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Cardiovascular Risks in Relation to Posttraumatic Stress Severity among Young Trauma-Exposed Women

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Abstract

Background: Posttraumatic stress is associated with elevated risk for cardiovascular disease (CVD). Relatively little research, particularly among women, has documented mechanisms by which PTSD might confer CVD risk during early adulthood. The purpose of the present study was to examine whether the number and relative levels of CVD risk factors are associated with posttraumatic stress symptom severity among young, trauma-exposed women.

Methods: Participants were premenopausal women ages 19–49 with varying levels of posttraumatic stress and no history of chronic medical illness (n=54), and were recruited from mental health clinics and the general community. Posttraumatic stress severity was assessed with a structured clinical interview (Clinician-Administered PTSD Scale). The CVD risk factors assessed

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were lipids (total cholesterol, triglycerides, high- and low-density lipoproteins), resting blood pressure (BP), body mass index (BMI), no exercise in typical week, and cigarette smoking.

Results: Posttraumatic stress severity was associated with lower high-density lipoprotein levels and higher triglycerides, greater systolic and diastolic BP, greater BMI, and a greater number of total CVD risk factors.

Limitations: The main limitation is the limited number of participants who displayed clinical levels on some of the CVD risk factors (e.g., BP). Nonetheless, most participants exhibited more than one CVD risk factor, indicating the potential for many of the women in this relatively young sample to progress toward greater risk later in life.

Conclusions: The present results support the contention that, in the absence of medical illness, posttraumatic stress symptom severity among young women is associated with several CVD risk factors early in life.

Keywords

cardiovascular; posttraumatic stress; women

Introduction

Research in the area of psychological trauma has revealed a relationship between posttraumatic stress disorder (PTSD) and poor cardiovascular health (Bedi & Arora, 2007; Boscarino & Chang, 1999; Jordan et al., 2011; Kubzansky et al., 2009; Ouimette et al., 2004; Sumner et al., 2015; Xue et al., 2012). Much of this evidence has involved retrospective examination of PTSD status among combat veterans who exhibit clinical symptoms of cardiovascular disease (CVD). Many civilians also suffer from PTSD resulting from the occurrence of threatening incidents including sexual abuse/rape, physical assault, and automobile accidents (e.g., McGruder-Johnson et al., 2000; Norris et al., 2002). Studies have revealed high rates of lifetime exposure to potentially traumatic events among young women (e.g., McGruder-Johnson et al., 2000; Norris et al., 2002), and women are more likely than men to develop chronic PTSD after a trauma exposure (Davidson, 2000; Galea et al., 2002; Norris et al., 2002).

The available evidence concerning PTSD-related CVD risk among women suggests that women may display similarly high levels of cardiovascular risk relative to males (e.g., Kubzansky et al., 2009; Ouimette et al., 2004; Sumner et al., 2015). The relationship between heart disease and PTSD symptoms was examined in 1,059 community-dwelling women ages 19–93 (mean age = 44 years at the start of 4-year follow-up) from the Baltimore cohort of the Epidemiologic Area Catchment study (Kubzansky et al., 2009). Results indicated that with each additional PTSD symptom the risk of developing incident CHD increased 17%. Sumner et al. (2015) subsequently demonstrated, among 49,978 female nurses followed longitudinally in the Nurses' Health Study II (ages 25–42 in year 1 of the 20-year study period), that women with four or more PTSD symptoms had the highest likelihood of incident CVD events (myocardial infarction or stroke) compared to those with fewer symptoms. Additional analyses from this large-scale study indicated that elevated levels of posttraumatic stress were also associated with the occurrence of a

thromboembolism (Sumner, Kubzansky, Kabrhel et al., 2016). In a study of 134 men and women in VA medical clinics (mean ± SD age = 52 ± 15), PTSD was associated with an odds ratio of 3.7 for greater ICD-9 coded circulatory problems (Ouimette et al., 2004); gender did not moderate this relationship. Civilian women suffering from PTSD have been understudied with regard to CVD risk factors. Thus, there is a need to investigate the potential cardiovascular manifestations of trauma among young women, prior to the development of CVD, in order to improve understanding of the mechanisms that contribute to this relationship.

There are several hypotheses about specific behavioral, psychological, and physiological risk factors and mechanisms that may contribute to CVD in PTSD (e.g., Dedert et al., 2010; Gustafson & Sarwer, 2004; Harrington et al., 2010; Kubzansky et al., 2014; McShane & Zirkel, 2008; Robinson, 2000; Wiederman et al., 1999; Weiner & Stephens, 1999; Wonderlich et al., 2001). Although it is beyond the scope of the present paper to review all potential explanatory mechanisms with regard to PTSD/CVD risk associations, we review a number of the most prevalent behavioral/psychological and physiological theories/concepts. From a behavioral perspective, the approaches utilized by individuals with PTSD to cope with trauma and other stressors are sometimes physically unhealthy; in particular, weight management may be disrupted among individuals with PTSD (e.g., Dedert et al., 2010; Kubzansky et al., 2014). In a sample of civilian women, Dedert et al. (2010) found support for PTSD as a potential mediating variable in the relationship between childhood traumatic stress (childhood sexual and physical trauma) and weight outcomes as adults [body mass index (BMI) and hip-to-waist ratios]. Subsequently, Kubzansky et al. (2014) demonstrated a positive relationship between PTSD symptoms and the prospective risk of becoming overweight or obese in the large-scale Nurse’s Health Study II.

Given the relationship of physical activity to weight and CVD risk, assessing exercise patterns for women with PTSD could yield additional information about risk. Although, there is little evidence regarding physical activity levels in PTSD, some studies have indicated that PTSD has a negative impact on physical activity levels (e.g., de Assis et al., 2008; Winning et al., 2017). Further study of exercise levels in PTSD may provide greater insight into physical activity as a mechanism that may be associated with CVD. Smoking/tobacco use is another widely recognized health risk behavior associated with PTSD (Breslau et al., 2003; Fu et al., 2007). This research has outlined a causal effect of PTSD on smoking.

There is some evidence that unhealthy lipid levels and elevated blood pressure (BP) are CVD risks that occur with increased prevalence among individuals with PTSD (e.g., Dedert et al., 2013; Dennis et al., 2014; Filakovic et al., 1997; Kagan et al., 1999; Kibler et al., 2009; Maia et al., 2007; Sumner, Kubzansky, Roberts et al., 2016). Most of the research associating PTSD with unhealthy lipid profiles has been conducted with male combat veterans (e.g., Filakovic et al., 1997; Kagan et al., 1999; Maia et al., 2007). Among Croatian soldiers, elevated total cholesterol and triglycerides were observed in mental health patients with PTSD relative to patients without PTSD (Filakovic et al., 1997). Brazilian police officers with PTSD exhibited significantly higher total cholesterol, low-density lipoprotein (LDL) cholesterol, and triglycerides than those without PTSD (Maia et al., 2007). The

limited research examining lipids in relation to PTSD with female samples has yielded mixed results. Dedert et al. (2013) did not observe differences between women with and without PTSD for triglycerides, LDL levels or high-density lipoprotein (HDL) levels. In a sample of combined men and women, Dennis et al. (2014) observed significantly lower HDL levels between a PTSD group and non-PTSD controls, but no significant differences in triglycerides or LDL levels; when PTSD and depressive symptoms were placed on a continuum and combined as a latent variable in this study, the PTSD/depressive symptoms were negatively associated with HDL and positively associated with triglycerides. Given the scarcity of research related to PTSD and lipids with female samples, and the mixed findings, further examination is needed to evaluate whether lipid alterations are observed among women with PTSD. With regard to BP, data from the National Comorbidity Survey (Kibler et al., 2009) indicated greater rates of hypertension among women and men with PTSD compared with a no mental illness group and a group with MDD only (no PTSD). These differences in hypertension rates were significant when controlling for the relationship between age and hypertension rate. Subsequently, results from 47,514 civilian women in the Nurses' Health Study II indicated that elevated levels of posttraumatic stress were associated with the occurrence of hypertension (Sumner, Kubzansky, Roberts et al., 2016).

Taken together, the evidence suggests a convergence of behavioral and physiological risks that may help to explain the higher rates of CVD in women with PTSD. The physiological pathways involved in maladaptive stress responses involving autonomic, metabolic, and/or immune dysregulation (e.g., Brudey et al., 2015; Sumner et al., 2017; Thayer et al, 2017) may contribute to hypertension and cardiovascular events in PTSD. However, the underrepresentation of civilian women in most preliminary studies of PTSD-related CVD risk factors underscores the need for additional research with this population. Research focused on cardiovascular risk factors in young women with PTSD and no current CVD is critical in understanding pre-clinical progression of PTSD toward CVD. Studies of young, relatively healthy individuals with posttraumatic stress, permits detection of health behaviors or physiological risks prior to complication by most age-related or other physiological (e.g., menopausal factors in women) or illness-related confounds that occur later in life.

The present study was conducted to examine whether the number and relative levels of CVD risk factors are associated with posttraumatic stress symptom severity among young, trauma-exposed women. Most studies that have examined CVD risk factors in PTSD have not examined more than 1 or 2 risk variables, such as BMI or lipids. The proposed research permits assessment of a total CVD risk factor cluster by assessing several indices of CVD risk. Another major strength of the present study is the clinical assessment of PTSD symptoms and other psychiatric disorders using structured clinical interviews. Most studies of CVD risk in PTSD have either relied on PTSD screening instruments or short participant-rated or researcher-rated checklists. The use of structured interviews represents the only true method of establishing clinical PTSD severity.

Methods

Participants

A total of 54 young women ($M \pm SD$ age = 30 ± 8) completed the study. Participants were recruited via posting of flyers, advertisement in scientific and public websites, and referrals from a community mental health clinic. Inclusion criteria were 1) no history of major chronic illness, 2) pre-menopausal, and 3) not currently taking any medications that could significantly influence physiological measures (e.g., beta-blockers, lipid-lowering agents). Chronic illness was an exclusion criterion, because it complicates our focus on factors that may increase risk for developing CVD. Exclusion for most axis I disorders was implemented in an effort to focus our findings on phenomena associated with PTSD severity. The study was open to participants both with and without trauma histories. However, all of the participants reported exposure to at least one potentially traumatic event (see the Results for descriptive data on trauma exposure). This study was approved by the appropriate University IRB. All participants completed an informed consent procedure prior to inclusion.

Measures

Trauma Life Event Questionnaire (TLEQ).—Prior to the structured clinical interviews, participants completed an assessment of prior exposure to potentially traumatic events using the TLEQ (Kubany et al., 2000). The TLEQ is a brief survey used to assess a broad range of potentially traumatic events such as motor vehicle accidents, combat, physical assault, and sexual abuse. Events are described in behaviorally descriptive terms consistent with the language for the Diagnostic and Statistical Manual of Mental Disorders 4th edition - revised (DSM-IV) PTSD criterion A traumatic event (Kubany et al., 2000). The TLEQ has yielded good reliability, and good concurrent and predictive validity (Kubany et al., 2000).

Clinician-Administered PTSD Scale (CAPS).—The clinical interview to assess PTSD severity followed the format of the CAPS - an international standard in diagnostic assessments for PTSD (Blake et al., 1995; Blanchard et al., 1995; Hovens et al., 1994; King et al., 1998; Weathers et al., 1999). The CAPS is a semi-structured interview designed to assess current and lifetime PTSD, and has been shown to be reliable based on analyses of inter-rater reliability (.92-.99), test-retest reliability (.91-.95), and internal consistency (.73-.95) (Blake et al., 1995; Blanchard et al., 1995; Hovens et al., 1994; Weathers et al., 1999). Studies of the CAPS have also shown high inter-rater agreement and good convergent validity (Blake et al., 1995; Hovens et al., 1994; King et al., 1998; Weathers et al., 1999).

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID).—The clinical interview for other Axis I disorders followed the format of the SCID, research version (Basco et al., 2000). Studies have demonstrated superior validity of the SCID relative to standard unstructured interviews (e.g., Basco et al., 2000; Kranzler et al., 1996).

Fasting Lipid Profile.—The Cholestech LDX System (Cholestech Corp., Hayward, CA) was utilized to assess lipid profile using finger stick capillary whole blood (Cobbaert et al., 1993; Drimmer & Girgenti, 1995). The Cholestech LDX Analyzer is designed for point of service lipid analysis using finger stick capillary whole blood. The system uses reflectance

photometry to obtain lipid results that are available within 4 minutes. Lipid values derived from the Cholestech system are highly correlated with serum-derived reference values (*r* values = .96–.98) with approximate percent bias of 0–3% for total cholesterol, HDL, and LDL and 0–8% for triglycerides (Cobbaert et al., 1993; Drimmer & Girgenti, 1995; Polito et al., 2000). The following lipid levels were determined for the present study: 1) triglycerides, 2) total cholesterol, 3) HDL, and 4) LDL.

Body Mass Index.—Body weight relative to height was utilized for calculation of BMI and determination of obesity status.

Resting BP.—The participant sat quietly for 5 min after which 3 seated mercury sphygmomanometer-determined systolic and diastolic BP readings were taken at 2 min intervals from the dominant arm. The average of the last 2 measures provided an index of the participant's resting systolic and diastolic BP.

Secondary Self-Report Measures.—Basic demographic information was assessed by self-report including age, race/ethnicity, and family income. Physical activity was assessed by self-report using a 7-day recall originally developed for use in the Stanford Heart Prevention Program (Richardson, Ainsworth, Jacobs, & Leon, 2001; Sallis et al., 1985). Smoking status (current use) was also assessed by self-report.

Procedures

Data collection took place during two separate assessment sessions - a structured interview session and a laboratory assessment session. The interval between the interview and laboratory assessment was minimized (no more than 2 weeks) due to the possibility that symptom presentation could change over time. To control for menstrual cycle effects on the cardiovascular measures, participants completed the laboratory session during the follicular stage of the menstrual cycle (approximately days 5–9, depending on the participant's estimate of cycle length).

The structured interviews (i.e., CAPS, SCID) were conducted in a University-based psychological services center by advanced clinical psychology doctoral students under supervision of the first author. Interviewers received extensive, focused training consistent with the recommendations given by the designers of the CAPS and SCID from the first author prior to conducting the interviews. Each interview was audiotaped, and an interviewer who did not conduct the original interview provided ratings of the participants' symptoms offline for the purpose of calculating inter-rater reliability of the diagnostic assessments. The overall inter-rater reliability correlations were .87 for the CAPS and 0.69 for the SCID.

Participants presented to a psychophysiological assessment laboratory for the cardiovascular risk assessment. Separate written informed consent was required for this session. Prior to arriving at the laboratory, participants were asked to refrain from eating for 12 hours, caffeine and strenuous exercise for 3 hours, and smoking for 30 minutes prior to this session. When the participant arrived, compliance with restrictions was assessed. Noncompliance would result in rescheduling. However, there was only one instance of rescheduling due to noncompliance (coffee consumed in the morning before the scheduled session). In general,

reminder calls conducted the day before each session were effective in promoting compliance with the restrictions. This session began early in the morning (approx. 8:00 am) due to the requirement of fasting for the lipid assessment. A standardized light breakfast snack (e.g., granola bar and water or juice) was provided after the lipid assessment. For the BP assessment, the participant sat quietly for 5 min after which 3 seated mercury sphygmomanometer-determined systolic and diastolic BP readings were taken at 2 min intervals from the dominant arm. After the physical risk factor measures (i.e., height, weight, lipids, BP) were completed, the brief self-report surveys were administered. The research assistants were present and available to answer any questions of the participants throughout the laboratory session.

Data Reduction and Analyses

Preliminary analyses were conducted to check for outliers and examine distributions. Univariate correlation coefficients (Pearson) were calculated for the purpose of evaluating the associations of PTSD severity with the CVD risk variables. The qualitative cutoffs for determining the total number of CVD risk factors were consistent with standard guidelines (Flegal et al., 2013; Whelton et al., 2017) established for traditional risk factors (i.e., BMI > 25, total cholesterol > 200, HDL < 40, LDL > 130, triglycerides > 150, systolic BP ≥ 130, diastolic BP ≥ 80), no exercise in a typical week, and current use of cigarettes. The dependent variable for the analysis involving total number of CVD risks consisted of non-normally distributed count data (Poisson distribution). To approximate a normal distribution and stabilize the variances, we followed the standard recommendation to use a log(y+1) transformation for Poisson distributions with a mean of less than 3.0 with zero-counts included (Hinkelmann & Kempthorne, 2005; Kuehl, 1999). Follow-up analyses were conducted for significant univariate associations, adjusting for the potential confounding effects of age and oral contraceptive use on the CVD risks (nine of the participants were using oral contraceptives).

Results

Descriptive Data

Participants ranged in age from 19–49 ($M \pm SD = 30 \pm 8$). The ethnic breakdown of the sample was as follows: 56% Caucasian, 21% African American, 19% Hispanic, and 4% other. One third of participants reported family income less than $20,000, another 37% reported $20,000–50,000, 21% reported $50,000–100,000, and 9% reported over $100,000. With regard to education, 26% reported high school or equivalent as the terminal degree, 36% reported a Bachelor's degree, 19% reported Associate's, 15% reported graduate or professional degrees, and 3% reported "other". Only 7% of the sample were sedentary (as defined by no exercise in a typical week), and 21% reported current cigarette use. Overall, 69% of participants had at least one CVD risk factor and 40% exhibited more than one CVD risk factor. Descriptive data for the continuous cardiovascular risk variables and PTSD symptoms are depicted in Table 1.

With regard to trauma histories, the most distressing "index" events consisted of sexual assault/abuse (24%), physical assault/abuse/victim of domestic violence (18%), witnessing

violence (12%), motor vehicle accident (4%), natural disaster (4%), sudden unexpected death of a loved one (20%), stalking (4%), abortion (4%), sexual harassment (2%), and other traumas (e.g., jailed/lost in foreign country) or life-threatening accidents requiring hospitalization (8%). This was a sample with high levels of trauma exposure protracted over an extended period - in terms of frequency, all participants reported exposure to more than one potentially traumatic event/incident ($M \pm SD = 13 \pm 11$). The PTSD symptom severity varied across the full range, and not all participants endorsed PTSD symptoms. Of the participants with the highest PTSD severity, 14 evidenced full PTSD criteria, and 5 women had significant subthreshold PTSD symptoms but did not meet full criteria (≥ 4 symptoms with ≥ 1 re-experiencing).

Primary Analyses

Posttraumatic stress severity was associated with lower HDL levels ($r = -.40$, $p < .01$) and higher triglycerides ($r = .36$, $p < .05$), but was not significantly associated with total cholesterol ($r = .12$) or LDL levels ($r = .15$). The posttraumatic stress severity scores were also significantly associated with greater systolic BP ($r = .48$, $p < .01$) and diastolic BP ($r = .30$, $p < .05$), greater BMI ($r = .62$, $p < .001$), and a greater number of total CVD risk factors ($r = .34$, $p < .05$). The associations of PTSD severity with systolic BP and BMI are illustrated in Figures 1 and 2, respectively.

Adjusting for the potential confounding effects of age, the associations of posttraumatic stress severity with HDL levels ($r = -.40$, $p < .01$), triglycerides ($r = .36$, $p < .05$), systolic BP ($r = .45$, $p < .01$) and BMI ($r = .61$, $p < .001$) remained significant. After adjusting for age, the association of PTSD severity with total CVD risk factors only approached significance ($r = .30$; $p = .05$), and the association of PTSD severity with diastolic BP was not significant ($p = .397$). The analyses adjusting for oral contraceptive use as a potential confound did not impact the significance of CVD risk factor/PTSD severity associations, with the exception of diastolic BP - this correlation was no longer significant after controlling for oral contraceptive use ($p = .468$).

Post-hoc exploratory analyses were conducted to determine whether the type of trauma (assaultive/interpersonal vs. non-assaultive) were systematically related to the CVD risk outcomes. Although participants identifying assaultive trauma had significantly higher PTSD severity, and tended to have greater levels of CVD risk across the outcome variables (aside from diastolic BP), none of these differences in CVD risk factors were statistically significant (see Table 2).

Discussion

Among women with no diagnosed medical illnesses, PTSD severity was associated with a greater number of CVD risks than controls. The comprehensive assessment of CVD risk factors in the present study is a relative strength that permitted quantification of this risk factor total index. The PTSD-related CVD risks observed in prior studies of predominantly male veterans appear to be salient health risks for women. The present findings are consistent with recent studies of posttraumatic stress and CVD risks among women (Kubzansky et al., 2014; Sumner, Kubzansky, Roberts et al., 2016). With a mean age of 30

in the present study, our sample is younger than other studies of premorbid CVD risk factors; this factor is significant in emphasizing the early nature of CVD risks that may in part derive from unhealthy behaviors, and may also begin to develop as early as childhood for those who experience early traumatic events.

For some of the specific risk variables (i.e., BMI, BP, triglycerides), there were significant associations between levels of CVD risk and PTSD symptom severity. These findings generally reflected effects in the moderate or small-to-moderate range. The finding that greater PTSD severity was associated higher BMI is consistent with prior research (e.g., Kubzansky et al., 2014; Scott et al., 2008). It is notable that the largest effect was for BMI and PTSD severity in the present study; this finding underscores the extent of the weight management problem associated with PTSD. Therefore, further examination is needed with regard to theories concerning overweight and obesity among women with abuse histories and PTSD. With regard to behaviors/factors that may influence body weight, several trauma types have been associated with binge eating to cope with daily stressors (Harrington et al., 2010; Wonderlich et al., 2001). Binging may represent a means of inducing dissociation or focusing attention away from stressful thoughts and negative emotions (McShane & Zirkel, 2008). Another salient construct for women with PTSD is the effect of negative self-image on body weight. Women who have been abused commonly have a disrupted sense of self-worth and often experience disgust regarding their own bodies; these perceptions can be manifested in diminished self-care, including overeating and physical inactivity (Robinson, 2000). Few studies have explored physical activity levels among women with PTSD. However, Winning et al. (2017) tracked physical activity of women over more than 20 years using data from Nurse's Health Study, and found that women with high levels of PTSD symptoms exhibited steep declines in physical activity over the study period (compared to women with no PTSD symptoms who had steady levels on average). Another construct related to weight-management in PTSD is the desire to be overweight, which serves as a protective mechanism for some sexual trauma victims who may consider themselves less attractive to other potential perpetrators - this phenomenon has been referred to as sexual barrier weight (Gustafson & Sarwer, 2004; Wiederman et al., 1999; Weiner & Stephens, 1999). Given the literature on eating and other factors that may influence body weight for women with PTSD, further examination of obesity/BMI as a preventable CVD risk in this population is needed.

Our findings concerning BP and lipids in relation to PTSD severity are consistent with prior studies (Filakovic et al., 1997; Kagan et al., 1999; Maia et al., 2007), and further expand these findings to women. In large samples from the US National Comorbidity Study (Kibler et al., 2009) and the Nurses' Health Study II (Sumner, Kubzansky, Roberts et al., 2016), elevated levels of posttraumatic stress were associated with the occurrence of hypertension. The finding in the present study that young women with greater PTSD severity had higher BP levels (within the normal range) supports the possibility that early BP elevations may eventually manifest in hypertension. Although lipid levels are determined by physiological factors, in addition to diet, research of this issue generally indicates behavioral factors such as diet and exercise confer at least an interactive effect with genes (e.g., Cooper et al., 1992; Vinson et al., 2008). The findings that levels of triglycerides and HDL were significantly associated with PTSD severity in the present study, have the most apparent implications for

dietary behaviors. Although it is not yet clear from the PTSD literature, it is generally accepted that disruption in these lipid measures results from the digestion of fats from food. Therefore, there is a need for further research of the behavioral aspects (i.e., dietary factors) that impact lipid levels among young women with PTSD.

Primary limitations of the present study include the cross-sectional design and the limited number of participants who displayed clinical levels on some of the CVD risk factors (e.g., systolic BP). Nonetheless, most of the participants had at least one CVD risk factor and nearly half exhibited more than one CVD risk factor, indicating the potential for many of the women in this relatively young sample to progress toward greater risk later in life. Identifying risk factors (or even elevations in the normal range) among young adults, adolescents, and children, has implications for early identification of these problems and timely intervention studies and prevention programs. Thus, despite its limitations, the present study provides data with practical implications. We utilized a comprehensive assessment of CVD risk variables, and the findings may assist researchers in further understanding the CVD risks and enhancing prevention and health-promotion for young women with PTSD.

The cardiovascular health risks that are associated with PTSD are not directly addressed by traditional PTSD treatments - clinicians are generally trained to utilize evidence-based treatments that focus on the mental health symptoms. Therefore, this area of research has implications for the multidisciplinary training of clinicians. Ideally, clinical trainees could benefit from increased focus on behavioral medicine approaches to managing health risks among individuals with PTSD.

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Highlights

- Little research, particularly among women, has documented mechanisms by which PTSD might confer cardiovascular disease (CVD) risk during early adulthood.
- This study was designed to examine whether the number and relative levels of CVD risk factors are associated with posttraumatic stress symptom severity among young, trauma-exposed women.
- Posttraumatic stress severity was associated with lower high-density lipoprotein levels and higher triglycerides, greater systolic and diastolic blood pressure, greater body mass index, and a greater number of total CVD risk factors.
- These findings support the contention that, in the absence of medical illness, posttraumatic stress symptom severity among young women is associated with several CVD risk factors early in life.

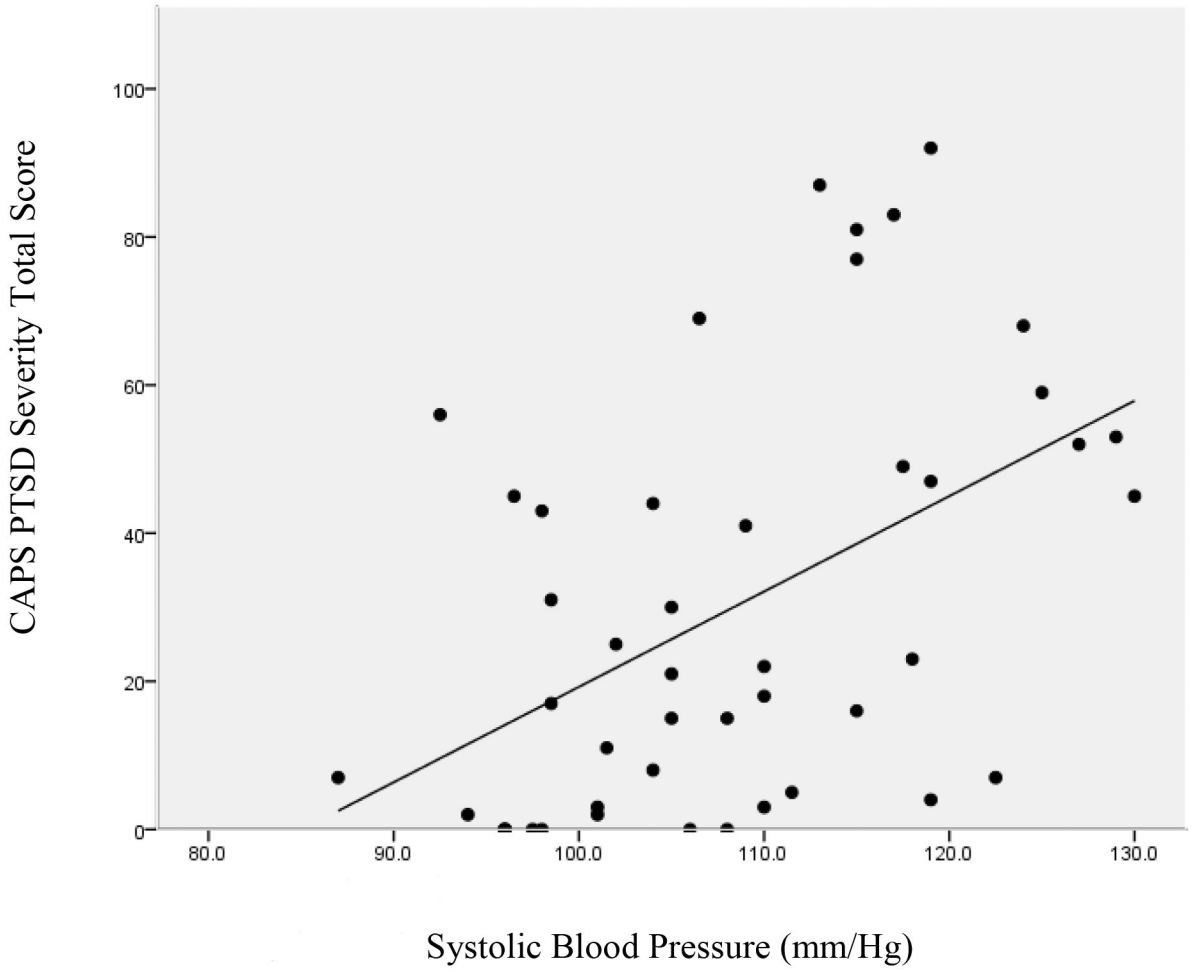

Figure 1.
The correlation between PTSD severity and systolic blood pressure.

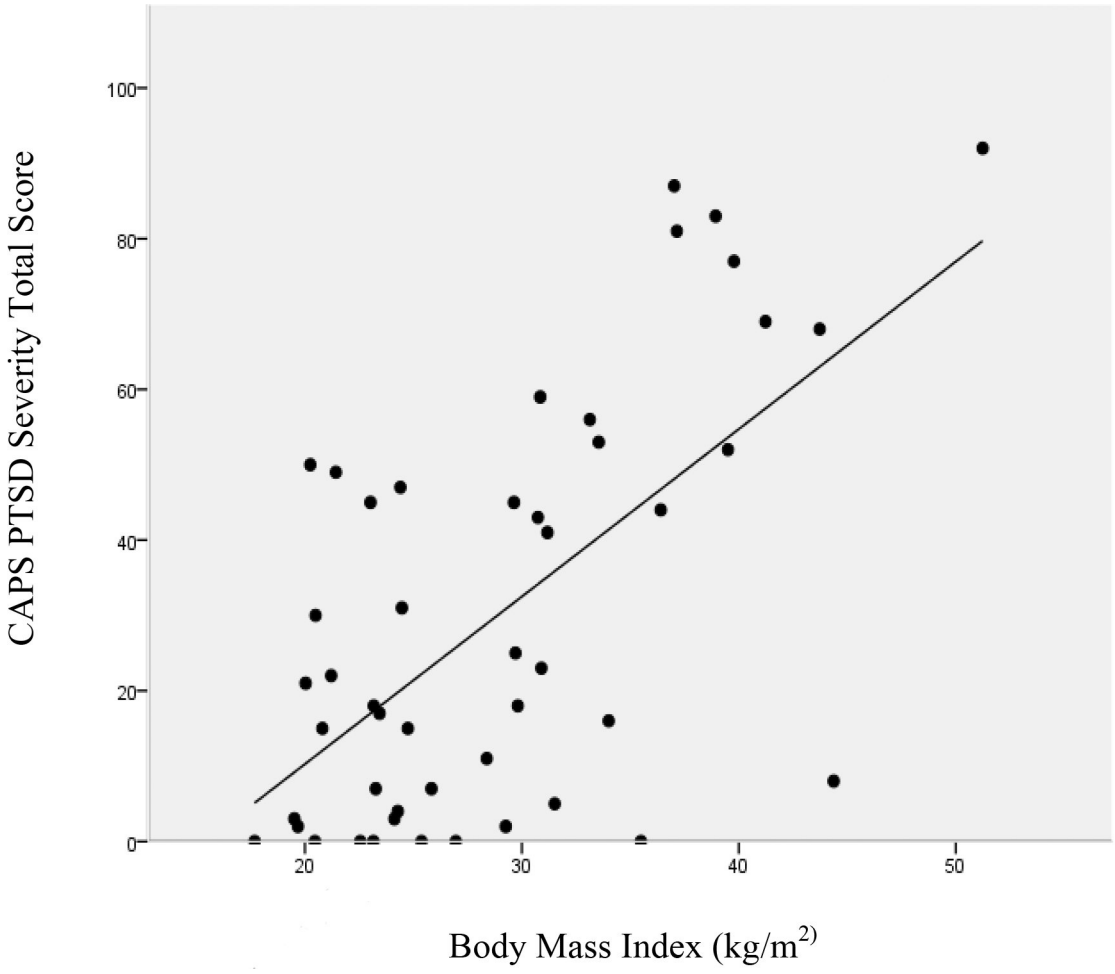

Figure 2.
The correlation between PTSD severity and body mass index.

Table 1.

Descriptive data for primary study variables.

Risk Variable	Mean	SD	Range	% clinically elevated
PTSD Total CAPS Score	25.9	30.1	0 – 92	
Number of CVD Risks	1.8	2.0	0 – 8	
Body Mass Index	33.1	8.4	17.7 – 51.2	50%
Triglycerides	95.4	72.8	40 – 384	12%
Total Cholesterol	174.0	36.9	114 – 311	17%
HDL Cholesterol	52.1	15.6	28 – 98	24%
LDL Cholesterol	102.0	36.2	43 – 212	14%
SBP	107.6	10.3	87 – 130	2%
DBP	69.1	8.3	48.5 – 92.5	10%

Abbreviations: Cardiovascular disease (CVD); Clinician-Administered PTSD Scale (CAPS); High-density lipoproteins (HDL); Low-density lipoproteins (LDL); Systolic blood pressure (SBP); Diastolic blood pressure (DBP)

Table 2.

Descriptive data for primary study variables by trauma type (assaultive/interpersonal vs. non-assaultive).

	Assaultive		Non-assaultive		
Risk Variable	**Mean**	**SD**	**Mean**	**SD**	***p* value**
PTSD Total CAPS Score	36.8	29.0	14.7	27.4	$p = .009$
Number of CVD Risks	2.0	2.0	1.4	1.7	$p = .256$
Body Mass Index	29.4	8.6	27.9	7.5	$p = .482$
Triglycerides	100.3	72.4	95.3	72.1	$p = .813$
Total Cholesterol	176.3	35.6	172.2	40.3	$p = .709$
HDL Cholesterol	48.7	16.0	55.7	15.2	$p = .118$
LDL Cholesterol	107.5	34.6	97.5	37.4	$p = .328$
SBP	108.7	11.4	106.6	9.5	$p = .473$
DBP	68.5	9.0	69.6	7.9	$p = .623$

Abbreviations: Cardiovascular disease (CVD); Clinician-Administered PTSD Scale (CAPS); High-density lipoproteins (HDL); Low-density lipoproteins (LDL); Systolic blood pressure (SBP); Diastolic blood pressure (DBP)