ORIGINAL RESEARCH

Changes in Autonomic Nervous System Activity are Associated with Changes in Sexual Function in Women with a History of Childhood Sexual Abuse

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ABSTRACT

Introduction. Women with histories of childhood sexual abuse (CSA) have higher rates of sexual difficulties, as well as high sympathetic nervous system response to sexual stimuli.

Aim. The study aims to examine whether treatment-related changes in autonomic balance, as indexed by heart rate variability (HRV), were associated with changes in sexual arousal and orgasm function.

Methods. In study 1, we measured HRV while writing a sexual essay in 42 healthy, sexually functional women without any history of sexual trauma. These data, along with demographics, were used to develop HRV norms equations. In study 2, 136 women with a history of CSA were randomized to one of three active expressive writing treatments that focused on their trauma, sexuality, or daily life (control condition). We recorded HRV while writing a sexual essay at pretreatment, posttreatment, and 2-week, and 1- and 6-month follow-ups; we also calculated the expected HRV for each participant based on the norms equations from study 1.

Main Outcome Measures. The main outcome measures used were HRV, Female Sexual Function Index, Sexual Satisfaction Scale—Women.

Results. The difference between expected and observed HRV decreased over time, indicating that, posttreatment, CSA survivors displayed HRV closer to the expected HRV of a demographics-matched woman with no history of sexual trauma. Also, over time, participants whose HRV became less dysregulated showed the biggest gains in sexual arousal and orgasm function. These effects were consistent across condition.

Conclusions. Treatments that reduce autonomic imbalance may improve sexual well-being among CSA populations.

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Key Words. Childhood Sexual Abuse; Heart Rate Variability; Sexual Function; Autonomic Nervous System; Expressive Writing

Introduction

The role of the autonomic nervous system in trauma has been well documented. Threat activates the sympathetic (SNS) and parasympathetic (PNS) nervous systems, and high levels of threat exposure, particularly early in life, can significantly affect an individual's long-term ability to modulate the SNS and PNS response to subsequent stress [1]. In response to a normal stressor, the SNS instigates autonomic arousal responses (e.g., increased blood pressure, perspiration, faster breathing), which soon return to resting equilibrium after removal of the stressor. However, after a traumatic stressor, SNS response to trauma-related stimuli is often elevated [2].

Women with a history of childhood sexual abuse (CSA) evidence relatively high SNS activity [3], particularly in response to sexual cues [4]. This is important, as there is a curvilinear relationship between autonomic balance and vaginal arousal such that very high SNS (or low PNS) activity is associated with lower sexual arousal in women [5]. It is likely that the SNS dominance displayed by CSA survivors toward sexual cues leads to poorer sexual arousal, and by extension, poorer orgasm function. Indeed, one study in CSA populations has found that relatively high SNS arousal to sexual stimuli is related to low sexual arousal and orgasm function [6]. However, it is unknown if *changes* in autonomic balance to sexual stimuli are associated with concomitant changes in sexual arousal and orgasm function.

Given that CSA survivors, compared with women without abuse histories, are at higher risk for sexual dysfunction [7], examining mechanisms by which sexual well-being may be augmented in this sample is important. To this end, the present study explored whether treatment-related changes in autonomic arousal to sexual stimuli (writing a sexual essay) were associated with improvements in sexual well-being among adult women with a history of CSA. SNS activity was examined using heart rate variability (HRV), an objective and noninvasive marker of autonomic function. HRV is a measure of vagal tone and reflects the degree of variability of beat-to-beat intervals across time. High levels of HRV (indicating low SNS activation and/or high PNS activation) are a sign of healthy cardiac function and enhanced physical [8] and mental health [9], whereas high sympathetic tone (reflected as reductions in HRV), makes the heart vulnerable to arrhythmia and sudden death [10].

Data for this study were taken from a randomized controlled trial [11] where CSA survivors were randomly assigned to one of three expressive writing treatments. The expressive writing paradigm, in which participants write continuously and anonymously about a prespecified topic for 20–40 minutes, has been shown to reduce SNS activity to trauma reminders [12]. In concert with ameliorating physical health symptoms, expressive writing has also been shown to improve indices of mental health such as depression and posttraumatic stress symptoms [13]. Of particular importance to the present study, expressive writing has been shown to be an effective treatment for sexual dysfunction in women with CSA histories [11].

Aims

Our aim was to test if changes in autonomic balance predicted treatment-related changes in sexual function in women with a history of CSA. We hypothesized that women with trauma histories would have significantly lower HRV (corresponding to higher SNS response) to sexual stimuli (writing a sexual essay) than what would be expected of healthy nonabused women. In study 1, we developed norms equations to predict HRV to sexual stimuli expected of healthy, sexually functional women with no trauma history. In other words, the predictive equation would model a "mathematically matched" never sexually abused participant who is exactly similar to the CSA participant in all respects except for abuse history. We predicted that, over time (i.e., pre- to posttreatment), CSA survivors' HRV to sexual stimuli would approach that of healthy never-abused women. We also predicted that as CSA women's HRV to sexual stimuli became less dysregulated (i.e., closer to that expected of a never-abused, sexually functional woman), their sexual arousal and orgasm function would improve. However, given the specificity of the mechanism (SNS activity) to genital arousal, we did not expect changes in HRV to predict a related, but nongenital, construct (sexual satisfaction).

All procedures were approved by the University of Texas at Austin Institutional Review Board from 2004 to 2013, and the trial was registered on http://www.Clinicaltrials.gov (identifier NCT01803802). All participants provided informed consent.

Methods: Study 1

Participants

We recruited women with no history of sexual trauma via advertisements in local newspapers and websites using advertisements that noted the sexual nature of the study. Participants were screened over the phone for the following criteria: age 18 or older, physically healthy (free from medical conditions known to impact cardiovascular or sexual function such as high blood pressure), free from sexual difficulties (sexual dysfunction or low sexual satisfaction), no history of sexual or physical abuse in childhood, no unwanted sexual experiences in adulthood, and no traumatic experiences in the 3 months prior to enrollment. Sexual functioning was further assessed at the experimental session via the Female Sexual Function Index (FSFI; see later). Of the 102 women who were enrolled, 31 reported no partnered sexual activity