), subjective sexual arousal did not differ between women with and without a history of CSA. The significant difference in genital but not in subjective sexual responses between women with and without a history of CSA emphasizes how impairments in sexual responses may have a physiological etiology more than a purely psychological one. However, it would be interesting to see how our findings would compare to the use of measures of subjective sexual arousal as experienced while engaging in sexual activities with a partner.

In conclusion, the findings provide additional evidence for the existence of differences in the sexual responses of women with a history of CSA as compared to women with no such history. Not only were physiological sexual responses smaller in women exposed to CSA, the affective mechanisms possibly influencing genital responses during exposure to sexual stimuli appear to be different in this group of women as well. It is noteworthy that although pre-existing negative affect was higher for the CSA group, this affective state did not explain their smaller genital responses. Future studies that address non-affective mechanisms are needed to provide a more clear understanding of the impaired sexual response in women with a history of CSA.

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