The intersection of intimate partner violence and traumatic brain injury: A call for interdisciplinary research

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Abstract:

An emerging body of research suggests that survivors of intimate partner violence (IPV) are at a high risk for sustaining traumatic brain injury (TBI). However, most scholars and practitioners working on the problem of IPV have not examined how TBI could be related to their familiar subject of study. Concomitantly, little work in the brain injury field has been done to examine TBI in the context of IPV. In this paper, we encourage cross-collaboration among these fields. To that end, we consider the relationship between IPV and TBI; the difficulty in detecting and measuring the IPV-related TBI and ethical concerns that may arise when addressing this issue. Our work emphasizes the need to recognize the complex interplay among psycho-physiological health and socio-cultural contexts. As such, we present a socio-ecological perspective of IPV-related TBI to provide a contextual framework to guide future interdisciplinary research. Finally, we outline directions for future research.

Keywords: Gender | Domestic violence | Public health | Socio-ecological framework

Article:

In recent years, media stories related to the dangers of traumatic brain injury (TBI) have increased the public's attention and prompted much dialogue about the detection and subsequent effects of injury to the brain. Most of this press coverage has focused on TBI among professional football players and war veterans. Specifically, increases in suicides among Iraq and Afghanistan war veterans and cases of widespread neurodegenerative disease among some professional football players have spurred much of this national attention (Belson 2013; Wenner 2012). In the *New York Times* alone, there were 432 articles about TBI in the National Football League (NFL) published between 2007 and 2013 and hundreds more dealing with TBI among war veterans (Wenner 2012).

Increased focus on and knowledge about the consequences of TBI experienced by military personnel and athletes has sparked public interest and spurred research funding to improve the ways in which TBI is diagnosed and treated. With veterans in particular, the media focus has led to increased research exploring TBI resulting from blast injuries and the connection between TBI and post-traumatic stress disorder (PTSD). Yet little-to-no attention is devoted to another group who is at high risk for TBI: individuals who have experienced intimate partner violence. We refer to this phenomenon as "IPV-related-TBI."

The purpose of this paper is fourfold: 1) to review existing research indicating the importance of greater research attention to IPV-related TBI, 2) to highlight gaps in research that currently limit scholars' and practitioners' understanding of this critical issue, including detection and measurement problems, 3) to issue a call for increased research that brings together groups of scholars from a variety of disciplines to examine this issue in an ethically responsible manner and to consider contextual factors as a crucial component of the process, and 4) to propose a socio-ecological framework of IPV-related TBI, a conceptual framework intended to guide this interdisciplinary research.

Traumatic Brain Injury has been studied almost exclusively at an individual level by researchers in the medical sciences. Non-medical IPV scholars and practitioners are often more focused on social and psychological dynamics of abuse and rarely consider TBI in their models. Consequently, a broad and inclusive framework is needed to achieve a comprehensive understanding of IPV-related TBI. A socio-ecological approach (Bronfenbrenner 1979) allows for the integration of two distinct areas of research and practice—intimate partner violence and traumatic brain injury. We conclude with six recommendations for future directions in research in this area.

A Socio-Ecological Framework of IPV-Related TBI

At the time of this writing, IPV related TBI has been studied exclusively at the individual level where the occurrence of TBI in select populations is identified and frequencies are reported. While this level of identification is an obvious and necessary first step, it does not reveal much about the social processes that produce IPV-related TBI in the first place. In order to achieve a holistic understanding of IPV-related TBI, researchers and practitioners must understand the interpersonal dynamics and social context in which these injuries occur. We contend that the injured body should not be studied in isolation, but should be understood as ecologically embedded. The socio-ecological framework suggested here nests the individual with IPV-related TBI (ontogentic) within the relationship (microsystem) and within the larger community and social context (exosystem and macro-system, respectively) (Bronfenbrenner 1979). Each of these layers are embedded within the other, interdependent and bi-directionally influencing each other.

To the extent that a socio-ecological approach is taken, the study of IPV related TBI will be an interdisciplinary effort. To date, most of the research on IPV related TBI has been conducted by scholars in the medical sciences. Meanwhile, IPV scholars and practitioners are focused on social and psychological dynamics of abuse and rarely consider TBI in their models. A socio-ecological approach (Bronfenbrenner 1979) allows for the integration of two distinct areas of research and practice—intimate partner violence and traumatic brain injury. With a few

exceptions, research and practice in these fields have rarely cross-pollinated. Most scholars and practitioners working on the problem of IPV have not thoroughly examined how TBIs could be related to their familiar subject of study. Concomitantly, little work in medical and neuroscience fields has been done to examine TBI in the context of IPV. A socio-ecological approach is one way to create more interconnectedness between professional groups, to garner a more complex understanding of the phenomenon, and to advance an interpretive device.

Ecological frameworks have been studied for several decades and are heuristic tools for researchers in a variety of fields, including human development, family studies, communication, psychology, public health, sociology, and biology, to name a few. Further, the Centers for Disease Control (CDC) (2014) has adapted a socio-ecological perspective to understand the causes and prevention of violence. While there are many different varieties (for a review, see Richard et al. 2011), all ecological perspectives are grounded in understanding how individual functioning influences and is influenced by larger contexts. More specifically, an ecological approach draws attention to "the individual and environmental determinants of behavior" (Richard et al. 2011, p. 309). Each *level of influence* related to a particular behavior is visually represented by a series of nested circles, starting at the most immediate and moving out to the most distant. For example, the CDC's's (2014) four-level model includes the *individual* (e.g., biological and personal factors), *relationships* (e.g., closest relationships that increase risk of experiencing violence), *community* (e.g., the settings and their characteristics that are associated with violence), and *societal* (e.g., the social and cultural norms that create a climate in which violence occurs). Similarly, individual, relationship, community, organizational, and policy levels are common in public health socio-ecological frameworks (Richard et al. 2011).

A key objective of this paper is to call for interdisciplinary research on this topic. A socio-ecological approach to the study of IPV-related TBI would address the three main levels that professionals from a range of disciplines might consider: (a) the physical, cognitive, and psychological context of the TBI and its related pattern of potential symptoms; (b) the abusive relationship context, as it relates to how TBI related symptoms may serve as both a potential consequence of and risk factor for IPV victimization; and (c) the community and broader social context, especially regarding how IPV-related TBI is viewed and addressed within various social systems (e.g., the interpretation of research on IPV, media representations of TBI, and the systems in place to prevent and respond to IPV). To the extent that researchers from a variety of disciplines consider these ecological factors, practice, policy, intervention, and science surrounding IPV related TBI would be informed by not just biological markers, but social, interpersonal, institutional, and community conditions. While studies of these social and contextual factors do indeed exist in the general IPV literature, this scholarship has yet to merge with TBI studies in the biological sciences.

Defining Intimate Partner Violence

It is important to note that there are various forms of violent intimate relationships (Olson 2004). A full summary is beyond the scope of this paper, but it is important to explain the terms used herein. Of the most serious form of abuse, *battering* "refers to a severe and escalating form of partner violence characterized by multiple forms of abuse, terrorization and threats, and increasingly possessive and controlling behaviour on the part of the abuser" (World Health

Organization 2012, p. 1). More broadly, *intimate partner violence* (IPV) is the term often used to define relationships characterized by a violence that varies in frequency, severity, motive, and impact. Intimate Partner Violence is a term that allows for variation in the type of violent relationship and the severity of abuse, inclusive of both battering and less frequent relationship-based violence. More than likely, most IPV that results in TBI comes from batterers. Yet, some instances of IPV from non-batterers also result in TBI. Thus, for our purposes, we employ the broader term, intimate partner violence, which we define as "any form of physical, sexual, emotional, psychological, and/or verbal abuse between partners in an (current or former) intimate relationship" (Murray and Graves 2012, p. 14).

Existing Research on IPV-Related TBI

There are only a handful of studies that investigate IPV-related TBI. The research that does exist draws on data from special populations, namely those in the emergency room for IPV related injuries or those residing in the shelters. These samples constitute a relatively small percent of all persons who experience IPV. Therefore, we cannot generalize these results to larger populations. The limits of the existing research mean that we cannot yet draw conclusions about IPV-related TBI in general. That said, the prevalence of IPV-related TBI in these studies suggests that this phenomenon may indeed be a common occurrence and certainly signals that IPV-related TBI warrants further investigation.

While the true prevalence of IPV-related TBI is unknown, a handful of studies find that it ranges from 30 to 74 % (Kwako et al. 2011). In one study, emergency room data indicated that 67 % of women treated for IPV-related injuries reported problems that were indicative of injuries to the head (Corrigan et al. 2001). Similarly, Valera and Berenbaum (2003) sampled women from both shelter and non-shelter populations who all had sustained at least one physically abusive encounter and found nearly 75 % of the entire sample reported an IPV-related TBI. Another study of women residing in shelters found a 35 % TBI prevalence rate (Monahan and O'Leary 1999).

While the incidence and prevalence of IPV-related TBI are just beginning to be understood, individuals who are battered or experience IPV frequently acknowledge being hit in the face, neck, and head. There is, therefore, a high potential for TBI as a consequence of IPV (Ackerman and Banks 2003; Corrigan et al. 2001). Researchers estimate that between 88 % to 94.4 % of physical IPV incidents involve injuries to the head and neck (Arosarena et al. 2009). In a study of women in three domestic violence shelters, for instance, Jackson et al. (2002) located 53 battered women (recruited from shelters and community outreach programs) who were screened for TBI using the HELPS questionnaire[1] to identify patients in need of neuropsychological assessment. The researchers found that 92 % of the women had been hit in the head by their partners, and most of these were repeated blows to the head. The same study also found that 83 % had been both hit in the head and severely shaken and 8 % of them had been hit in the head over 20 times in the past year.

In a qualitative study, Roberts and Kim (2005) reported interview results from 52 battered women, all of whom reported symptoms that are often associated with Mild TBI (here after

[1] The HELPS questionnaire is a TBI screening tool suitable for non-medically trained professionals

mTBI). Notably, of the 52 subjects, only 32 contacted the police and went to the hospital. The remaining 20 did not receive medical care. In yet another study, which involved a survey of 362 battered women recruited from community agencies which serve battered women, Mechanic et al. (2008) found that 46 % reported being hit in the head, 45 % reported loss of consciousness associated with IPV incidents, and 72 % reported strangulation. These researchers also discovered that the severity of injury was connected to length of the abusive relationship and severity of physical aggression.

Most of this existing research on IPV-related TBI is decontextualized. As research on this issue progresses, we argue in favor of changing the way we think about IPV-related TBI to study the injured body in embedded systems. A socio-economic framework allows for a dynamic understanding of the interplay of IPV-related TBI and a range of influential social conditions, such as families, relationships, health care, communities, existing policy, and macro-social factors. To the extent that research on IPV-related TBI accommodates an array of contextual considerations, scholars can identify those environmental and demographic features that increase risk. Moreover, the context in which an individual lives might promote resilience, healing, or decline. As research on IPV-related TBI continues, typologies of situations that illuminate linkages between different circumstances and contexts can reveal the problem in a holistic way and help scholars plan appropriate interventions.

Understanding Traumatic Brain Injury

Research on TBI typically considers only one dimension: the body. One of the key aims of this paper is to recognize and study the context in which bodies are embedded. Consistent with a socio-ecological framework, all human phenomena are experienced in a nested fashion where the ever changing circumstances of our environment shape and impact life events. But before we can move toward a complete understanding of environmental influences on IPV-related TBI, practitioners and researchers must first understand the physiological basis of TBI and its impact on cognitive and psychological functioning.

A TBI is typically caused by a blow to the head, face, or neck; a fall into/onto a hard surface; or strangulation: external compression of the neck. The TBI may result in a closed injury to the head (i.e. one that does not penetrate the skull) or an open head injury. Any of these events may disrupt the normal functioning of the brain, resulting in changes in physical, cognitive, and/ or emotional wellbeing, depending on the extent and severity of the injury. The initial assessment of symptoms leads to an individual being placed into one of three TBI severity groups: mild, moderate, or severe. Mild TBI is the most frequently occurring severity level, accounting for about 80 % of the 1.7 million TBIs reported in the US each year (Faul et al. 2010). It is also the most difficult type to detect due to the subtle nature of the subsequent symptoms and/or a lack of awareness of the variety of deficits that might indicate brain dysfunction. We turn to the most widely accepted definition of mTBI, put forth by the American Congress of Rehabilitation Medicine (1993), to better understand the subtleties:

> A patient with mTBI is a person who has had a traumatically induced physiological disruption of brain function, as manifested by at least one of the following: 1. **any** period of loss of consciousness; 2. **any** loss of memory for events immediately before or after

> the accident; 3.**any** alteration in mental state at the time of the accident (e.g., feeling dazed, disoriented, or confused); and focal neurological deficit(s) that may or may not be transient; but where the severity of the injury does not exceed the following: loss of consciousness of approximately 30 minutes or less; after 30 minutes, an initial Glasgow Coma Scale (GCS) of 13-15; and posttraumatic amnesia (PTA) not greater than 24 hours. (p. 86)

Violent acts such as choking, blows to the head, or being forcibly shaken place an individual at high risk for brain injury. Damage to the brain may take the form of contusions (bruises on the brain) at the point of impact, a contre coup injury on the opposite side of the impact, and/or a tearing/shearing/stretching of the neural fibers in the brain (i.e., diffuse axonal injury) (Roberts and Kim 2005; Valera and Berenbaum 2003). While the immediate consequences of moderate to severe TBI are easily observed due to more observable symptoms (level of consciousness, poor orientation to time and place, memory impairments), mTBI, as described above, is less likely to be detected because the behavioral symptoms are much more subtle in this group of survivors. Mild TBI often goes unreported, despite a host of symptoms that may last for hours, days, or months following the injury. Injury-related sequelae refer to the complications and consequences resulting from the original injury. These residual effects of TBI might include problems with memory, attention, concentration, judgment, problem solving, depression, anxiety, aggression, personality changes, sleep disturbances, and headaches (Rapoport et al. 2005).

The symptoms of TBI are some of the same symptoms reported by many individuals who have experienced repeated instances of IPV (Valera and Berenbaum 2003). These symptoms may have significant functional implications in daily life and also place an individual at risk for sustaining another TBI. Because a mTBI may affect decision-making abilities, concentration, and judgment, it may be difficult for an individual with mTBI symptoms to extract themselves from a violent situation or seek help. Repeated mTBI injuries may lead to progressive neuro-degineration, a disease known as Chronic Traumatic Encephalpathy (CTE) (McKee et al. 2012). Although we were unable to locate any previous research examining CTE among individuals who have experienced IPV-related TBI, research on athletes and veterans reveal that repeated blows to the head have cumulative and chronic consequences (Belson 2013; McKee et al. 2012). Traumatic brain injury is not always a single event. It can develop into a serious chronic disease process (Masel and DeWitt 2010), which may lead to significant health complications (Breiding et al. 2008) and social isolation.

TBI as a Consequence of and Risk Factor for IPV

Bringing a socio-ecological framework to the study of IPV-related TBI would illuminate how ongoing stressors, social climate, resources, and life events affect risk and recovery for IPV-related TBI. Understanding the context in which IPV-related TBI occurs would also help practitioners with the management of TBI over the long term, particularly within potentially ongoing violent partnerships. Individuals with IPV-related TBI who remain in a battering or abusive relationship face environmental conditions that may exacerbate the negative effects of a TBI. While a football player may be removed from playing sports to allow for a full recovery, people who are embedded in violent partnerships may experience cumulative blows to the head over a short or long period of time. Intimate partner violence may lead to TBI, and the physical,

cognitive, and emotional symptoms associated with TBI may, in turn, result in a greater risk for future violence, including additional TBIs. However, because TBI—and especially mTBI—is often less visible than other forms of IPV-related injuries (e.g., bruises or broken bones), these injuries may go undetected and untreated despite symptoms that may last for days or months following the injury (Corrigan et al. 2001; Valera and Berenbaum 2003). Thus, injuries sustained on a regular basis are particularly dangerous because multiple TBIs, without the benefit of healing, result in longer recovery times and potentially more severe deficits (Rapoport et al. 2005; Valera and Berenbaum 2003). Therefore, the timing and frequency of abuse is particularly pressing to identify.

In addition to the physical and cognitive effects of injury to the brain, having sustained a TBI can increase a battered person's risk of further victimization, as the symptoms resulting from the injury may increase vulnerability to additional violence. As Jackson et al. (2002) wrote, "The frequency and severity of symptoms…would make it difficult to think through or cope with the complex, often formidable organizational tasks required for battered women to stop the violence, disengage from violent partners, and/or establish independent lives" (p.43). Moreover, the negative health impacts become more serious with the increased frequency and severity of violence (Campbell 2002). For example, Valera and Berenbaum (2003) examined whether women in a sample of both shelter and non-shelter groups sustained brain injuries from their abusive partners. The findings revealed that the rates of at least one mTBI were not different among the shelter and non-shelter groups. However, shelter women experienced more choking and severe brain injuries than those in the non-shelter group. In general, higher TBI severity scores were associated with higher partner abuse severity scores. Indeed, the more severe the violence, the greater the chance of sustaining a severe brain injury. With that said, however, Valera and Berenbaum (2003) state "although we cannot necessarily generalize our results to all battered women, these data suggest that brain injuries are not restricted to shelter populations" (p. 801).

Chronic stress may be both a precursor and overlapping condition that co-occurs with IPV-related TBI. Existing in a violent social arrangement makes coping with the effects of a TBI challenging at best, and exacerbating of the effects of the injury at worst. Covassin and Bay (2011) found that as chronic stress levels increased, female patients with mTBI exhibited a worsening of verbal memory, motor processing speed, and reaction time. Depending on the extent and the severity, TBI sequelae could make it difficult to cope with everyday functional tasks, make good personal decisions, organize and sequence daily activities, or maintain a job. These consequences present many potential challenges for those who are attempting to disconnect from violent partners and establish safety in their lives (Jackson et al. 2002).

One of the factors complicating the understanding of TBI in the context of IPV is the similarity of many of the symptoms of TBI to the mental health symptoms that victims and survivors of IPV may experience. In particular, victims of IPV are known to experience symptoms of depression, anxiety, and posttraumatic stress disorder (PTSD) at high rates (Helfrich et al. 2008; Draper et al. 2007). In addition, existing research suggests that TBI may be a precursor to depressive symptoms, anxiety, and a risk of suicide (Reeves and Laizer 2012). Differentiating the symptoms of mental health disorders and TBI symptoms is complex and requires an interdisciplinary approach in which assessment is conducted by both medical and mental health

professionals. Furthermore, it is possible for a victim or survivor of IPV who has sustained an injury to the head and/or neck to be appropriately diagnosed with both a TBI and a mental health disorder, assuming the person meets the criteria for each (Bryant 2011). Therefore, additional research attention is needed to elucidate the overlaps between TBI and mental health disorders in the context of IPV.

Having reviewed existing literature on IPV-related TBI, proposed a socio-ecologicalfFramework of IPV-related TBI to guide future inquires, and discussed the physiological and psychological manifestations of TBI, we now turn toward mapping directions in future research. First we consider specific challenges associated with studying IPV-related TBI, such as problems associated with identification and reporting of TBI and the ethical dilemmas that may arise as both researchers and practitioners turn greater attention to IPV-related TBI. We conclude with six recommendations for future directions in research.

Recognizing Important Challenges

Challenges in Identifying mTBI. Moderate to severe TBIs are much more likely to be identified and treated in medical settings (e.g., emergency rooms) due to the longer period of unconsciousness, whereas the symptoms associated with mTBI are difficult to identify and far more likely to escape attention. It is also difficult to tease out the consequences of mTBI from other symptoms related to the IPV experience. For example, some researchers argue that the severity and psychological trauma of just living in a battering relationship may account for changes in one's cognition and psychological functioning (Housecamp and Foy 1991), making it even harder to separate mTBI from other physical and mental health problems. Both exposure to a violent situation and sustaining a TBI may contribute directly and indirectly to cognitive and psychological dysfunction (Valera and Berenbaum 2003). For practitioners in particular, there is limited guidance available to help them tease apart all of these overlapping symptoms that may result from the stress of the abuse itself, injuries, psychological effects of the abuse, and potential TBI.

Neuroimaging would ostensibly seem to help identify IPV-related TBI, but mTBI is most frequently present without any signs revealed by MRI or neurological exams (Ackerman and Banks 2003; Committee on Mild Traumatic Brain Injury 1993). Further, these data are limited for IPV survivors. In fact, only one study was found to examine the relationships between imaging (MRI) and neuropsychological functioning in individuals who experienced IPV (Fennema-Notestine et al. 2002). To detect TBI, and especially mTBI, a combination of neuroimaging, neurological examinations, self-report data, witness accounts, and cognitive testing is ideal. Even if this combination of multiple examinations was used, however, the problem remains that the majority of people who sustain IPV-related injuries do not seek medical treatment (Plichta 2004; Campbell 2002). In Valera and Berenbaum's (2003) sample of battered women in shelters and non-shelters, only 25 % reported having gone to the hospital after an injury, perhaps due to restricted access to medical care.

As previously mentioned, traumatic brain injury, especially when it is categorized as mild or chronic, can be an elusive injury, invisible and difficult to detect (Roberts and Kim 2005). Individuals with IPV-related TBI may experience significant functional consequences without

any visible injuries. These less visible injuries and other consequences of IPV-related TBI might be trivialized or dismissed. There may indeed be life threatening injuries present, but they may be classified as "no injury" or "minor injury" simply because they are not visibly identifiable and often have subtle indicators. The visibility of IPV-related TBI also appears to be lacking in research and theory on the consequences of IPV. Previous theorizing and research has suggested that it is IPV severity itself that accounts for problems with cognitive and psychological functioning reported by survivors of abuse – missing or bypassing the potential presence of TBI (Valera and Berenbaum 2003).

Challenges in Reporting of IPV Related TBI. Restricted access to medical care and inadequate measurement tools are not the only obstacles to identifying IPV-related TBI. The culture of silence surrounding IPV prevents accurate diagnoses and intervention for IPV-related TBI. Many individuals who experience IPV are fearful of the consequences associated with divulging any information about their abusive experiences. In addition, there is often a stigma associated with any injury that may affect brain functioning, leaving questions about independence and competency. To date, many professionals who work with clients impacted by IPV lack training to understand, screen, and intervene in cases of IPV-related TBI. Therefore, at the present time, a need remains for greater attention to developing guidelines to address IPV-related TBI in both community practice settings and in scholarly research.

Challenges in the Empirical Measurement of the Frequency of Occurrence of TBI: The Absence of TBI from Major IPV Surveys. The Centers for Disease Control (2010) (CDC) and the National Institute of Justice (NIJ) have conducted the largest national surveys of IPV in the U.S. As one of the nation's largest and most consistent agencies focusing on violence prevention, the CDC (2010) estimates that 24.3 % (or 1 in 4) women and 13.8 % (1 in 7) men have experienced severe physical violence from an intimate partner in their lifetimes. In another widely-cited, nationally representative survey of IPV, funded by the National Institute of Justice, the prevalence of IPV among women was 22.1 % and 7.4 % for men (Tjaden and Thoennes 2000, 2006). Further, Tjaden and Thoennes (2000) reported that 31.5 % of female rape victims and 16.1 % of male rape victims were injured during their most recent rape. For physical assault, 39.0 % of female victims, and 24.8 % of male physical assault victims sustained an injury during their most resent IPV assault (Tjaden and Thoennes 2000).

The incidence of IPV-related TBI is conspicuously absent in both the CDC and NIJ reports. The two largest surveys on IPV do not isolate TBI in their questionnaires. While the CDC survey asks respondents to report on the type of violence experienced (e.g. slapped, hit, punched, kicked), survey participants were not asked if they were hit in the head or lost consciousness. Indeed, symptoms resulting from TBI are not mentioned once in the entire CDC report. The NIJ study did ask respondents to describe their injuries. The results showed that 6.6 % of rape victims and 10.1 % of assault victims experienced head or spinal cord injury. However, the NIJ survey did not specifically inquire about the symptoms associated with these injuries. Instead, injury to the head was lumped into a category with spinal cord injury.

The Revised Conflict Tactics Scales (CTS2; Straus et al. 1996) is a widely-used measure of IPV and it includes the following forms of abuse on the physical assault subscale: punching the partner, beating up the partner, hitting the partner with something, choking the partner, slamming

the partner against the wall, throwing something at the partner that could hurt, and using a gun or knife on the partner. However, it does not specifically assess whether injuries were directed to the head, further contributing to the lack of attention to this issue in existing research. Any of these forms of abuse, among many other specific violent behaviors, could result in a TBI if the violence is directed toward the head and/or neck. In sum, our three most widely-used IPV data sources (i.e., surveys from the CDC and the NIJ and studies using the CTS2) do not isolate specific information on TBI and associated symptoms.

Challenges with the Ethics of IPV-Related TBI Research. Although there are numerous benefits to the greater attention to IPV-related TBI, researchers and practitioners from all relevant professions must ensure that research findings and clinical applications are used and interpreted responsibly and in a way that does not add to the stigma that survivors of IPV often face. A growing body of research suggests that there is a significant stigma surrounding IPV that poses numerous potential challenges for those who experience it (e.g., Crowe and Murray in press; Overstreet and Quinn 2013). The stigma is manifest through such dynamics as victim-blaming, discrimination, stereotyping, labeling, and diminished value and worth ascribed to survivors (Crowe and Murray in press).

There is a significant potential that greater attention to the impact of TBI on survivors of IPV could contribute to further stigmatizing and discrimination against this vulnerable population from different sources, including the media and perpetrators. For example, a perpetrator who learns that his/her partner has a TBI could use this information to question decision-making skills or a person's ability to care for children as part of continued emotional and verbal abuse patterns. In addition, media reports of research demonstrating rates of TBI among survivors of IPV could be stated in such a way as to imply that survivors are somehow "damaged," "incompetent," or unable to function secondary to their abuse. These media messages could perpetuate cultural stigma (Overstreet and Quinn 2013) and lead to a sense of hopelessness among survivors who have experienced TBI. Therefore, researchers and practitioners who communicate with survivors, those in close relationship to them, and the wider population must ensure that information about TBI is conveyed in ethically-responsible ways that do not increase the stigma that survivors already face.

Directions in Future Research. Following from the socio-ecological framework presented in this article, there are six interdisciplinary directions for future research that we recommend moving forward. Each research objective suggested here addresses one or more of the levels of inquiry in the socio-ecological model: the physical, cognitive, and psychological context of the TBI and its related pattern of potential symptoms; (b) the abusive relationship context, as it relates to how TBI related symptoms may serve as both a potential consequence of and risk factor for IPV victimization; and (c) the community and broader social context.

First, researchers should assess for TBI in studies of survivors of IPV more frequently to provide a more comprehensive understanding of this phenomenon. At the most basic level, we believe that more researchers should begin to include questions about TBI on IPV data collection instruments and screen for TBI in practice settings. Doing so, undoubtedly, would increase the time to participate in a study or to complete an intake session. Yet, we argue that this increased time is practical for two primary reasons. First, the additional time would be minimal since only

a few questions are needed to gather some very brief initial information that could be used to identify the "potential" for a head injury. Appropriate follow-up procedures could be developed for only those individuals. Second, and relatedly, because of the serious consequences involved with not detecting and treating TBI's, we argue that the benefits of such knowledge far outweigh the costs. Knowing the prevalence of IPV-related TBI, it becomes a matter of professional ethics to no longer choose to ignore but instead to purposefully commit to identifying. Of course, even with questions about brain injury, there remains the difficulty with detecting TBI, specifically, teasing out symptoms of injury to the brain from other conditions. Researchers from multiple disciplines should work toward the development of more sensitive measures to address these complicated factors. Estimating the number of cases of IPV-related TBI is a critical starting point. Qualitative research is needed that explores the perspective of persons living with IPV-related TBI in differing social contexts. Quantitative research will serve to uncover how much and who is most at risk, both demographically and situationally.

Second, researchers should study the developmental trajectory of IPV-related TBI. Longitudinal studies will reveal far more than cross-sectional studies. Following individuals over time will be especially important to sort out the temporal sequencing of injury in relation to past and further victimization. Longitudinal designs will also help to determine whether TBI is a result of IPV or a precursor to IPV, or both (Ellsberg et al. 2008). Time is a crucial piece of any socio-ecological framework, in order to illuminate the process by which any one person experiences IPV-related TBI in a given context. Since sustaining a TBI places an individual at risk for additional violence, only studies that occur over time can isolate the changing contextual risks for individuals living with brain injury. The use of this socio-ecological framework invites an understanding of identification and treatment of TBI within ongoing violent partnerships. Consistent with this framework, IPV related TBI should be studied across the lifespan to understand how it is connected to the diversity of economic forces, cultural factors, and even individual temperament to show how these factors impact the ability for survivors of IPV-related TBI to thrive. Conditions such as disability, unemployment/underemployment, substance abuse, and unmet needs of care (Plichta 2004) may all be taken up by community health programs to create therapeutic environments and address specific survivor needs. Such an approach will also expose long term consequences of IPV-related TBI.

Third, researchers should examine common symptom patterns and practice implications for different severity levels of IPV-related TBI. Since TBI can present with a vast array of symptoms, depending on the location and severity of injury, future research should explore whether different symptoms have differing effects in the lives of IPV survivors. Moreover, researchers need to examine the relationships between violent couple types and severity and frequency of TBI's. Doing so can help determine if important nuanced patterns exist that differentiate various violent relationships from one another. The identification of differences has important practice implications as well. Instead of a "one-size-fits-all" model, therapeutic intervention could be more tailor-made based upon the type of violent relationships in which brain injuries occur. In keeping with a socio-ecological framework, one approach would be to identify common types of social situations in which IPV-related TBI occurs. Inter-professional researchers can collaborate with practitioners to develop practice guidelines for addressing IPV-related TBI in various relevant practice settings, including hospitals, domestic violence agencies and shelters, mental health counseling, and law enforcement responses. Partnerships between scholars who study

IPV, first responders, and the medical community are reflective of a socio-ecological approach, where various zones of social life are addressed by the appropriate professional entity.

Fourth, researchers should examine the challenges and obstacles posed in daily life management for survivors of IPV-related TBI. There are complex relationships between IPV, TBI, and life before and after the battering incident. The chronic stress of living with both a brain injury and a violent relationship could have deleterious effects on brain recovery and cognitive and emotional functions (Covassin and Bay 2011). Survivors of IPV-related TBI may face a myriad of health consequences and depletion of personal and social resources. Survivors may self-medicate with alcohol and/or drugs, which can complicate treatment and recovery, and PTSD among formerly abused persons is well documented (Campbell (2002); Twamley et al. 2009). In one study, observations from counseling sessions show that women with brain injuries discussed how their injuries compromised their ability to make informed, consistent decisions about shelter, child care, and safety planning (Banks and Ackerman 2002). Researchers might identify challenges associated with resuming life after an IPV-related TBI and identify community resources needed to serve this population.

Fifth, research attention should focus on TBI among IPV Perpetrators. While this article has focused on individuals who sustain IPV-related TBI, perpetrators also may exhibit TBI (Stern 2004). This is an important subject to consider to the extent that TBI may be a precursor to IPV-related TBI. Farrer et al. (2012) found that the prevalence of TBI among IPV perpetrators is much higher than the general population. Similarly, Ray et al. (2014) found that the rate of TBI among inmates in an Indiana prison was twice that of the TBI rate among the general U.S. male population. Research conducted in a clinical research setting by Alderman et al. (2002) found an astonishingly high number of aggressive incidents observed among 46 patients, most of whom displayed closed head injuries, in a hospital setting over the course of 14 days.

Research on how TBI impacts risk for IPV perpetration could provide valuable information to aid in the prevention and early identification of future violence. There are several well-established social risk factors associated with IPV perpetration: alcohol use, education level, traditional sex-role ideology, emotional/verbal abuse, forced sex, illicit drug use, an attitude condoning violence, career/life stress, history of partner abuse, and jealousy (Farrer et al. 2012; Plichta 2004). Child abuse is considered to be a precursor to both TBI and IPV (Wuest et al. 2009; Stern 2004). All of these risk factors play out overtime in one's social life. IPV-related TBI therefore must be situated within a larger social and relational context.

Sixth, researchers should examine further the impact of gender, race, and other socio-demographic variables on IPV-related TBI, especially as it relates to implications for clinical practice. Intimate partner violence related TBI is certainly a complex issue complicated by a host of social conditions, including poverty, race, education, and gender. Since IPV-related TBI is a gendered phenomenon, researchers might seek to gain a deeper understanding of how gender identity, gender ideology, and gendered social arrangements impact the experience, risks, and outcomes of IPV related TBI. Race is also an important mediating variable in IPV-related TBI. When compared to other ethnic groups, African American women may experience more severe community violence and IPV, placing them at a disproportionate risk for injuries to the head. Further, African American women may receive inadequate medical care, leading to undetected

symptoms (Banks and Ackerman 2002). In other words, the risk of sustaining a TBI and the effect of living with a TBI may be compounded by the experience of living with a marginalized identity. The hardships faced by an individual's social location could exacerbate the struggle associated with the challenges posed by living with a TBI.

Conclusion

While a host of devastating injuries may result from IPV, TBI is among the most disabling (Reichard et al. 2007). Persons with TBI are at risk for additional IPV-related injuries, including repeat TBI. Compared with the nondisabled, people with disabilities are at a higher risk of violent victimization (Hughes, et al. 2012; Reichard et al. 2007). Persons with TBI-related disabilities may live with altered physical and cognitive functions, reducing their capacity for self-protection and placing them at greater risk than those with slight or without disabling conditions (Diaz-Olavarrieta et al. 1999).

Compared to the attention TBI has received among football players and war veterans, there is a paucity of attention, particularly in the area of scholarly articles and research funding, devoted to a better understanding of IPV-related TBI. If we draw parallels between veterans, football players, and individuals who experience repeated IPV, then the reality for cumulative damage becomes urgent. These two groups—veterans and football players—have received significant public attention and have begun to receive additional resources and support to help them recover from the TBI they have experienced. Similar attention is needed for survivors of IPV, especially because resources to support this population are often scarce and TBI has been under-recognized in the aftermath of abuse.

Despite growing recognition of the risk for TBI among people who have experienced IPV, this issue remains under-studied, misunderstood, and not commonly integrated in theories related to IPV. Furthermore, IPV-related TBI is rarely addressed in professional training programs for front-line staff who work with individuals experiencing IPV (Ackerman and Banks 2003; Banks and Ackerman 2002). Given the limited information available about IPV-related TBI in the existing body of research, there are even fewer recommendations for practitioners to assess and provide intervention services to clients who have experienced IPV-related TBI.

Not only is it critical to identify those individuals who have sustained a TBI as a result of IPV, it is equally important for researchers, police, social workers, and treatment providers to be sensitive to the complicated terrain of IPV-related TBI in various social contexts. Given the high prevalence of IPV, there is an urgent need for practitioners and researchers from multiple professions to integrate an understanding of IPV-related TBI into research and clinical practice. This awareness should not be solely at the level of assessment and treatment of the symptoms of TBI, but should be sensitive to the ways in which survivors are members of broader social context that includes families, communities, and society. Of course, it is not enough to identify this problem. To make an effective intervention – that is, to influence policy and practice – risk for and recovery from IPV-related TBI needs to be understood in diverse environmental contexts. The use of a socio-ecological framework will enhance understanding of the dynamic interplay between the body and varied social influences.

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