Trauma Exposure, *DSM-5* Posttraumatic Stress, and Binge Eating Symptoms:
Results From a Nationally Representative Sample

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ABSTRACT

Objective: To evaluate the association between trauma exposure type, number and type of *DSM-5* posttraumatic stress disorder (PTSD) symptoms, and binge eating symptoms.

Methods: Data were analyzed from the National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III: 2012–2013), which surveyed a nationally representative sample of 36,309 non-institutionalized US civilians aged 18 years and older. Trauma exposure, PTSD, and binge eating symptoms were assessed using the Alcohol Use Disorder and Associated Disabilities Interview Schedule, *DSM-5* Version (AUDADIS-5). Three groups were compared: trauma-exposed individuals with no/low PTSD symptoms, those with subthreshold PTSD, and those with threshold PTSD.

Results: Among both men and women, zero-inflated negative binomial regression analyses demonstrated that individuals with subthreshold and threshold PTSD endorsed a greater number of binge eating symptoms than trauma-exposed individuals with no/low PTSD symptoms (unstandardized coefficient [B] range, 0.33–0.92). Relative to witnessing trauma, combat-related trauma was associated with fewer binge eating symptoms in men (B = −0.62, SE = 0.17), while child maltreatment was associated with a greater number of binge eating symptoms in women (B = 0.28, SE = 0.12). Negative cognitions and mood symptoms in particular were associated with a greater number of binge eating symptoms (B range, 0.09–0.10).

Conclusions: Subthreshold and threshold PTSD are associated with binge eating symptoms in both men and women. Similar to drugs and alcohol, binge eating may be used as a strategy to alleviate distressing symptoms of PTSD.

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Posttraumatic stress disorder (PTSD), a psychiatric disorder that can develop following exposure to a traumatic event, has a lifetime prevalence of approximately 6.1% to 7.8% in the US general adult population.[1–4] The disorder disproportionately affects women and is strongly associated with multiple comorbid mental health conditions and functional difficulties.[1,5] Trauma-exposed individuals and those who develop PTSD symptoms have been found to have increased engagement in health-risk behaviors, including drug and alcohol misuse and overeating.[5,6] These maladaptive behaviors may be used to help mitigate or manage stressful emotions and symptoms associated with posttraumatic stress.[7,8]

To date, behaviors and conditions related to excessive eating, including overeating, food addiction, and binge eating disorder, have been understudied in relation to trauma exposure and PTSD symptoms. It has been theorized that binge eating behavior can be used as a form of self-medication, similar to substance misuse, to alleviate distress caused by PTSD symptoms.[9–11] Prior research[12–14] has found high rates of comorbidity between binge eating disorder and individuals with PTSD symptoms. Recent research has also examined the relationship between food addiction (ie, eating more food than intended, being unsuccessful in reducing/stopping the behavior, and continuing the behavior despite negative consequences) and PTSD.[15] However, food addiction is a construct related to, but distinct from, binge eating that is based on criteria for substance abuse from the *DSM-5*.[16] Like with binge eating, a higher prevalence of food addiction has been demonstrated with increasing PTSD symptoms among women.[9] Both binge eating and food addiction have been shown to play a role in increasing rates of obesity and higher body mass index (BMI), which may partly account for the increased risk of physical health conditions, such as cardiovascular disease, diabetes, and metabolic syndrome, observed among individuals with PTSD.[8,15,17–20]

There are several limitations to previous studies examining associations between binge eating symptoms and PTSD. First, most studies have used non-representative samples comprising mostly females. Only 1 known study, by Mitchell et al,[21] examined associations between eating disorders and PTSD in both sexes separately using a nationally representative sample, and the authors found higher rates of PTSD in both men and women with eating disorders compared to those without them. Most individuals

Clinical Points

- Men and women with subthreshold and threshold posttraumatic stress disorder (PTSD) endorsed a greater number of binge eating symptoms than trauma-exposed individuals with no/low PTSD symptoms.
- Negative cognitions and mood symptoms of PTSD were particularly associated with a higher number of binge eating symptoms.
- Understanding associations between trauma exposure, PTSD, and binge eating behavior could lead to the development of integrated therapies to help patients presenting with both PTSD-related and binge eating symptoms.

with eating disorders in that study had also been previously exposed to interpersonal trauma, suggesting that certain types of trauma exposure may be associated with a higher likelihood of binge eating disorder. In a recent nationally representative study examining maladaptive eating typologies and physical conditions among individuals with PTSD, our group[22] identified a probable higher prevalence of binge eating disorder among those with PTSD than in the entire sample. However, we did not test this difference statistically in men and women separately or examine associations between PTSD characteristics (eg, trauma type, symptom clusters) and binge eating symptoms. Second, few previous studies have assessed PTSD according to *DSM-5* diagnostic criteria. Third, most studies have used self-report measures to assess PTSD and binge eating rather than structured, diagnostic interviews.[9] Finally, no studies have examined associations between individual PTSD symptom clusters and binge eating symptoms. Characterization of PTSD symptom clusters linked to binge eating symptoms may help inform interventions for binge eating targeted specifically toward individuals reporting specific PTSD symptoms.

The current study addressed these limitations by analyzing data from a large, nationally representative US sample in whom PTSD was diagnosed based on *DSM-5* criteria using structured clinical interviews. Specifically, we examined associations between trauma exposure, PTSD severity (ie, subthreshold and threshold), and number of binge eating symptoms in both sexes; type of index trauma and number of binge eating symptoms; and each of the 4 PTSD symptom clusters and number of binge eating symptoms among trauma-exposed men and women.

METHODS

Participants

The National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III; 2012–2013) is a national survey sponsored by the National Institute on Alcohol Abuse and Alcoholism (NIAAA). It included adults aged 18 years or older living in the United States, including Alaska and Hawaii. Excluded from the survey were persons that were institutionalized or on active duty within the military. The

NESARC-III used multistage sampling to randomly select 43,364 eligible individuals across all 50 states. The final sample comprised 36,309 participants, resulting in a response rate of 60.1%.[23] Surveys were conducted face-to-face by trained lay personnel using computer-assisted interviews.[24] This study was approved by the University of Manitoba Health Research Ethics Board and the NESARC-III access committee.

Assessments

Trauma exposure and PTSD. Respondents were provided a list of 34 possible traumatic events and were asked whether they had ever personally experienced or witnessed or were repeatedly exposed to details of any such event in their lifetime or learned that such an event happened to a close friend or relative. Respondents were classified as trauma-exposed if they endorsed at least 1 of these events.

PTSD symptoms were assessed using the Alcohol Use Disorder and Associated Disabilities Interview Schedule, *DSM-5* Version (AUDADIS-5),[25] which used *DSM-5* diagnostic criteria to assess mental disorders. The PTSD module of the AUDADIS-5 has fair to modest concordance (κ = 0.34–0.46) with the clinician-administered Psychiatric Research Interview for Substance and Mental Disorders-5 (PRISM-5).[25] PTSD symptoms were assessed in relation to participants' worst lifetime traumatic event reported. We categorized participants into 1 of 4 groups based on their trauma exposure and endorsement of lifetime PTSD symptoms: (1) no trauma exposure (for descriptive purposes), (2) trauma exposure with no/low PTSD symptoms (defined as meeting 1 or 0 PTSD symptom criteria for each cluster B–E), (3) subthreshold PTSD symptoms (defined as meeting 2 or more PTSD symptom criteria for clusters B–E without meeting full criteria for PTSD), and (4) threshold PTSD (defined as meeting all *DSM-5* criteria A–H).[26] However, the symptom duration and functional impairment criteria (ie, F and G) were assessed only among those in the NESARC-III who met criteria B through E and therefore were not incorporated into the operationalization of subthreshold PTSD.

Binge eating symptoms. Lifetime binge eating disorder symptoms were assessed using the AUDADIS-5. Due to the relatively low prevalence of binge eating disorder among this sample (0.8%), psychometric characteristics of the AUDADIS-5 for binge eating disorder could not be assessed. However, recent research[27,28] has been published that included NESARC-III eating disorder variables in analyses, further supporting the use of the AUDADIS-5 for *DSM-5* binge eating symptoms. Within the interview, 3 screening questions were asked of all respondents, including "Have you ever eaten an unusually large amount of food within any 2-hour period, not including the holidays?" "Was there ever a time when you ate an unusually large amount of food on average at least once a week for at least 3 months?" and "During any time like this when you ate an unusually large amount of food did you feel that you couldn't stop eating or control how much or what you were eating?" Participants responding "No" to these symptoms were given "0" values

for the remaining symptoms assessed. Individuals who endorsed having ever eaten an unusually large amount of food were also asked about whether during any of these times they had ever eaten faster than usual, eaten until uncomfortably full, eaten when not hungry, eaten alone to avoid embarrassment, and felt disgusted, depressed, or guilty about eating so much. A variable of total number of binge eating symptoms with a range of 0 to 8 was created to reflect binge eating severity.

Covariates. Sociodemographic covariates included in analyses were age (continuous), race/ethnicity (white, black, Hispanic, other), household income (income ≤ $19,999, $20,000–$39,999, $40,000–$69,999, ≥ $70,000), highest education level achieved (less than high school, high school, some post-secondary education and higher), and marital status (married/cohabitating, separated/divorced/widowed, never married). A dichotomous number-of-traumas variable (single vs multiple trauma exposure) as well as index trauma type (witnessed event, combat-related, child mistreatment, assaultive violence, injurious/shocking event, and other) were also included as covariates. Finally, a dichotomous summary variable of any lifetime mental disorder other than PTSD was created and used as a covariate. This variable included any substance use, mood, anxiety, and personality disorder (borderline, schizotypal, and antisocial personality disorder were assessed). These disorders were also assessed using the AUDADIS-5, which has been shown to have good concordance with other clinician-administered interviews.[25,29]

Statistical Analysis

Analyses were conducted using STATA Version 13 (StataCorp; College Station, Texas), with the Taylor Series Linearization variance estimation technique employed to account for the complex sampling design of the NESARC-III. Survey data in the NESARC-III were weighted to ensure that the sample collected was representative of the US general adult population. Weights were calibrated against 2012 US Census data.[30] Data analysis proceeded in 4 steps. First, we used χ^2 analyses to examine differences between the 4 trauma/PTSD groups on sociodemographic variables, binge eating variables, and any other mental disorder. Analyses of variance (ANOVAs) were used to examine group differences in age. Second, we used zero-inflated negative binomial (ZINB) regression analysis, an appropriate approach when the dependent variable is a count variable with an excess number of zero values and an overdispersed distribution,[31] to examine associations between trauma/PTSD groups (independent variable; trauma exposure with no/low PTSD symptoms, subthreshold PTSD, or threshold PTSD) and binge eating symptoms (dependent variable). The reference group for these analyses was the most prevalent group (ie, trauma-exposed respondents with no/low PTSD symptoms). We excluded the no trauma group from our independent variable to include trauma-related covariates (described subsequently); however, we included a secondary comparison examining the no trauma group compared to

the same reference group while excluding the trauma-related covariates. Third, we examined the relationship between type of index trauma and number of binge eating symptoms among trauma-exposed respondents using ZINB regression analyses. A categorical variable of 6 trauma type groups based on respondents' worst or index lifetime traumatic event was used: combat-related, child mistreatment, assaultive violence, injurious/shocking event, witnessed event, and other, consistent with previous categorizations.[32–34] The "other" category included any reported trauma not included in the other traumatic events assessed. The reference group for trauma type was the most prevalent group, consisting of individuals who had witnessed a trauma. Fourth, we examined associations between PTSD symptom clusters and number of binge eating symptoms among trauma-exposed respondents using ZINB regression analyses. All symptom cluster variables were entered simultaneously into the models along with covariates.

To examine which individual symptoms of each cluster were independently associated with binge eating symptoms, a post hoc analysis was conducted by placing the individual symptoms of each cluster simultaneously into a model with all the covariates. To account for multiple testing, we adjusted the α to .01 in the post hoc analyses to reduce the risk of type I error. All analyses were conducted in men and women separately and 2 models were tested; one adjusted for sociodemographic variables, number of traumas, and index trauma type (with the exception of the index trauma analysis) and a second model additionally adjusted for any other lifetime mental disorder. Analyses examining the associations between type of index trauma and binge eating symptoms were also adjusted for number of PTSD symptoms.

RESULTS

Table 1 shows sociodemographic characteristics by sex and trauma/PTSD groups. Across all 4 groups, in both sexes, participants were predominantly white (range, 56.3%–72.0%), had post-secondary education (range, 51.5%–68.7%), and were married or cohabitating (range, 48.1%–64.3%). Mean age ranged from 43.7 to 47.5 years among men and from 42.9 to 48.5 years among women. Chi-square tests and ANOVAs showed significant differences (*P* < .05) for sociodemographic factors across all variables between the 4 trauma/PTSD groups. The prevalence of endorsing at least 1 binge eating symptom, lifetime binge eating disorder, and any other mental disorder increased as a function of increasing PTSD symptom severity for both sexes. For example, the prevalence of endorsing ≥ 1 binge eating symptom was 11.7% among men and 5.5% among women with no trauma exposure; these rates were 40.0% among men and 25.7% among women with PTSD. Lifetime binge eating disorder prevalence was 0.2% among men and among women with no trauma exposure; these rates increased to 2.7% among men and 4.7% among women with PTSD.

Table 1. Characteristics Across Trauma/PTSD Groups in the NESARC-III[a]

	Men				Women			
Variable	No Trauma Exposure	Trauma Exposed[b]	Subthreshold PTSD[c]	Threshold PTSD	No Trauma Exposure	Trauma Exposed[b]	Subthreshold PTSD[c]	Threshold PTSD
Overall	5,282 (31.1)	6,490 (44.4)	3,207 (20.4)	678 (4.1)	6,833 (31.2)	6,331 (33.5)	5,344 (27.1)	1,661 (8.1)
Age, mean (SD), y	43.7 (0.32)	47.5 (0.35)	45.8 (0.40)	44.2 (0.67)	46.6 (0.36)	48.5 (0.28)	47.0 (0.33)	42.9 (0.46)
Race/ethnicity								
White	2,356 (57.1)	3,899 (72.0)	1,840 (70.0)	355 (64.6)	2,866 (56.3)	3,600 (69.9)	3,053 (69.7)	958 (70.3)
Black	1,160 (12.4)	1,138 (9.5)	651 (11.5)	158 (14.3)	1,758 (14.7)	1,346 (11.3)	1,132 (12.0)	322 (10.9)
Hispanic	1,382 (22.5)	1,022 (11.6)	521 (12.1)	133 (15.9)	1,734 (20.2)	988 (11.1)	888 (12.2)	293 (12.1)
Other	384 (8.0)	431 (6.9)	195 (6.3)	32 (5.2)	475 (8.8)	397 (7.6)	271 (6.0)	88 (6.7)
Education								
Less than high school	1,138 (19.2)	720 (9.3)	436 (12.3)	120 (17.3)	1,333 (17.1)	690 (9.1)	678 (11.0)	286 (16.0)
High School	1,625 (29.3)	1,650 (24.3)	938 (28.1)	200 (30.1)	2,032 (27.7)	1,469 (22.2)	1,324 (24.3)	431 (24.4)
Post-secondary education	2,519 (51.5)	4,120 (66.4)	1,833 (59.5)	358 (52.7)	3,468 (55.2)	4,172 (68.7)	3,342 (64.7)	944 (59.6)
Marital Status								
Married/cohabitating	2,507 (57.7)	3,436 (64.3)	1,507 (58.6)	270 (49.0)	2,980 (54.8)	3,008 (59.9)	2,254 (53.1)	628 (48.1)
Separated/divorced/widowed	961 (12.6)	1,244 (13.4)	762 (17.6)	184 (23.4)	1,840 (21.8)	1,873 (22.7)	1,794 (27.7)	595 (28.9)
Never married	1,814 (29.7)	1,810 (22.3)	938 (23.9)	224 (27.6)	2,013 (23.4)	1,450 (17.3)	1,296 (19.2)	438 (23.0)
Household income								
≤$19,999	1,349 (20.0)	1,286 (14.6)	802 (20.0)	228 (28.5)	2,298 (25.9)	1,565 (18.4)	1,580 (22.6)	656 (31.0)
$20,000–39,999	1,492 (25.6)	1,503 (20.1)	867 (24.4)	173 (24.2)	1,955 (25.8)	1,676 (22.5)	1,488 (25.8)	457 (26.6)
$40,000–69,999	1,195 (23.2)	1,568 (23.9)	740 (23.5)	157 (24.2)	1,346 (22.4)	1,401 (22.5)	1,070 (21.4)	301 (21.3)
≥$70,000	1,246 (31.2)	2,133 (41.4)	798 (32.0)	120 (23.1)	1,234 (25.9)	1,689 (36.6)	1,206 (30.2)	247 (21.0)
Endorsed ≥1 binge eating symptom	542 (11.7)	1,249 (19.9)	895 (29.8)	259 (40.0)	394 (5.5)	613 (8.9)	831 (15.8)	400 (25.7)
Lifetime binge eating disorder	12 (0.2)	14 (0.2)	37 (1.1)	19 (2.7)	16 (0.2)	39 (0.6)	76 (1.3)	70 (4.7)
Lifetime any other mental disorder[d]	2,227 (43.4)	3,714 (57.0)	2,571 (79.8)	637 (94.4)	2,350 (36.0)	3,017 (48.6)	3,973 (75.4)	1,549 (93.6)

[a]Values are shown as n (%) unless otherwise noted. Data were missing for 483 individuals (1.3%) across the 4 trauma groups.
[b]Trauma exposed = endorsing at least 1 lifetime trauma and 1 criterion or fewer from *DSM-5* clusters B–E for lifetime PTSD.
[c]Subthreshold PTSD = endorsing at least 1 lifetime trauma and 2 or more criteria from *DSM-5* clusters B–E for lifetime PTSD without meeting threshold PTSD.
[d]Lifetime any other mental disorder category includes mood, anxiety, substance use, and personality disorders. Chi-square analyses and analysis of variance showed significant differences (*P* < .05) between all 4 trauma/PTSD groups for all sociodemographic variables.
Abbreviations: NESARC-III = National Epidemiologic Survey on Alcohol and Related Conditions-III, PTSD = posttraumatic stress disorder.

Table 2. Relationships Between Trauma/PTSD Groups and Binge Eating Symptoms[a]

	Model 1[b]				Model 2[c]			
	Men		Women		Men		Women	
PTSD Group	B (SE)	*P* Value	B (SE)	*P* Value	B (SE)	*P* Value	B (SE)	*P* Value
Subthreshold	0.50 (0.06)	<.001	0.52 (0.09)	<.001	0.39 (0.06)	<.001	0.33 (0.09)	<.001
Threshold	1.08 (0.08)	<.001	1.07 (0.12)	<.001	0.92 (0.09)	<.001	0.81 (0.13)	<.001

[a]Trauma-exposed individuals without PTSD served as the reference group.
[b]Model 1 = zero-inflated negative binomial regression count model adjusted for sociodemographics (BMI, age, race/ethnicity, education, marital status, income), number of traumas, and index trauma type; zero-inflated model adjusted for age and BMI.
[c]Model 2 = zero-inflated negative binomial regression count model adjusted for sociodemographics, number of traumas, index trauma type, and any other mental disorder (mood, anxiety, substance, personality); zero-inflated model adjusted for age and BMI.
Abbreviations: B = nonstandardized coefficient (β), BMI = body mass index, PTSD = posttraumatic stress disorder.

Table 2 shows associations between the trauma exposure and PTSD groups and binge eating symptoms. Results of the most stringent ZINB regression models revealed that, in both sexes, individuals in the subthreshold and threshold PTSD groups reported a greater number of binge eating symptoms relative to the trauma-exposed, no/low PTSD symptoms group (unstandardized coefficient [B] range, 0.39–0.92 in men, 0.33–0.81 in women; all *P* values <.001). Results of our secondary comparison, including individuals reporting no lifetime trauma exposure (and removing trauma-related covariates), demonstrated fewer binge eating symptoms in this group (B = −0.41, *P* <.001 in men; B = −0.35, *P* = .001 in women) compared to the trauma-exposed group.

Table 3 shows associations between the type of index trauma reported and number of binge eating symptoms among trauma-exposed individuals only. The most stringent ZINB regression model indicated that in men, combat-related index traumas were associated with fewer binge eating symptoms relative to witnessing trauma (B = −0.62, SE = 0.17, *P* <.001). In women, child maltreatment was associated with a greater number of binge eating symptoms relative to witnessing trauma (B = 0.28, SE = 0.12, *P* = .028).

Table 4 shows the relationship between PTSD symptom clusters and number of binge eating symptoms among trauma-exposed individuals, stratified by sex. The most stringent ZINB regression model showed that in men, greater severity of negative cognitions and mood (B = 0.09, SE = 0.03, *P* = .001) and alterations in arousal and reactivity (B = 0.09, SE = 0.03, *P* = .005) were associated with a greater number of binge eating symptoms. In women, negative cognitions and mood was the only PTSD cluster associated with number of binge eating symptoms (B = 0.10, SE = 0.03, *P* = .001). A post

Table 3. Relationships Between Worst Trauma and Binge Eating Symptoms Among Trauma-Exposed Individuals[a,b]

| | Model 1[c] | | | | Model 2[d] | | | |
| | Men | | Women | | Men | | Women | |
Trauma Type	B (SE)	P Value	B (SE)	P Value	B (SE)	P Value	B (SE)	P Value
Combat-related	**−0.67 (0.16)**	**<.001**	−0.32 (0.39)	.408	**−0.62 (0.17)**	**<.001**	−0.33 (0.35)	.350
Child maltreatment	−0.02 (0.13)	.901	**0.30 (0.13)**	**.019**	−0.01 (0.13)	.921	**0.28 (0.12)**	**.028**
Assaultive violence	0.16 (0.10)	.137	0.03 (0.11)	.778	0.12 (0.10)	.251	−0.01 (0.11)	.911
Injurious/shocking event	−0.02 (0.06)	.767	0.02 (0.10)	.875	−0.02 (0.06)	.785	0.02 (0.10)	.873
Other	−0.14 (0.20)	.479	−0.07 (0.26)	.801	−0.16 (0.19)	.402	−0.04 (0.25)	.882

[a]Reference group = individuals reporting witnessed events as worst trauma. Examples of trauma within each trauma group include combat-related (active military combat, peacekeeper/relief worker, refugee), child mistreatment (physically abused or sexually assaulted before the age of 18 years), assaultive violence (sexually assaulted as an adult, beaten up by a spouse/romantic partner, beaten up by someone else, stalked, held hostage, prisoner of war), injurious/shocking event (natural disaster, serious or life-threatening injury/illness), witnessed event, and other.
[b]Boldface indicates statistical significance.
[c]Model 1 = zero-inflated negative binomial regression count model adjusted for sociodemographics (BMI, age, race/ethnicity, education, marital status, income), number of traumas, and number of PTSD symptoms; zero-inflated model adjusted for age and BMI.
[d]Model 2 = zero-inflated negative binomial regression count model adjusted for sociodemographics, number of traumas, number of PTSD symptoms, and any other mental disorder (mood, anxiety, substance, personality); zero-inflated model adjusted for age and BMI.
Abbreviations: B = nonstandardized coefficient (β), BMI = body mass index, PTSD = posttraumatic stress disorder.

Table 4. Relationship Between PTSD Symptom Clusters and Binge Eating Symptoms Among Trauma-Exposed Individuals[a]

| | Model 1[b] | | | | Model 2[c] | | | |
| | Men | | Women | | Men | | Women | |
PTSD Symptom Cluster	B (SE)	P Value	B (SE)	P Value	B (SE)	P Value	B (SE)	P Value
Intrusions	0.00 (0.03)	.914	0.02 (0.04)	.598	−0.01 (0.03)	.628	−0.00 (0.04)	.980
Avoidance	0.07 (0.06)	.189	0.11 (0.06)	.059	0.06 (0.05)	.265	0.08 (0.06)	.163
Negative cognitions and mood	**0.10 (0.03)**	**<.001**	**0.12 (0.03)**	**<.001**	**0.09 (0.03)**	**.001**	**0.10 (0.03)**	**.001**
Alterations in arousal and reactivity	**0.09 (0.03)**	**.002**	0.07 (0.04)	.053	**0.09 (0.03)**	**.005**	0.06 (0.04)	.084

[a]Boldface indicates statistical significance.
[b]Model 1 = zero-inflated negative binomial regression count model adjusted for sociodemographics (BMI, age, race/ethnicity, education, marital status, income), number of traumas, and index trauma type; zero-inflated model adjusted for age and BMI.
[c]Model 2 = zero-inflated negative binomial regression count model adjusted for sociodemographics, number of traumas, index trauma type, and any other mental disorder (mood, anxiety, substance, personality); zero-inflated model adjusted for age and BMI.
Abbreviations: B = nonstandardized coefficient (β), BMI = body mass index, PTSD = posttraumatic stress disorder.

hoc analysis was conducted to examine which individual symptoms of these PTSD clusters were independently associated with binge eating severity. Individual PTSD symptoms of the cluster being examined were entered into a model along with the other PTSD symptom clusters, sociodemographic variables, number of traumas, index trauma type, and any mental disorder. In men, the symptoms "persistent and exaggerated negative beliefs" (B = 0.36, SE = 0.07, P < .001) within the negative cognitions and mood cluster and "hypervigilance" in the alterations in arousal and reactivity cluster (B = 0.20, SE = 0.07, P = .009) were independently associated with more binge eating symptoms. In women, there were no specific PTSD symptoms analyzed in the post hoc analysis that achieved statistical significance.

DISCUSSION

To our knowledge, this study is the first to examine associations between trauma exposure, *DSM-5* PTSD, and binge eating symptoms in a nationally representative sample of US adults. A number of novel findings emerged. Relative to trauma-exposed individuals with no/low PTSD symptoms, those with subthreshold and threshold lifetime PTSD reported a greater number of binge eating symptoms. A secondary comparison revealed that individuals never exposed to trauma exhibited significantly fewer binge eating symptoms compared to trauma-exposed individuals. These results support and extend previous research[9,11,13,14,17–19,21] that has demonstrated a link between PTSD and maladaptive eating behaviors, including binge eating, food addiction, obesity, and weight gain. The higher prevalence of these conditions among individuals with PTSD may be understood through the self-medication hypothesis whereby binge eating food, similar to alcohol or drugs, may be used to cope with trauma and PTSD symptoms.[10,15] Animal and human experiments have shown that food intake and drug use both cause dopamine release in the brain, resulting in a sense of pleasure and well-being.[35] Individuals experiencing PTSD symptoms may therefore binge eat to enhance their mood and overall sense of well-being. With addictive drugs, neuroadaptations in the dopamine reward system occur, resulting in craving and tolerance to the ingested drug, and large quantities of highly palatable foods can result in similar neuroadaptations.[10,11]

In examining whether certain types of index traumas were specifically associated with binge eating symptoms, we found that in men, combat-related traumas were associated with fewer binge eating symptoms compared to witnessing a trauma. This finding may be due to the "healthy warrior" effect, which posits that military personnel selected for combat missions are typically healthier than average,[36,37] and this phenotype may protect against binge eating. In women, child maltreatment was associated with more binge eating symptoms than witnessing trauma, paralleling previous research demonstrating an association between a range of child maltreatment types (eg, physical abuse, sexual abuse, emotional abuse) and binge eating disorder.[27,38–41]

This study also examined associations between individual PTSD symptom clusters and binge eating symptoms. In both sexes, a greater number of negative cognition and mood symptoms was independently associated with more binge eating symptoms. In men, a greater number of alterations in arousal and reactivity symptoms was additionally associated with more binge eating symptoms. Associations between negative cognition and mood symptoms with binge eating symptoms may underscore the overlap of similar negative cognitions (eg, guilt and shame) existent in both PTSD and binge eating disorder.[21,42–46] These negative emotions can result in disinhibition,[47] which may increase risk for binge eating behavior. Alternatively, binge eating episodes may result in greater feelings of shame or guilt related to loss of self-control and the amount of food consumed. In men, the association of alterations in arousal with increased binge eating symptoms may be due to effects of chronic stress on eating behavior. The dysregulation of the hypothalamic-pituitary-adrenal axis following prolonged periods of chronic stress can result in consumption of more high-fat and sugary foods.[7,35] While studies have shown that individuals with PTSD do consume more sugary and fatty foods compared to individuals with no trauma exposure or PTSD symptoms,[47] further research is needed to fully understand the mechanisms underlying these associations.

There were several limitations of this study. First, due to the assessment approach of PTSD in the NESARC-III survey, criteria F and G (duration of symptoms and functional impairment, respectively) were not able to be included in the operationalization of subthreshold PTSD. Despite this limitation, a "dose-response" association was observed between the trauma/PTSD groups and the number of binge eating symptoms. Second, causal relations between PTSD and binge eating symptoms cannot be assumed, as the NESARC-III is cross-sectional and lifetime PTSD and binge eating symptoms were used. Finally, computer-assisted, diagnostic interviews by trained lay persons were used as opposed to clinician-based assessment.

Notwithstanding these limitations, the current study has clinical implications in encouraging health care providers to screen for binge eating symptoms among trauma-exposed adults. Additionally, these results indicate that using a trauma-informed care model may be beneficial when working with trauma-exposed patients with maladaptive eating behaviors to ensure the physical, psychological, and emotional safety of individuals undergoing care.[48,49] Due to the co-occurrence of PTSD and eating pathology, devising transdiagnostic treatments that are designed to address trauma-related symptoms may help address both PTSD and eating disorder symptoms simultaneously.[50] Future research is needed using longitudinal studies to understand causal relationships between trauma occurrence and maladaptive eating behaviors to further inform clinical interventions.

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