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## Screening for Traumatic Brain Injury in Prostituted Women

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## Screening for Traumatic Brain Injury in Prostituted Women

### Abstract

Violence is pervasive in prostitution and can cause traumatic brain injury (TBI). This study estimated the prevalence and demographic correlates of TBI among 66 women and transwomen in prostitution. Ninety-five percent had sustained head injuries, either by being hit in the head with objects and/or having their heads slammed into objects. Sixty-one percent had sustained head injuries in prostitution. The women described acute and chronic symptoms resulting from head injury and/or concussions. These included dizziness, depressed mood, headache, sleep difficulty, poor concentration, memory problems, difficulty following directions, low frustration tolerance, fatigue, and appetite and weight changes. Screening for TBI is crucial to the care of prostituted women.

### Keywords

prostitution, women, violence, traumatic brain injury, TBI, head injury, ethnicity, transgender, headaches, depression, memory problems

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## SCREENING FOR TRAUMATIC BRAIN INJURY IN PROSTITUTED WOMEN

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### ABSTRACT

Violence is pervasive in prostitution and can cause traumatic brain injury (TBI). This study estimated the prevalence and demographic correlates of TBI among 66 women and transwomen in prostitution. Ninety-five percent had sustained head injuries, either by being hit in the head with objects and/or having their heads slammed into objects. Sixty-one percent had sustained head injuries in prostitution. The women described acute and chronic symptoms resulting from head injury and/or concussions. These included dizziness, depressed mood, headache, sleep difficulty, poor concentration, memory problems, difficulty following directions, low frustration tolerance, fatigue, and appetite and weight changes. Screening for TBI is crucial to the care of prostituted women.

### KEYWORDS

prostitution, traumatic brain injury, TBI, head injury, ethnicity, headaches, depression, memory problems, prostitution, women, violence

**T**raumatic brain injury (TBI) is defined as an “alteration in brain function, or other evidence of brain pathology, caused by an external force” (Menon, Schwab, Wright, & Maas, 2010, p. 1637). TBIs vary in severity and may be classified as mild, moderate, or severe, based on the duration of unconsciousness, score on the Glasgow Coma Scale and duration of posttraumatic amnesia (Iverson, 2012). Posttraumatic amnesia is characterized by “confusion, disorientation, retrograde and anterograde amnesia, poor attention, and sometimes agitation and delusions” (Ponsford et al., 2014, p. 307). Eighty-five percent of TBIs seen in hospital emergency departments fall within the mild category (Bigler & Maxwell, 2012). “The term ‘concussion’ is often used interchangeably with mild TBI and has been recommended as a less stigmatizing term as compared to ‘TBI’ ... but ... not all experts agree that the two terms are synonymous” (Vasterling, Bryant, & Keane, 2012a, p.5).

Brain trauma is typically caused by a blow to the head, by having one's head slammed against a floor or a wall, by violent shaking, or by attempted asphyxiation (Valera & Berenbaum, 2003). In one study of neuropathology resulting from TBI, "inclusion criteria were based entirely on exposure to repetitive head trauma (e.g., contact sports, military service, or domestic violence) ... Playing American football was sufficient for inclusion" (Mez et al., 2017, p 361). Head injury is more common in interpersonal assaults than in motor vehicle accidents or falls (Crandall, Nathens, & Rivara, 2004). Head injury is more common in intimate partner violence (IPV) than in other assaults (Yau, Stayton, & Davidson, 2013). Women, particularly those in health care and social services, are more likely than men to acquire TBI on the job, with injuries inflicted by consumers and clients (Mollayeva, Mollayeva, Lewko, & Colantonio, 2016).

### **Prevalence of Traumatic Brain Injuries**

A recent meta-analysis found that the prevalence of TBI in general populations of women in the United States, Canada, Australia, and New Zealand averages 8.6% (Frost, Farrer, Primosch, & Hedges, 2013). In contrast, rates of at least one TBI range from 14% to 20% among Iraq War veterans (Tanielian & Jaycox, 2008) and have been estimated at 61% of retired football players (Guskiewicz et al., 2007). Postmortem examinations of the brains of 111 National Football League players found that 99% showed physical neurologic damage resulting from TBI (Mez et al., 2017).

Studies of women who were subjected to violence show much higher rates of TBI compared to women in the general population. For example, from 30% to 74% of women seeking emergency shelter or hospital emergency room treatment for IPV and 10% of IPV survivors in general populations had sustained TBI (Kwako et al., 2011; Yau et al., 2013). We know of only two studies that report the prevalence of TBI among women in prostitution, finding rates of 53% (Farley et al., 2003) and 72% (Farley et al., 2016).

### **Sequelae of Traumatic Brain Injuries**

Brain injury has been associated with chronic illness, other disabilities, unemployment, and early death, including death by traumatic causes (Ackerman & Banks, 2009; Corrigan, Selassie, & Orman, 2010; Doctor et al., 2005; Hart et al., 2014; Langlois, Rutland-Brown, & Wald, 2006; Pogoda et al., 2016; Tanielian & Jaycox, 2008; Vaaramo, Puljula, Tetri, Juvela, & Hillbom, 2015).

Symptoms that commonly occur subsequent to TBI may be difficult to distinguish from symptoms of psychological problems associated with the psychosocial trauma of prostitution, such as posttraumatic stress disorder (PTSD), dissociation, depression, anxiety, and substance abuse (Choi, Klein, Shin, & Lee, 2006; Farley et al., 2003; Iverson, 2012; Ross, Farley, & Schwartz, 2003; Roxburgh, Degenhardt, & Copeland, 2006). Symptoms subsequent to TBI include headache, dizziness, fatigue, irritability, difficulties with concentration and memory, insomnia, and reduced stress tolerance (World Health Organization, 2015). Among raped women, battered women, and prostituted women symptoms of TBI include irritability, cognitive deficits, and difficulties in ambulation and speech (Murphy, 1993). These symptoms are also associated with major depression, posttraumatic stress disorder, dissociation, and/or substance abuse (Bjork & Grant, 2009; Brenner et al., 2010; Hayes & Gilbertson, 2012; Hesdorffer,

Rauch & Tamminga, 2009; Iverson, 2012; Jones, Harvey & Brewin, 2005; Taylor, Kreutzer, Demm & Meade, 2003).

There is considerable overlap between symptoms of PTSD and TBI (Banks, 2013; Verfaellie, Amick, & Vasterling, 2012; Vasterling et al., 2012a). Among people diagnosed with TBI, from one-tenth to three-fourths also display PTSD and/or depression (Bombardier et al., 2010; Brenner et al., 2010; Iverson, 2012; Lew, Vanderploeg, Moore, & Schwab, 2008; Vasterling et al., 2012a). Women who had sustained TBI were at greater risk than men for PTSD (Barker-Collo et al., 2013). Symptoms of TBI have been confused with PTSD, dissociation, and substance abuse (Gerber, Iverson, Dichter, Klapp, & Latta, 2014; Sikora, 2003; Stein, Kennedy, & Twamley, 2002). TBI and PTSD may be associated in part because the same traumatic events can cause both (Vasterling et al., 2012a). Additionally, sustaining a mild TBI during a psychologically traumatic event is associated with increased risk of PTSD and depression (Verfaellie et al., 2012). Prostitution itself is typically experienced as psychologically traumatic (Häggström, 2016; Moran, 2015; Norma & Tankard Reist, 2016) even without TBI (Hayes & Gilbertson, 2012), and is associated with a history of additional traumatic events (Farley et al., 2003; Farley, Franzblau, & Kennedy, 2014). People who sustain a TBI that was caused by interpersonal violence are at higher risk of depression and PTSD than those with TBI from other causes (e.g. motor vehicle or sports accidents, falls; Bombardier et al., 2010; Mathias, Harman-Smith, Bowden, Rosenfeld, & Bigler, 2014). Further, the prevalence of depression is higher among female than male TBI patients (Bombardier et al., 2010), which would increase the risk of depression for women in prostitution who sustain TBI.

Even when there is no (or relatively little) psychological trauma, TBI is associated with increased risk for later mental health problems such as depression and PTSD (Lew et al., 2008; Reeves, Russell, Beltzman, & Killu, 2000; Vasterling, Constans, & Hanna-Pladdy, 2000; Verfaellie et al., 2012). Some suspect that the reason for this is overlap in the brain regions that are thought to be associated with TBI, depression, and PTSD (Bigler & Maxwell, 2012). TBI is frequently associated with structural or functional changes in brain structures that mediate emotion and self-regulation, in addition to the stress of the disability it causes (Reeves et al., 2000; Vasterling et al., 2000). Verfaellie et al. (2012) suggest that the disruptions of memory, executive function, and verbal information processing that can be consequences of TBI may contribute to the development of PTSD. Animal research is beginning to elucidate the anatomic and cellular basis of this association (Zhao et al., 2017). Together, these considerations suggest that in addition to the inherent difficulties in distinguishing symptoms of TBI from symptoms of depression or PTSD in general populations, differential diagnosis may be particularly difficult with women who sustain TBI in prostitution because these women are likely to be at elevated risk for depression and PTSD relative to other people who sustain TBI.

### **Risk of Traumatic Brain Injuries Among Women in Prostitution**

Assault is common in the lives of women in prostitution. Of 854 people in prostitution in nine countries (Canada, Colombia, Germany, Mexico, South Africa, Thailand, Turkey, United States, and Zambia), 71% had experienced physical assaults in prostitution (Farley et al., 2003). In a review of more than a thousand research studies, Deering et al. (2014) found that the lifetime prevalence of any or combined violence in prostitution ranged from 45% to 75%. In the past year, prevalence of violence in prostitution was 32% to 55% (Deering et al., 2014). Farley et

al. (2014) also summarized studies documenting prostitution's violence. For most of the world's prostituted women, prostitution is the experience of being hunted, dominated, harassed, assaulted, and battered.

Childhood sexual and physical abuse are associated with TBI (Colantonio et al., 2014), and a majority of women in prostitution have a history of childhood sexual and/or physical abuse (Farley et al., 2003).

A survivor described prostitution as being “like domestic violence taken to the extreme” (Leone, 2001). Prevalence rates of domestic violence or IPV among women in prostitution range from 70% (Farley, 2004) to 90% (Parriott, 1994). These rates include violence by pimps and by men who buy sex (Stark & Hodgson, 2003). Consequently, the elevated rate of TBI among women who experience IPV suggests a heightened risk of TBI among women in prostitution.

### **The Present Study**

Because of the high prevalence of violence and injury among women in prostitution, we hypothesized that these women would be at elevated risk for TBI. The primary purpose of the present study was to describe and to bring a focus to the unaddressed symptoms of TBI in prostituted women and to describe sequelae of TBI in these women.

Because of discrimination related to gender identity, transwomen may be at increased risk for violence. We hypothesized that because of their elevated risk of violent victimization (Coulter et al., 2017; Valentine et al., 2017), transwomen in prostitution might, therefore, have higher rates of TBI than other women in prostitution. A secondary purpose of this pilot study was to evaluate this hypothesis in this pilot sample.

Third, to potentially identify risk factors for TBI in this population, we also estimated associations of age and ethnicity with TBI and its correlates.

## **METHOD**

### **Participants**

Participants were 66 women who were clients of four agencies that offered services to women escaping prostitution in San Francisco, Chicago, and Toronto, Canada. Of the 66 women we interviewed, one did not respond to the question about whether she had sustained a head injury, and was therefore deleted from data analyses. The women's mean age was 36.8 ( $SD = 8.1$  years), with a range of 16 to 58 years. Sixty-five percent ( $n = 41$ ) of the women were of African and/or Caribbean descent, 23% ( $n = 15$ ) were European American, 8% ( $n = 5$ ), were Latina, and 3% ( $n = 2$ ) were American Indian. Their mean age of entry into prostitution was 21 years ( $SD = 6.8$  years), with a range of 12 to 39 years. Two-thirds of the women in this sample (67%,  $n = 44$ ) described themselves as women, and one-third (33%,  $n = 22$ ) described themselves as transwomen. We here use the descriptors that they used to describe their gender identities. The two groups of women were similar with respect to ethnicity and age. Table 1 summarizes characteristics of study participants.

## Procedure

We invited program directors of four agencies (two in San Francisco, one each in Chicago and Toronto) who offered services for exiting prostitution to permit us to screen for TBI and to conduct focus groups whose purpose was to discuss prostitution and head injury. The groups were conducted within the agencies where clients were receiving services. All clients who were receiving

**Table 1. Participant Characteristics**

	<b>Mean</b>	<b>(SD)</b>	<b>Range</b>	<b>N</b>	<b>Percent</b>
<b>Current Age</b>	36.8	(8.1)	16 - 58		
<b>Age of entry into prostitution</b>	21	(6.8)	12 - 39		
<b>Ethnicity</b>					
African American and/or Caribbean				41	65%
European American				15	23%
Latina				5	8%
American Indian				2	3%
<b>Gender identity</b>					
Women				44	67%
Transwomen				22	33%

services were strongly encouraged to attend, and all agreed to attend the group screening and subsequent discussion. We obtained informed consent from participants. We administered questionnaires to all participants, reading the questions out loud to the group (to ensure comprehension in the case of reading difficulty) and assisting as needed with participants' written responses. The questionnaire inquired about head injuries, immediate symptoms resulting from head injuries, and health consequences. Brain injury symptoms on the questionnaire were adapted from existing surveys (Ackerman & Banks, 2006, 2009; Banks & Ackerman, 2006) to be able to administer the questions in 15-20 minutes rather than 2 hours. These two authors of existing surveys are content experts and helped to adapt the questionnaire.

To estimate the prevalence of TBI, we asked, "Have you ever been hit in the head with an object?" and "Was your head ever shoved or slammed into an object?" A "yes" response to either of these questions was construed as a positive lifetime history of head injury. We also asked, "Were you prostituting at that time?" Women who answered "yes" were considered to have a positive history of head injury during prostitution. Additionally, we asked, "Did you have any head injuries in childhood?" Participants who responded "yes" were considered to have a positive history of head injury during childhood.

The questionnaire also included questions such as the age of entry into prostitution and occurrence of head injury in childhood. We asked about the type of objects used to cause head injury, the number of head injuries, and the period during

which the injuries were experienced. Participants were asked whether they had experienced acute symptoms of a concussion immediately after the violence and whether or not medical care was needed and obtained. We also asked about symptoms experienced later, at the time of this survey.

The questionnaires, which were anonymous, were reviewed and approved by the Prostitution Research & Education IRB and also by the treatment coordinators at the four agencies. We held focus groups where participants shared their experiences and asked questions. During the focus group discussion, we answered questions about violence-related injuries and offered information about TBI, general health information, and referrals. We administered the questionnaires after the focus groups.

Two of the authors have expertise in neuropsychological rehabilitation. All participants had access to support staff in their respective agencies. We, and each agency, viewed the screening questions and subsequent focus group discussion as a possible means of improving clients' health awareness and increasing appropriate referrals.

### **Data Analysis**

The overall prevalence of head injury and of single items indicating circumstances of injury (e.g., method of injury, need for treatment) and symptoms was calculated using cross-tabulation. To evaluate associations between pairs of categorical variables, we used Pearson  $\chi^2$  when appropriate cell sizes were present, and Fisher's Exact Test for 2 x 2 tables in which cell sizes were too small for use of Pearson  $\chi^2$ . In these analyses, ethnicity was collapsed into three categories (European American, African American, and other [the latter consisting primarily of Latina and Native American women]) because of excessive numbers of empty cells when more detailed categories were used. To evaluate associations between dichotomous and continuous variables, we used point-biserial correlations. Associations of ethnicity with continuous variables were estimated using analysis of variance. Statistical analyses were conducted using Statistical Analysis System (SAS) versions 9.2 and 9.4 (64 bit) for Windows 10.

## **RESULTS**

### **Prevalence and Means of Head Injury**

Of the 65 women, 95% ( $n = 62$ ) had sustained head injuries at some time during their lives, either by being hit in the head with objects (89%) and/or having their heads shoved into objects (74%). There were no significant differences in these prevalence rates by gender identity, age, or ethnicity. Fifty percent of the 60 women who had been hit with objects had been hit in the head with hands or fists. They also reported being hit in the head with bottles, bats, sticks, hammers, guns, telephones, canes, screwdrivers, belts, rocks, bed slats, steel tubes, and ash trays (see Table 2). Thirty-four percent of the women who had had their heads shoved into objects had been shoved into walls, with others reporting having their heads slammed into floors; against dashboards, steering wheels, or windows of cars; against furniture or sinks; against other people; or against vehicles, buildings, doors, or stairs (see Table 3). Gender identity was not associated with the objects used to hit women or the objects the women had been shoved into.



Of the 65 women, 40 (61%) had sustained head injuries during prostitution. This represents 65% of the 62 women with any lifetime head injury. Of the 40 women who had sustained head injuries during prostitution, 39 (98%) had been hit in the head, and 30 (77%) had had their head shoved into an object. There were no significant differences in these prevalence rates by gender identity, age, or ethnicity.

**Table 2. Objects Used to Hit Participants**

Objects	Participants With Any Lifetime Head Injury		Participants With Any Head Injury During Prostitution	
	N <sup>a</sup>	Percent	N <sup>b</sup>	Percent
Hand or fist	30	50.0%	18	46.2%
Stick	5	8.3%	5	12.8%
Bat	5	8.3%	4	10.3%
Bottle	4	6.7%	2	5.1%
Hammer	2	3.3%	2	5.1%
Cane	2	3.3%	2	5.1%
Screwdriver	2	3.3%	2	5.1%
Gun	1	1.7%	1	2.6%
Telephone	1	1.7%	1	2.6%
Belt	1	1.7%	1	2.6%
Rock	1	1.7%	0	0.0%
Bed slat	1	1.7%	1	2.6%
Steel tube	1	1.7%	1	2.6%
Stabbed	1	1.7%	1	2.6%
Ash tray	1	1.7%	0	0.0%

<sup>a</sup>N = 60 women who reported having been hit in the head with an object during their lifetime.

<sup>b</sup>N = 39 women who reported having been hit in the head with an object during prostitution.

Of the 40 women who had been hit in the head during prostitution, 46% had been hit with hands or fists. These women also reported being hit with sticks, bats, bottles, hammers, canes, screwdrivers, guns, telephones, belts, bed slats, and steel tubes (see Table 2). There were no significant differences in risk of being hit with any of these objects by gender identity, age, or ethnicity.

One-third of the 30 women who had had their head shoved into an object during prostitution had been shoved into walls, with others reporting having their heads slammed into the floor; against furniture or sinks; against dashboards, steering wheels, or windows of cars; against another person; or against vehicles, buildings, doors, or stairs (see Table 3). There were no significant associations of gender identity, age or ethnicity with being shoved into any of these objects. Thirty-

one of the 40 women who reported having sustained a head injury during prostitution told us how many head injuries they had sustained. These women reported a mean of 15.3 incidents (SD = 36.6, range 0 – 200). There were no significant gender identity, age, or ethnic differences in the number of head injuries.

**Table 3. Objects Into Which Participants Had Been Shoved**

Objects	Participants With Any Lifetime Head Injury		Participants With Any Head Injury During Prostitution	
	N <sup>a</sup>	Percent	N <sup>b</sup>	Percent
Wall	16	34.0%	10	33.3%
Concrete, floor, ground	6	12.8%	3	10.0%
Furniture	3	6.4%	3	10.0%
Dashboard, Steering Wheel, Car Window	3	6.4%	2	6.7%
Another Person	2	4.3%	2	6.7%
Sink	1	2.1%	1	3.33%
Vehicle	1	2.1%	1	3.33%
Building	1	2.1%	1	3.33%
Door	1	2.1%	1	3.33%
Stairs	1	2.1%	1	3.33%

<sup>a</sup>N = 47 women who reported having been shoved into objects during their lifetime.

<sup>b</sup>N = 30 women who reported having been shoved into objects during prostitution.

### Childhood Head Injury and Childhood Prostitution

Thirty-six percent of the women began prostitution before age 18. Women who began prostitution before age 18 and women who began prostitution at age 18 or older were equally likely to report a head injury at some time in their lives, 95% compared to 100%,  $\chi^2(1, N = 54) = 1.732, p = .188$ . Women who were prostituted in childhood were no more likely than women who began prostitution at age 18 or older to report head injury during prostitution, 43% compared to 57%,  $\chi^2(1, N = 53) = 2.201, p = .138$ .

Thirty-eight percent of the women who reported head injuries during prostitution (and gave information about childhood head injury) also reported having sustained at least one head injury in childhood. There were no significant gender identity, age, or ethnic differences in reports of childhood head injury, and women who reported childhood prostitution and those who did not were equally likely to report childhood head injury. (This was the case whether we considered the full sample of 65 women, the 62 women who had at least one-lifetime head injury, or the 40 women who reported head injury during prostitution).

Transwomen (55.0%) were significantly more likely than women (25.7%) to report having been prostituted as children,  $\chi^2(1, N = 55) = 4.717, p = .012$ .

### Symptoms Associated with Head Injury

At the time of head injury, our participants had experienced symptoms of concussion such as headache (95%), dizziness (39%), and memory loss (13%) (see Table 4). Eighty-eight percent of the interviewees stated that their injuries were so severe that they felt a need for urgent medical treatment. Of those, 63% received medical care.

**Table 4. Symptoms Experienced Immediately After TBI**

Symptoms	N	Percent
Headache, migraine	59	95.2%
Dizziness	24	38.7%
Memory loss	8	12.9%
Stars	6	9.7%
Nausea, vomiting	4	6.5%
None	4	6.5%
Blackout	3	4.8%
Weak	2	3.2%
Pain	2	3.2%
Ear ringing	2	3.2%
Sleepiness	2	3.2%
Cannot think right	1	1.6%
Not able to express	1	1.6%
Blurred vision	1	1.6%
“Use a cold towel”	1	1.6%
Fogginess	1	1.6%

Later, at the time when the questionnaire was administered, the women described symptoms that they currently experienced and that may reflect lasting consequences of TBI in prostitution. These included dizziness (80%), depressed mood (77%), and headaches (73%). Subsequent to head injury and at the time of the survey, the participants experienced changes in sleep patterns (73%), libido (52%), appetite and weight (48%), and menstruation (39%); day or night sweats (36%); bowel or bladder incontinence (32%); and fevers (18%), among other symptoms. The women noted problems with cognition at the time of interview, including poor concentration (64%), memory problems (64%), poor information retention (57%), difficulty in following directions (41%), problems with new learning (39%), and confusion (36%) (see Table 5). Descriptions of the nature of the cognitive problems included, “I need a rough draft to go on,” “I forget in midstream,” “information comes and goes,” “I can't seem to concentrate on anything,” and “difficulty in completing things.” Twenty-seven percent of these interviewees complained of difficulty understanding abstract concepts. One woman said that she had “no patience”

when trying to find solutions to problems. Thirty-nine percent of the women told us that they had problems relating to other people that they attributed to head injury (see Table 5).

**Table 5. Current Symptoms Consistent with Traumatic Brain Injuries**

<b>Symptoms</b>	<b>N</b>	<b>Percent</b>
Dizziness	35	79.5%
Depressed mood	34	77.3%
Headaches	32	72.7%
Too much or too little sleep	32	72.7%
Poor concentration	28	63.6%
Memory problems	28	63.6%
Irritability	26	59.1%
Poor information retention	25	56.8%
Agitation	25	56.8%
Poor emotional control	25	56.8%
Personality change	23	52.3%
Change in sexual desire/energy	23	52.3%
Low frustration tolerance	22	50.0%
Fatigue	21	47.7%
Apathy	21	47.7%
Appetite and weight changes	21	47.7%
Problems expressing emotions	20	45.5%
Migraines	18	40.9%
Difficulty following directions	18	40.9%
Problems with new learning	17	38.6%
Problems with job post-injury	17	38.6%
Easily startled	17	38.6%
Menstrual changes	17	38.6%
Problems relating to other people	17	38.6%
Confusion	16	36.4%
Day or night sweats	16	36.4%
Lack of self-direction	15	34.1%
Bowel or bladder incontinence	14	31.8%
Concreteness	12	27.3%
Fevers	8	18.2%
Seizures	4	9.1%

## DISCUSSION

Because of the violence in prostitution (Deering et al., 2014; Farley et al., 2014), we hypothesized that the prevalence of TBI would be high among women in prostitution. The 95% rate of lifetime TBI and the 61% rate of TBI during prostitution in the present group suggest the necessity of screening for TBI in clinics and agencies offering services or referrals to prostituted women. The range of TBI rates among women in prostitution (53% to 95%) can be understood in the context of rates for retired professional football players (61%; Guskiewicz et al., 2007) and Iraq War veterans (14% to 22%; Tanielian & Jaycox, 2008; Okie, 2005).

Prevalence of TBI was similar regardless of gender identity, age, or ethnicity. Although this finding is inconsistent with our hypothesis of higher prevalence in transwomen, it is similar to a finding of no differences in physical assault history between women and transwomen in prostitution (Nadal, Davidoff, & Fujii-Doe, 2014). It is possible that the lack of subgroup differences was a result of the high prevalence of TBI regardless of demographics.

Over half the transwomen (55%) had begun prostitution in childhood compared to about one-fourth of the women (26%).

The most frequent and potentially TBI-related symptoms the women reported (in order of most to least frequent) were dizziness, depressed mood, headaches, sleep difficulty, poor concentration, memory problems, irritability, difficulty following directions, poor emotional control, changes in personality or libido, low frustration tolerance, fatigue, apathy, and appetite and weight changes. A third (30%) of the women who had needed medical treatment for their injuries had not received it. Others have noted that an unknown number of people sustain TBI and did not seek treatment (Langlois et al., 2006).

Thirty-eight percent of the women who had sustained head injuries in prostitution had also sustained head injuries in childhood. The combination of head injury in childhood with a later head injury in prostitution might have had lasting adverse effects on these women's brain function, but we did not assess the frequency of childhood head injury. It would be useful to investigate the incremental effect of head injury (Helmes, Østbye, & Steenhuis, 2011).

The prevalence of a current headache in the present sample (73%) was similar to rates seen in other samples with mild TBI (reviewed by Otis, Fortier, & Keane, 2012). Forty-one percent of the women reported a current migraine. In a study of veterans with deployment-related TBI, 58% of the posttraumatic headaches were migraines (Otis et al., 2012). It is thought that the neural pathways for TBI, PTSD, and pain overlap considerably (Otis et al., 2012; Zhao et al., 2017). Pain may intensify PTSD by triggering traumatic memories (Otis et al., 2012). TBI may be associated with chronic pain over and above the potential contribution of PTSD to the association (Otis et al., 2012).

Research with TBI patients shows a substantial decrease in headaches with sleep hygiene counseling and nightly sedative use (Otis et al., 2012). We found that about three-fourths of the women in the present study with a history of TBI reported sleep disturbance, with similar findings noted by Nakase-Richardson et al. (2013). About three-fourths of the women in this study with a history of TBI also reported depressive symptoms. Because deficient sleep exacerbates depressive symptoms (Paunio et al., 2015), and improved sleep appears to reduce headache pain, these treatments have multiple potential benefits for women in prostitution

who have chronic pain and a history of TBI and could be considered for this population.

Diagnosis of TBI may be complicated by overlap among the symptoms of TBI, PTSD, and substance use disorders, including emotional dysregulation and limitations in memory and executive functioning (Cernich, Chandler, Scherdell, & Kurtz, 2012; Najavits, Highley, Dolan, & Fee, 2012). Although not assessed in the present study, substance use disorders are common among women in prostitution (Farley et al., 2003).

Women in prostitution have high rates of PTSD (Choi et al., 2006; Farley et al., 2003, 2016; Roxburgh et al., 2006), dissociation (Farley et al., 2014; Ross et al., 2003), depression (Ross et al., 2003; Roxburgh et al., 2006), and substance abuse (Farley et al., 2014; Ross et al., 2003; Roxburgh et al., 2006), all of which can present with symptoms that are similar to TBI (Brenner et al., 2010; Hayes & Gilbertson, 2012; Iverson, 2012; Lew et al., 2008; Verfaellie et al., 2012). Comorbidity of TBI with these disorders is common, with one-tenth to three-fourths of people with TBI also suffering from PTSD and/or depression (Bombardier et al., 2010; Brenner et al., 2010; Iverson, 2012; Lew et al., 2008; Vasterling et al., 2012a). The causal path between TBI and PTSD is hypothesized to be bi-directional (Vasterling, Bryant, & Keane, 2012b). Because of symptom overlap as well as comorbidity, differential diagnosis may be challenging but is likely to be crucial in treatment planning.

Repeated exposure to the traumatic events that cause TBI as well as PTSD can complicate recovery from both conditions (Vasterling et al., 2012b). The cognitive and self-regulation difficulties associated with TBI may complicate recovery from PTSD (Lew et al., 2008; Verfaellie et al., 2012), and substance abuse may complicate recovery from both TBI and PTSD (Corrigan, Wolfe, Mysiw, Jackson, & Bogner, 2003; Najavits et al., 2012). The physical discomforts associated with TBI can compound psychological distress (Vasterling et al., 2012b)

### **Limitations of This Study**

This sample of 65 women is representative of women in supportive programs for exiting prostitution. It may or may not be representative of all women in prostitution or of those who want to escape but are not in supportive programs. These findings may not represent the prevalence of head injury among women who have been in prostitution for only a short time. Future research should include larger samples and should inquire about the length of time in prostitution, locations where prostitution occurred, and locations where the violence occurred. While we were able to differentiate childhood and adult head injury, we did not ask about frequency of childhood head injury (Taylor et al., 2002). This may be a confounding variable with respect to both acute and long-term symptoms of head injury. Research that includes extensive history-taking regarding TBI in both childhood and adulthood is advisable.

As high as the prevalence of TBI in this sample is, it may represent an underestimate, to the extent that the injuries themselves may impair memory. Similarly, symptom recall could potentially have been affected in unknown ways by memory impairments caused by the injuries themselves. In addition, although the women reported symptoms experienced following a head injury, because of the retrospective research design and the lack of detailed data on time of onset of each symptom,

they cannot be unambiguously attributed to TBI and could be attributed to another trauma history.

In addition to the age at which each TBI occurred, we also recommend that future research screen for severity levels of TBI. We recommend investigation of symptoms of PTSD, depression, and other known psychological consequences of IPV and prostitution (Juengst, Kumar, & Wagner, 2017). The overlap between symptoms of TBI and PTSD is a crucial area for future research because symptoms of TBI are often overlooked because they are perceived as symptoms of PTSD (Barker-Collo et al., 2013). As the Centers for Disease Control and Prevention (2015, p. 15) has noted, “Post-traumatic stress disorder (PTSD) and dementia also are conditions of concern for persons affected by TBI. Considerable gaps in understanding exist with regard to the overlap and specific relations among TBI and these conditions.”

### **Implications of the Findings**

Despite this study’s limitations, the results suggest a need for screening for TBI among women in prostitution. There is a new focus on the impact of TBI on military personnel and veterans (Tanielian & Jaycox, 2008; Vasterling et al., 2012a) with new screening techniques now being recommended for early detection and monitoring of TBI even if post-injury symptoms are not apparent (Burgess, 2010). Routine screening and referral for TBI have been recommended for battered women (Banks, 2013, 2016; Family Caregiver Alliance, 2007; Jackson, Philip, Nuttall, & Diller, 2004). The commonalities between prostitution and IPV, along with the high prevalence of IPV among women in prostitution, also suggest that women in prostitution should be screened and offered referrals. This recommendation is consistent with guidelines for screening and referral for treatment of brain injury in combat veterans (Schwab et al., 2007) and for athletes who have suffered head injury (Lovell et al., 2003; Team Physician Consensus Statements, 2009). In an era of shrinking health care resources, screening in high-risk populations could increase the efficiency of health care delivery. Brain injury impairs the cognitive ability to anticipate and recognize danger, including the dangers in prostitution. Women with brain injury who do not receive appropriate treatment may be vulnerable to increased dependency on partners or caregivers, some of whom may be perpetrators of violence (Ackerman & Banks, 2009; Banks, 2013). Environmental barriers reported by TBI survivors include transportation, government policies, and social attitudes (Whiteneck, Gerhart, & Cusick, 2004). The long-term rehabilitation needs of veterans with TBI and the development of comprehensive rehabilitation programs with a focus on community reintegration are helpful models for the care of prostituted women with TBI (McGarity et al., 2017). Accurate screening for TBI will assist health care personnel in making a more accurate differential diagnosis in a population with frequent multiple diagnoses.

To protect women from the kinds of violence reported here, including TBI, prostituting women should be offered alternatives to prostitution that permit survival without violence. The recommended two-year window of post-TBI healing is not possible for women who remain in prostitution (De Beaumont, Brisson, Lassonde, & Jolicoeur, 2009; Cox et al., 2006) since it is a probability that they will continue to sustain TBIs. Unfortunately, it is not possible to protect someone whose economic survival exposes them to the probability of frequent battery and rape.

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