Psychoneuroendocrinology 63 (2016) 271–275

Contents lists available at ScienceDirect

Psychoneuroendocrinology

journal homepage: www.elsevier.com/locate/psyneuen

Short communication

Sexual dysfunction and neuroendocrine correlates of posttraumatic stress disorder in combat veterans: Preliminary findings

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ARTICLE INFO

Article history:
Received 11 June 2015
Received in revised form 8 October 2015
Accepted 19 October 2015

Keywords:
Sexual dysfunction
Posttraumatic stress disorder
Neurobiology
Neuroendocrinology

ABSTRACT

Sexual dysfunction is not a symptom of PTSD but is a common clinical complaint in trauma survivors with this disorder. In that there are biological parallels in the neuroendocrine processes underlying both PTSD and sexual behavior, we conducted an exploratory investigation of the relationship of PTSD and related neuroendocrine indicators with sexual dysfunction in armed service veterans. Major Depressive Disorder, highly comorbid with PTSD and sexual dysfunction, was also assessed. In veterans with PTSD, sexual problems were associated with plasma DHEA and cortisol, urinary catecholamines, and glucocorticoid sensitivity, even when controlling for the effects of comorbid depression. In a subsample analysis, testosterone levels did not distinguish PTSD or sexual dysfunction, suggesting that sexual problems reported by veterans in this sample were not the result of organic disorder. PTSD did predict higher dihydrotestosterone (DHT) levels, which were associated with sexual problems. More detailed assessment of sexual dysfunction in biologically informed studies of PTSD is warranted to clarify the relationships of PTSD symptomatology and related neurobiology with sexual dysfunction.

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1. Introduction

Posttraumatic Stress Disorder (PTSD) can develop following exposure to a life-threatening or horrifying experience, such as an accident, assault, natural disaster, terrorist attack, or combat. Symptoms of the disorder encompass intrusive memories, hyperarousal, avoidance of reminders, and changes in mood and cognitions (American Psychiatric Association, 2013). PTSD negatively impacts interpersonal relationships and is associated with marital separation, divorce, and intimate partner violence (e.g., Davidson et al., 1991; Glenn et al., 2002). PTSD has also been associated with sexual dysfunction (SD), which can include problems in desire, arousal, consummation, activity or satisfaction, in men and women (e.g., Breyer et al., 2014; Yehuda et al., 2015b). Rates of SD in PTSD range as high as 89% in male combat veterans, with up to a 30-fold increase in risk for sexual problems such as erectile dysfunction, and the increased risk conferred by PTSD is seen in younger, as well as older, individuals (Yehuda et al., 2015b). Hallmark symptoms of PTSD, such as intrusive memories and emotional numbing, may contribute to problems with sexual intimacy.

There is a large literature on the neuroendocrinology of PTSD (Zoladz and Diamond, 2013), but a dearth of studies extending current knowledge of the biology of PTSD into research on associated SD. Yet there are notable biological parallels in the neuroendocrine processes underlying both PTSD and sexual behavior (Yehuda et al., 2015b). The sympathetic nervous system and hypothalamic-pituitary-adrenal (HPA) axis are both activated by arousal, whether sexual or threat-induced, and it is possible that this confluence may be one mechanism whereby PTSD interferes with sexual functioning (Öznur et al., 2014). For example, catecholamine elevations are a central component of sexual response, but increased catecholamines such as norepinephrine have also been associated with PTSD diagnosis and symptom severity (Geracioti et al., 2001; Yehuda et al., 1992). Overly high levels of catecholamines may impair sexual performance directly or by triggering intrusive memories in persons with PTSD during sexual activity. Vivid trauma-related images during sexual activity have been reported in the literature and anecdotally in our outpatient PTSD clinic (Hirsch, 2009).

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http://dx.doi.org/10.1016/j.psyneuen.2015.10.015
0306-4530/Published by Elsevier Ltd.

Despite the high comorbidity of PTSD and SD and the overlap in neuroendocrine processes relevant to both PTSD and sexual functioning, sexual dysfunction has been completely neglected in biological studies of PTSD. In this brief report we performed an exploratory study to investigate the relationship of SD with PTSD and with known neuroendocrine correlates of PTSD including cortisol and catecholamines (Zoladz and Diamond, 2013), in veterans. Hormones relevant to sexual functioning (e.g., testosterone) were also analyzed in a subset of participants. Depression is an important potential confound in the emerging literature on PTSD and SD, given the high rate of comorbidity of PTSD and depression (roughly 50% across diverse epidemiological samples) and the known association of depression with sexual dysfunction (Baldwin, 2001), and therefore Major Depressive Disorder (MDD) was also evaluated and included as a covariate.

2. Methods

Data from four studies of PTSD biomarkers in veterans were analyzed for this report. Participants in all studies: (1) had trauma exposure that met DSM-IV diagnostic criteria for PTSD (i.e., a "Criterion A" trauma), (2) provided blood (collected at 0800 h by routine venipuncture) and 24 h urine samples, (3) completed structured clinical interviews for axis I diagnoses (e.g., MDD) and self-report measures, and (4) were assessed for PTSD by a clinical psychologist using the Clinician-Administered PTSD Scale for DSM-IV (CAPS). All study procedures were IRB approved, and all participants provided written, informed consent. Indicators of HPA axis function in blood (e.g., cortisol, DHEA, DHEA-S), glucocorticoid sensitivity (i.e., plasma cortisol suppression on the low-dose [0.5 mg] dexamethasone suppression test [DST]), and urinary catecholamines (epinephrine, norepinephrine, and dopamine) are analyzed in this report. Because of the association of age with sexual dysfunction (Feldman et al., 1994), all analyses include age as a covariate. When associated with the biological indicator of interest, BMI is an additional covariate in analyses of biological measures, which are log transformed when appropriate.

Two datasets were created from four separate studies of PTSD in veterans. The first dataset (Part I) includes data from an ongoing, cross-sectional study of Iraq and Afghanistan combat veterans who responded to referral, flyers, and letters seeking veterans for research participation. This report includes data from 170 male veterans with ($n = 76$) and without ($n = 94$) PTSD. Eligible participants had either a diagnosis of current PTSD related to their warzone experiences with a CAPS score $\geq$40, or no PTSD diagnosis with a CAPS score $\leq$20 and no history of PTSD. More details about inclusion/exclusion criteria and procedures are reported in (Yehuda et al., 2015a). Sex hormones (e.g., testosterone, estradiol, and dihydrotestosterone [DHT]) were assayed for two subgroups, veterans with PTSD who reported SD ($n = 37$) and veterans without PTSD with low levels of reported SD ($n = 24$).

The second dataset (Part II) combines data from male treatment-seeking veterans of any era who participated in three treatment studies (two completed and one ongoing; $n = 120$). These veterans were referred by their clinicians in an outpatient VA PTSD clinic to participate in a treatment study. Eligible participants had current PTSD with a CAPS $\geq$50. More detailed inclusion/exclusion criteria and procedures are described in Yehuda et al. (2014) and Yehuda et al. (2015c). These two datasets were analyzed separately to minimize heterogeneity and missing data due to differences in the measures used, inclusion criteria, and recruitment strategies.

Sexual dysfunction was assessed by self-report items on multiple measures. The Beck Depression Inventory II (BDI; Beck et al., 1996) item 21 assesses "loss of interest in sex" in the past week with a 4-point response scale. The Social Adjustment Scale-Self Report (SAS; Weissman and Bothwell, 1976) asks respondents living with a spouse or intimate how many times the respondent has had sex with a partner in the prior 2 weeks (5 point scale ranging from "more than twice a week" to "not at all in a month or longer"); and whether the respondent had "any problems during sexual relations during these last two weeks" (scale from none to no sexual relations). The Life Experiences Survey (LES; Sarason et al., 1978) item 16 asks participants to rate how negatively or positively "sexual difficulties" in the past year have impacted one's life (7 point scale) in the prior 6 months or 7 months to 1 year. The Expanded Health Symptom Checklist (HC; Proctor et al., 1998) ranks problems that have been moderately severe or bothersome over the prior 30 days on a five point scale (none to almost every day). Item 35 is "loss of interest in sex," and item 36 is "difficulty achieving orgasm." The Symptom Checklist 90-Revised item 5 assesses loss of sexual interest in the prior 7 days using a 5-point scale (Derogatis and Unger, 2010). Not all measures were administered across all studies; varied sample sizes reflect this.

3. Results

3.1. Demographic and clinical data

Table 1 presents demographic and clinical data for the two datasets. Both PTSD status and symptom severity were positively

Table 1
Demographics and clinical data.

	Study A ($n = 170$) M ± SD or n (%)		Study B ($n = 137$) M ± SD or n (%)
Age	32.57 ± 8.11		43.23 ± 13.72
Race			
Black	49 (28%)		74 (54%)
White	71 (40.6%)		48 (35%)
Asian	10 (5.7%)		2 (1.5%)
Other	20 (11.4%)		5 (3.6%)
Ethnicity	Hispanic: 64 (36.6%)		Hispanic: 67 (48.9%)
Conflict			
OEF/OIF/OND	175 (100%)		96 (70.1%)
Vietnam	–		35 (25.5%)
Gulf war/other	–		6 (4.4%)
CAPS total score	PTSD (+) 69.18 ± 16.87	PTSD (−) 3.73 ± 5.19	78.35 ± 19.19
Major Depressive Disorder	PTSD (+) 44 (57.9%)	PTSD (−) 3 (3.2%)	51 (37.2%)

OEF/OIF/OND = Operation Enduring Freedom, Operation Iraqi Freedom, Operation New Dawn; CAPS = Clinician-Administered PTSD Scale for DSM-IV; Major Depressive Disorder = presence of current DSM-IV diagnosis of Major Depressive Disorder.