



Trauma exposure and PTSD symptoms associate with violence in inner city civilians



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ABSTRACT

Understanding whether a history of psychological trauma is associated with perpetrating aggressive and violent behavior is of critical importance to public health. This relationship is especially important to study within urban areas where violence is prevalent. In this paper we examined whether a history of trauma or Post Traumatic Stress Disorder (PTSD) in inner city civilians was associated with violent behavior. Data were collected from over 1900 primary care patients at Grady Memorial Hospital in Atlanta, Georgia. Childhood trauma history was assessed with the Childhood Trauma Questionnaire (CTQ) and adult trauma history with the Traumatic Events Inventory (TEI). PTSD symptoms were measured with the PTSD Symptom Scale (PSS) and violent behaviors were measured with the Behavior Questionnaire (BQ). Using these measures we studied violent behavior in the inner city and its association with childhood or adult trauma history or PTSD. Trauma, PTSD and violence were all prevalent in this at-risk urban cohort. Perpetrating interpersonal violence was associated with a history childhood and adult trauma history, and with PTSD symptoms and diagnosis. An association between violent behavior and PTSD diagnosis was maintained after controlling for other pertinent variables such as demographics and presence of depression. Our findings point to a dysregulation of aggressive and violent behavior that may be a consequence of trauma and PTSD. These data indicate that more effective PTSD screening and treatment may help to reduce urban violence.

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1. Introduction

Traumatic experiences are tragically common within inner-city neighborhoods (Breslau et al., 1998; Latkin et al., 2013). Urban trauma includes the sudden death of loved ones, being assaulted and being exposed to the violent deaths of others (Breslau et al., 1998; Latkin et al., 2013). As an example, nearly 1 in 6 people recruited from areas of inner city Baltimore, Maryland, have encountered a dead body with violence being a leading cause of death (Latkin et al., 2013).

This violence exposure has insidious effects on the psychological health of urban civilians. For instance, inner city students that

experience violence are more likely to be depressed, to contemplate suicide and to abuse substances (Lipschitz et al., 2003; Mazza and Reynolds, 1999). Another consequence of this violence is Post Traumatic Stress Disorder (PTSD). PTSD is a debilitating psychiatric disorder that may develop after exposure to a traumatic event and is characterized by intrusive and avoidant symptoms, as well as hyper-arousal and negative cognition and mood (Kirkpatrick and Heller, 2014). Though commonly associated with combat Veterans, PTSD also exists at a high frequency within urban neighborhoods. In fact, our research groups have demonstrated that nearly 90% of urban, low-income residents of inner city Atlanta, GA have been traumatized with a lifetime PTSD prevalence of at least 40% (Gillespie et al., 2009).

Given the high level of violence in America's inner cities, and its' devastating psychological consequences, it is critical to understand the factors contributing to its frequency. One influential factor may reside in the very behavioral consequences of being traumatized.

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For instance, many studies have associated PTSD symptoms with being violent (Barrett et al., 2014; Daisy and Hien, 2014; Elbogen et al., 2010; Macmanus et al., 2013; Wekerle et al., 2009). Added to these observations, we have demonstrated that PTSD in inner city civilians is strongly associated with violent criminal offenses (Donley et al., 2012). These data suggest that PTSD within inner city civilians is related to the perpetration of violent actions. Confirming this relationship would broaden the significance of PTSD treatment, not only for lessening the suffering of individuals with this disorder, but also for potentially decreasing inner city violence.

In this study we sought to directly examine whether a history of trauma and PTSD associated with violent behavior in inner city civilians. We hypothesized that childhood and adult trauma and PTSD burden would be associated with the perpetration of violence, and that this effect would be maintained after controlling for other pertinent variables such as demographics and presence of depression. Additionally, we hypothesized that trauma and PTSD would associate with the perpetration of violence in both sexes. An analysis of both sexes is essential since PTSD is more common in females (Stein et al., 2000), including those in the inner city (Breslau et al., 1998). PTSD also has differing symptoms and behavioral consequences in males versus females (Reddy et al., 2011; Renshaw et al., 2014). Therefore, it is important to investigate whether there are consequences of trauma that differ according to sex.

To test these hypotheses, data were collected from male and female primary care patients in a large inner-city hospital setting. We assessed childhood trauma history with the Childhood Trauma Questionnaire (CTQ) and adult trauma history with the Traumatic Events Inventory (TEI). PTSD symptoms were measured with the PTSD Symptom Scale (PSS) and violent behaviors were measured with the Behavior Questionnaire (BQ). Using these measures, we examined the prevalence of self-reported history of violent behavior and whether childhood or adult trauma exposure associated with violent behavior in both sexes. We further studied if PTSD symptoms associated with violence in both sexes.

2. Materials and methods

2.1. Recruitment and procedures

The participants ($n = 1975$) were recruited as part of a larger study (Donley et al., 2012). Briefly, we approached potential participants in the waiting rooms of primary care and medical clinics at a large metropolitan county hospital, Grady Memorial Hospital in Atlanta, Georgia, from 2005 to 2012. Participants were approached randomly to create a cross-sectional sample of convenience. Those who agreed to be interviewed were administered a set of self-report questions by being read them aloud by a volunteer or project staff member, due to the varying literacy of the subjects. The items included demographic information, questions about childhood and adult trauma exposure, PTSD symptoms, symptoms of depression, and self-report items about history of perpetration of interpersonal violence. Participants received \$15 compensation for their answers.

We obtained written, informed consent for all subjects after they received a complete description of the study. Potential subjects were excluded if they were under age 18, if they were actively psychotic, or if they had intellectual disability. The overall project has IRB approval granted by the Institutional Review Board at Emory University.

2.2. Measures

2.2.1. Demographic data

Demographic information was collected from the subjects using questions about the participant's sex, age, race/ethnicity, household income, education level, employment and disability status.

2.2.2. Childhood Trauma history

A history of traumatic experiences during childhood was assessed using the Childhood Trauma Questionnaire (CTQ), a validated, self-report inventory of questions on a wide range of potentially traumatic incidents occurring before age 18, including history of neglect, emotional, sexual, and physical abuse, and other types of trauma (Bernstein et al., 2003). CTQ data demonstrated good internal consistency reliability ($\alpha = 0.99$ for physical abuse; $\alpha = 0.94$ for sexual abuse; $\alpha = 0.93$ for emotional abuse; and $\alpha = 0.98$ for the total of these 3 scales). Childhood trauma burden was then stratified according to Bernstein and Fink's stratification system (Bernstein and Fink, 1998). Participants were first classified into two groups: 1) none/mild range and b) moderate/severe range. A composite variable was then created across all three types of abuse. Using this composite, participants were then organized into 3 categories based upon the severity and frequency of abuse: a) 'None' = no abuse in the moderate/severe range, b) 'Moderate' = 1 type of abuse in the moderate/severe range, and c) 'Severe' = greater than or equal to 2 types of abuse in the moderate/severe range (Bradley et al., 2008; Wingo et al., 2010).

2.2.3. Adult Trauma history

Traumatic exposure during adulthood was assessed using the Traumatic Events Inventory (TEI), a fourteen-item self-report measure that asks participants if they have ever experienced a series of potential traumatic incidents (Schwartz et al., 2006). Only the TEI items pertaining to traumatic events occurring after age 18 were considered. For each item answered in the positive a series of follow-up questions assesses frequency of the type of trauma exposure. This allowed us to assess the degree of severity of adult trauma exposure in each participant. Adult trauma burden was then stratified according to previously described methods (Wrenn et al., 2011). Briefly, participants were divided into 3 categories based on the number of traumas they had experienced as quantified by the Traumatic Events Inventory: a)'None' = those with no traumatic experiences, b)'Moderate' = those with 1 type of traumatic exposure and c)'Severe' = those with 2 types of trauma exposure.

2.2.4. PTSD symptoms

To assess PTSD symptomatology, we used the PTSD Symptom Scale (PSS), which is a validated 17-item self-report measure that asks participants to rate how often they have had PTSD symptoms, as defined by DSM-IV, over the preceding two weeks. We then summed the frequency items of the PSS into a continuous measure of PTSD symptom severity which ranged from 0 to 51 (Foa and Tolin, 2000). The PSS is a psychometrically valid measure that assesses PTSD symptoms over the 2 weeks prior to assessment. Using this measure, scores from the B, C, and D clusters were individually quantified. These represent intrusive, avoidance/numbing, and hyperarousal symptoms, respectively (Jovanovic et al., 2010). The categorical diagnosis of PTSD required the presence of trauma, at least 1 intrusive symptom, the presence of at least 3 avoidance/numbing symptoms and at least 2 hyperarousal symptoms, present for at least one month.

2.2.5. Violent behavior

Violent behavior was assessed using 15 items from the Behavior

Questionnaire (BQ; please see [appendix](#) for specific phrasing of each question). These selected items are from a longer self-report measure with internal consistency assessed using Cronbach's coefficient alpha ([Cronbach, 1951](#)). Cronbach's alpha for this measure is 0.968 ([Evces, 2008](#)). The BQ was developed by the co-author, Dr Bekh Bradley. The measure was created using the Conflicts Tactics Scale, a commonly used measurement of conflict behaviors ([Straus et al., 1996](#)) and in consultation with researchers specializing in the identification of deviant and aggressive behaviors. A literature review found no other measures available to capture the scope of aggressive and other violent behaviors that we were interested in. Items from the BQ ask participants how often they have perpetrated a particular aggressive act and participants answered using a graded response to each question of “never,” “once,” “several times,” “many times,” or “more times than I can count.” Each response was assigned a score ranging from 0 (“Never”) to 4 (“More times than I can count”). We computed a total “Violence Score” (VS) by computing the sum of each of the BQ violence-related items for a total VS ranging from 0 to 60.

2.3. Statistical analyses

For all analyses, we used IBM Statistics SPSS 20 for Windows. Frequencies of each of the BQ items were assessed using one-way ANOVA to detect difference between the genders. To compare the mean VS between groups, we used one-way ANOVA. In order to evaluate if each measures of trauma were associated with the VS, we used linear regression. Finally, a stepwise linear regression was used to evaluate if PTSD was associated with violence after controlling for potential confounders.

3. Results

3.1. Study participants

A total of 1972 participants were included in the analysis ([Table 1](#)). Most of these participants were female ($n = 1258$, 63.8%). The majority of participants ($n = 1811$, 92.3%) self-identified as African American. The sample consisted primarily of low-income individuals. Most of the participants had a household monthly income of less than \$500 ($n = 693$, 36.7%) and only 11.2% of the population ($n = 212$) had a household monthly income of more than \$2000. The participants were primarily undereducated or unemployed. Nearly one quarter of the sample had not graduated from high school ($n = 437$, 22.3%) and two thirds of the population was unemployed at the time of the screening ($n = 1362$, 69.5%). Despite these financial and educational limitations, few participants were supported by disability ($n = 357$, 18.3%). Approximately one third of the sample met current criteria for PTSD diagnosis using the PSS ($n = 601$, 31.7%). Interpersonal violence was very common in the population we studied. Remarkably, nearly ninety percent of the participants reported having been aggressive in at least one of the ways we queried using the BQ ($n = 1721$, 87.1%).

3.2. Frequencies of violent behaviors in at-risk civilians

We quantified the specific self-reported violent behaviors from the BQ in both males and females ([Table 2](#)). Among the most frequent behaviors were having “Thrown something at someone that could hurt”, having “Pushed or shoved someone”, or having, “Beat someone up”. Over half the respondents reported they had engaged in each of these behaviors one or more times. To further illustrate the high level of interpersonal violence, 24.1% reported, “Pulling a knife or a gun on another” and 30.2% reported that they, “Slammed someone against a wall”. Up to 15.1% reported hitting a

Table 1
Study participants.

	Total	Percentage
Sex, n (%)	(N = 1972)	%
Male	714	36.2
Female	1258	63.8
Race, n (%)	(N = 1963)	%
African American or Black	1811	92.3
Hispanic or Latino	17	0.9
Asian	4	0.2
Caucasian or White	85	4.3
Mixed	28	1.4
Other	18	0.9
Household Monthly Income, \$	(N = 1888)	%
\$0 - 499	693	36.7
\$500 - 999	515	27.3
\$1000 - 1999	468	24.8
\$2000 or more	212	11.2
Highest Grade Completed	(N = 1963)	%
< 12th	437	22.3
Completed high school or GED	880	44.8
Some college or tech school	425	21.7
College or Technical School Graduate	201	10.2
Graduate School	20	1.0
Currently Employed	(N = 1961)	%
No	1362	69.5
Yes	599	30.5
Receiving Disability	(N = 1952)	%
No	1595	81.7
Yes	357	18.3
Current Diagnosis of PTSD	(N = 1908)	%
No	1304	68.3
Yes	604	31.7
Any self-report of violent behavior	(N = 1975)	%
None	254	12.9
At least one time	1721	87.1

child.

Males were more likely to report violent behaviors for nearly all of the items asked. An exception was two items regarding having struck a child in anger. Females more frequently agreed when asked if they, “Became so angry with a child that you attacked them with something really hard or painful like a belt, chair, etc.”, compared to males (BQ; males 4.9%, females 8.2%; $F = 8.623$, $p = 0.003$). Females also more frequently agreed when asked if they, “Became so angry with a child that you hit them (other than events you just told me about)”, compared to males (BQ; males 10.4%, females 17.7%; $F = 21.107$, $p < 0.001$).

Violent behaviors that were not significantly differently frequent between the sexes included having: “Thrown something at someone that could hurt” (BQ; males, 54.3% and females 54.7%; $F = 0.021$, $p = 0.884$); “Destroyed something belonging to someone on purpose” (BQ; males, 37.2% and females 38.7%; $F = 0.498$, $p = 0.480$); and “Became so angry with a child that you attacked them with a weapon or with the idea of seriously hurting them” (BQ; males, 1.8% and females 2.4%; $F = 0.975$, $p = 0.324$).

3.3. Childhood and adult Trauma associate with violence in inner city civilians

Prior studies have found associations between being aggressive and having a past history of psychological trauma. This has been observed in association with trauma in childhood ([Ehrensaft et al., 2003](#); [Widom, 1989](#)) or trauma experienced in adulthood ([Rosenheck, 1985](#)). In our sample, we therefore examined the relationship of violence within inner-city patients to both childhood and adult trauma. We computed a total “Violence Score” (VS) by computing the sum of each of the BQ violence-related items that we queried. The resulting VS, reported as mean $\pm$ S.E., ranged from

Table 2
Frequencies of violent behaviors in inner city civilians.

	Total				Male				Female				Male vs Female ANOVA results	
	Never		1+ times		Never		1+ times		Never		1+ times		F	p
	N	%	N	%	N	%	N	%	N	%	N	%		
Thrown something	1008	45.4	1207	54.5	363	45.7	432	54.3	642	45.3	774	54.7	0.021	0.884
Twisted arm or hair	1583	71.6	629	28.4	494	62.3	299	37.7	1085	76.7	330	23.3	52.795	0.000
Pushed or shoved	946	30.2	2188	69.8	240	24.1	757	75.9	704	33.1	1426	66.9	26.183	0.000
Pulled knife or gun	2370	75.9	754	24.1	710	71.6	281	28.4	1654	77.8	472	22.2	14.025	0.000
Stabbed or shot at	2674	86.0	434	14.0	777	79.3	203	20.7	1891	89.2	230	10.8	55.292	0.000
Punched or hit	1624	52.1	1493	47.9	381	38.4	611	61.6	1240	58.5	879	41.5	113.428	0.000
Destroyed property	1356	61.9	836	38.1	496	62.8	294	37.2	857	61.3	542	38.7	0.498	0.480
Choked someone	1695	77.2	501	22.8	523	66.3	266	33.7	1170	83.3	234	16.7	86.614	0.000
Slammed against wall	1530	69.8	662	30.2	437	55.5	351	44.5	1090	77.8	311	22.2	126.130	0.000
Beat someone up	1455	46.7	1658	53.3	337	34.0	654	66.0	1116	52.7	1000	47.3	98.099	0.000
Grabbed someone by neck/clothes	1145	52.2	1047	47.8	341	43.3	447	56.7	802	57.2	599	42.8	40.139	0.000
Attack child with weapon	2219	97.8	50	2.2	769	98.2	14	1.8	1446	97.6	36	2.4	0.975	0.324
Attack child with hard object	2098	92.9	160	7.1	741	95.1	38	4.9	1354	91.8	121	8.2	8.623	0.003
Hit child in another way	1911	84.9	341	15.1	697	89.6	81	10.4	1210	82.3	260	17.7	21.107	0.000
Attacked adult you lived with, with intent	1779	82.2	386	17.8	623	80.0	156	20.0	1152	83.4	230	16.6	3.890	0.049

(See [appendix](#) for specific phrasing of each question).

0 to 16 (overall mean: 5.19 ± 3.88). Violent behavior differed by sex. Males reported more violent behavior (VS, 6.01 ± 4.00) than did females (VS, 4.73 ± 3.74 ; $F = 51.429$, $p < 0.001$).

We next analyzed whether a history of childhood or adult trauma associated with violent behaviors as quantified by the VS. Statistical analysis found that a history of childhood trauma associated with being violent ([Table 3.1](#)). Participants who experienced severe childhood trauma reported more violent behavior (VS, 7.01 ± 3.90) than those with no childhood trauma exposure (VS, 4.39 ± 3.60 ; $F = 79.00$, $p < 0.001$). Adult trauma also associated with violent behavior ([Table 3.2](#)). Participants with severe adult trauma reported more violent behavior (VS, 6.26 ± 3.83) compared to those with moderate trauma (VS, 4.15 ± 3.39), and also compared those with no trauma in adulthood (VS, 2.85 ± 3.22 ; $F = 141.41$, $p < 0.001$).

In addition to comparing mean scores, we also performed linear regression analysis. Our analysis included childhood trauma as the independent variable and violence as the dependent variable ([Table 3.3](#)). We found that childhood trauma associated with

Table 3
Childhood and adult Trauma associate with violence in inner city civilians.

3.1 Childhood Trauma (N = 1963)		Mean Violence Score		SD
None		4.39		3.60
Moderate		5.99		4.03
Severe		7.01		3.90
		F=		79.00
		Sig		$p < 0.001$
3.2 Adult Trauma (N = 1960)		Mean Violence Score		SD
None		2.85		3.22
Moderate		4.15		3.39
Severe		6.26		3.83
		F=		141.41
		Sig		$p < 0.001$
3.3 Childhood Trauma	R ²	Std Error	β	p
Total	0.071	3.74930	0.267	<0.001
Male	0.095	3.80453	0.311	<0.001
Female	0.083	3.58746	0.289	<0.001
3.4 Adult Trauma	R ²	Std Error	β	p
Total	0.190	3.49962	0.993	<0.001
Male	0.247	3.48408	0.497	<0.001
Female	0.131	3.48282	0.362	<0.001

violence within our total sample ($F(1,1961) = 150.445$, $\beta = 0.267$, $p < 0.001$). When analyzed by sex, childhood trauma associated with violence in males ($F(1,710) = 75.983$, 0.311 , $p < 0.001$), and in females ($F(1,1246) = 113.253$, $\beta = 0.289$, $p < 0.001$). Our analysis also included linear regression with adult trauma as an independent variable and violence as the dependent variable ([Table 3.4](#)). Adult trauma also associated with higher levels of violence in our total sample ($F(1,1958) = 458.56$, $\beta = 0.993$, $p < 0.001$). When analyzed by sex, adult trauma associated with violence in males ($F(1,706) = 231.558$, $\beta = 0.497$, $p < 0.001$) and in females ($F(1,1247) = 187.906$, $\beta = 0.362$, $p < 0.001$).

3.4. PTSD associates with violence in inner city civilians

Studies have specifically related PTSD symptoms to aggressive behaviors in Veterans ([Elbogen et al., 2010](#); [Macmanus et al., 2013](#)). We were interested in whether a similar association exists in traumatized civilians. We therefore examined the impact of PTSD diagnosis on levels of violent behavior in our inner city population. We found that PTSD associated with violence ([Table 4.1](#)). Participants with PTSD reported more violence (VS, 6.89 ± 3.79) than those without a PTSD diagnosis (VS, 4.54 ± 3.66 ; $F = 166.38$, $p < 0.001$). Linear regression, with PTSD symptoms as an independent variable and violence as a dependent variable was also performed ([Table 4.2](#)). This analysis confirmed that PTSD was

Table 4
PTSD associates with violence in inner city civilians.

4.1 PTSD Diagnosis (N = 1960)		Mean ViolenceScore		SD
No		4.54		3.66
Yes		6.89		3.79
		F=		166.38
		Sig		$p < 0.001$
4.2 PTSD Symptoms	R ²	Std Error	β	p
Total	0.108	3.64748	0.329	<0.001
Male	0.142	3.68485	0.377	<0.001
Female	0.097	3.53808	0.312	<0.001
4.3 PTSD Symptom Subscale	R ²	Std Error	β	p
Avoidance/Numbing	0.100	3.66617	0.316	<0.001
Hyperarousal	0.103	3.66176	0.320	<0.001
Intrusive	0.061	3.74195	0.248	<0.001

associated with higher levels of violence ($F(1,1906) = 231.45$, $\beta = 0.329$; $p < 0.001$). When analyzed by gender, PTSD associated with violence in males ($F(1,703) = 116.468$, $\beta = 0.377$; $p < 0.001$) and in females ($F(1,1200) = 129.020$, $\beta = 0.312$; $p < 0.001$). In addition, linear regression analyses with PTSD symptom subscales as independent variables and violence as a dependent variable were performed. We found that the symptom cluster subscales of PTSD each associated with violence (Table 4.3). Violence was associated with Avoidance/Numbing ($F(1,1905) = 210.676$, $\beta = 0.316$; $p = 0.000$), Hyperarousal ($F(1,1902) = 217.533$, $\beta = 0.320$, $p = 0.000$) and Intrusive symptoms ($F(1,1906)$, $\beta = 0.248$; $p = 0.000$).

3.5. PTSD symptoms and Trauma associate with violence in inner city civilians after accounting for Trauma, demographics and depression

To examine whether PTSD symptoms remained significantly associated with violence score, even after adjusting for potentially confounding factors, we performed a hierarchical stepwise linear regression. We entered demographic information in the first step, trauma history in the second, depression scale score in the third, and finally PTSD in the fourth and final step. Violence was significantly associated with trauma ($F(2nd\ step) = 0.236$; $p < 0.001$), depression ($F(3rd\ step) = 0.255$; $p < 0.001$) and PTSD ($F(4th\ step) = 0.258$; $p < 0.01$). The final model remained significant, explaining 26% of the variance in perpetration of violence ($F(8,1783) = 77.652$, $p < 0.00001$).

4. Discussion

In this study we documented a high frequency of aggressive and violent acts within an economically disadvantaged inner-city neighborhood in Atlanta, GA. These data are consistent with numerous other reports that find high levels of inner-city violence (Breslau et al., 1998; Gillespie et al., 2009; Latkin et al., 2013). Given the level of this epidemic, our goal was to understand factors contributing to its frequency. Specifically, we hypothesized that a history of trauma or PTSD would associate with violence. Our data confirmed that both childhood and adult trauma and PTSD burden were highly associated with being a perpetrator of interpersonal violence. Although the presence of depression and demographics are both associated with aggression (Nazir and Mohsin, 2013; Valdez et al., 2007), our effect was still maintained after statistically controlling for these potential confounders.

These findings resonate with many others that point to violence as a consequence of being traumatized. For instance, childhood abuse correlates with measures of lifetime aggression (Brown et al., 1979), and contributes to interpersonal violence in adulthood (Ehrensaft et al., 2003; Widom, 1989). Intimate partner violence is reported by significantly more Vietnam-era Veterans with PTSD compared to those without PTSD (Jordan et al., 1992). PTSD in Iraq and Afghanistan Veterans is associated with aggressive impulses, difficulties managing anger and problems controlling violent behavior (Elbogen et al., 2010; Macmanus et al., 2013). Our data support a link between PTSD and violence, as documented in Veteran studies, and extend this association to trauma and PTSD experienced by inner-city civilians.

Whereas past studies examining a relationship between PTSD and violence have primarily focused on males (Elbogen et al., 2010; Macmanus et al., 2013), our analysis included both sexes. We found that violence in both genders was associated with PTSD and with a history of trauma. Of particular concern, up to ~15% of participants in our study reported aggression towards children and this was more commonly reported by females, although this may be due to

the increased likelihood of females being around young children in this cohort. Therefore, a risk for violence may be especially important to assess in inner city parents with a trauma history. Beyond the inner city, our findings also suggest that a risk for violence is important to consider in other contexts where male and female patients may have a trauma history. Within the correctional system, PTSD is commonplace in both genders and is one of most common psychiatric disorders in female prison inmates (Lynch et al., 2014). In combination with our findings, these data suggest that trauma-informed correctional care may help to decrease a risk for future violent offenses in inmates of both sexes (Miller and Najavits, 2012). In the military, females are increasingly being exposed to combat-related violence and stress (Mattocks et al., 2012). Our findings highlight the potential consequences of this stress on the aggressive behavior of female, as well as male, Veterans.

Our data suggest that PTSD treatments may have beneficial effects for decreasing violent behavior, particularly within urban communities. While specific therapies have not yet been rigorously tested for aggressive symptoms, pharmacological agents that target PTSD's hyperarousal symptoms may help in reducing violent behavior. Hyperarousal symptoms have been found to associate with aggression in prior studies (Barrett et al., 2014; Elbogen et al., 2010; Macmanus et al., 2012), as well as in our data. Hyperarousal is considered to be noradrenergically mediated (O'Donnell et al., 2004), and agents that target this neurotransmitter system, such as prazosin or venlafaxine, may be helpful in reducing aggressive symptoms (Olson et al., 2011; Presecki et al., 2010). Added to these medications are Accelerated Resolution Therapy (Kip et al., 2013) and meditation and mindfulness, which have also been proposed for aggression disturbances (Cloitre et al., 2011). Finally, trauma-related anger is thought to be an important risk factor for aggression (Novaco et al., 2012; Worthen et al., 2014). Cognitive-behavioral therapies that address anger, and that are helpful for reducing aggression, are also important to consider (Taft et al., 2012).

Despite the positive impact that these interventions may have on reducing violence in traumatized civilians, resources for their delivery in the inner city are very limited or nonexistent. Moreover, the residents that may benefit most may be uninsured and unable to utilize these resources (Richardson and Brakle, 2011). This limited access leads to many at-risk patients seeking mental health care through hospital emergency rooms or through other health providers that may not be trained to deliver appropriate and longitudinal care (Cunningham et al., 2006). The findings presented in this paper support a previously stated concern that neglect of civilian PTSD may compromise public safety and contribute to recidivism (Donley et al., 2012).

There are limitations to our study. Although PTSD associated with a higher level of self-reported violence, it is difficult to establish a cause-effect relationship. Participants may have had pre-existing traits that predisposed them to both aggression and traumatic experiences. For instance, antisocial personality traits include both impulsivity and aggressiveness (Horn et al., 2014). However, these personality traits were not quantified in our data. Similarly, substance use was not assessed in our participants, but is known to increase risk taking that may lead to both trauma and interpersonal aggression (Lane et al., 2004). A separate possibility is that the traumatic experiences of some participants resulted in physical injury that predisposed them to aggression. For instance, trauma may result in traumatic brain injury (TBI) that predisposes one to aggressive behavior (Iverson, 2010). However, conditions such as TBI were not accounted for in our sample. Participants also provided information from self-report, and objective criteria quantifying their acts of aggression were not included. Finally,

these studies assessed PTSD symptoms as defined by DSM-IV. Newer, DSM-V symptoms were not measured (Kirkpatrick and Heller, 2014).

Future studies that address these issues are needed. Longitudinal studies are required to study time-courses of aggressive behavior, before and after developing PTSD. Additionally, crime records as an objective measure of aggression may be a way to circumvent the limitations of self-report. Performing an even more extensive analysis of violent behavior according to participant's physical, sexual or emotional abuse history, might also clarify the specific traumatic experiences that are most likely to increase violence risk.

In conclusion, an enduring question has been whether a history of trauma and PTSD are related to an increased risk for aggressive and violent behaviors. Although this has been most studied in Veterans, inner city civilians are an underappreciated population with high levels of trauma exposure and PTSD symptoms. We found that traumatic experience and PTSD associated with being aggressive across sexes of an inner city population. Our data accompany several others that have found effects for trauma and PTSD on social function. For instance, women with PTSD have altered social learning that may predispose them to revictimization (Cisler et al., 2015). Trauma survivors with PTSD exhibit lower empathic resonance (Nietlisbach et al., 2010), and have deficits in mentalizing and emotion recognition (Plana et al., 2014). Patients with PTSD report lower levels of empathic concern, decreased perspective taking and difficulty recognizing social relationships (Nazarov et al., 2014b; Parlar et al., 2014). PTSD related to childhood abuse is associated with an impaired ability to detect affective prosody (Nazarov et al., 2014a). Combined with our data, these findings underscore the importance of PTSD treatment for both decreasing the suffering of individuals with this disorder, and for decreasing the harmful effects that its social impairments may have on families and communities.

Contributors

All authors contributed to the preparation of this article. Dr Gillikin statistically analyzed all of the data and assisted with the manuscript. Drs Habib, Bradley and Evces assisted in gathering data from our clinical sample. Dr Bradley created the Behavior Questionnaire. Dr Ressler supervised the collection, analysis and report of these data through The Grady Trauma Project. Dr Sanders wrote the manuscript, drafted tables and also supervised staff involved in the analysis of these data. All authors approve the final article.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.jpsychires.2016.07.027>.

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