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## Prevalence, correlates, symptomology, and assessment of women with aquired brain injury as a result of intimate partner violence

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Pepperdine University  
Graduate School of Education and Psychology

PREVALENCE, CORRELATES, SYMPTOMOLOGY, AND ASSESSMENT OF WOMEN  
WITH ACQUIRED BRAIN INJURY AS A RESULT OF INTIMATE PARTNER VIOLENCE

A clinical dissertation proposal submitted in partial satisfaction  
of the requirement for the degree of  
Doctor of Psychology

by  
Gillian Dowlou

June, 2024

Thema S. Bryant-Davis, Ph.D.— Dissertation Chairperson

This clinical dissertation, written by

Gillian Dowlou

under the guidance of a Faculty Committee and approved by its members, has been submitted to and accepted by the Graduate Faculty in partial fulfillment of the requirements for the degree of

DOCTOR OF PSYCHOLOGY

Doctoral Committee:

Thema S. Bryant-Davis, Ph.D., Chairperson

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## DEDICATION

This is for my mother, Elizabeth, who is joy, beauty, magic, and everything God has made good in this world. Thank you for being my number one supporter. My triumphs are ours because you are always there every step of the way. How blessed am I to have such an epic mother?

This is for my dear friend, Nia, whose name means purpose. Your passing altered the trajectory of my life and positioned me on a purposeful mission to “Create the life I imagined.”

## VITA

**EDUCATION**

|  |                    |
|--|--------------------|
| PEPPERDINE UNIVERSITY  | Malibu, CA         |
| <i>Doctor of Psychology in Clinical Psychology</i>               | April 2024         |
| NATIONAL UNIVERSITY  | Woodland Hills, CA |
| <i>Master of Arts in Psychology: Marriage and Family Therapy</i> |                    |

**DOCTORAL LEVEL TRAINING**

|   |                     |
|---|---------------------|
| CAMBRIDGE HEALTH ALLIANCE/HARVARD MEDICAL SCHOOL  | Cambridge, MA       |
| Adult/Acute Care: OPD, Primary Care, Emergency Department, Community Behavioral Health Center |                     |
| <i>Clinical Psychology Intern/ Harvard Medical School Fellow</i>                              | J June 2023-current |
| Supervisor: Patricia Harney, Ph.D.  |                     |

- Provide crisis assessment and therapeutic intervention for suicidality and homicidality
- Engage in multicultural and trauma-informed behavioral health services for individuals with complex post-traumatic stress disorder, post-traumatic stress disorder, dissociative disorders, psychosis, and other severe mental illness
- Demonstrate advanced knowledge and mastery of DSM-5-TR diagnostic criteria
- Utilizing a wide variety of trauma-informed and person-centered practices, including evidence-based treatment modalities (e.g., CBT, DBT, ACT, MI, short-term psychodynamics, and Mindfulness) across the lifespan
- Engage in advocacy, prevention, and community outreach services
- Attend and contribute to weekly multidisciplinary faculty and staff meetings

|  |                           |
|--|---------------------------|
| CEDARS-SINAI Medical Center                        | Beverly Hills, CA         |
| <i>Consult Liaison Psychology Practicum Extern</i> | September 2022-April 2023 |
| Supervisor: Robert Chernoff, Ph.D.                 |                           |

- Served as a Consultation Liaison while functioning within multidisciplinary teams (psychiatry, social work, nursing, and primary care professionals)
- Provided a wide variety of evidence-based treatment modalities to adult, adolescent, and child clients (e.g., CBT, DBT, ACT, MI, and Mindfulness)
- Utilized Virtual Reality and evidence-based practices for chronic pain management
- Provided patients with care coordination, case management, and other ancillary functions
- Evaluated patients' adjustment to current medical condition for patients with concurrent medical illness and psychological diagnoses, including challenges with substance use

|  |                    |
|--|--------------------|
| UCLA Semel Medical Psychology Assessment Center (MPAC)/Health Operation Mend Los Angeles, CA |                    |
| <i>Neuropsychology Practicum Extern</i>  | June 2022-May 2023 |
| Supervisor: Patricia Walshaw, Ph.D.  |                    |

- Conduct adult neuropsychological evaluations to assess specific neurodegenerative disorders, movement disorders, epilepsy, traumatic brain injuries
- Score, interpret, and write neuropsychological reports to inform current neurocognitive profile and to assist in diagnostic clarity
- Participate in neuropsychological group supervision and didactics
- Worked with numerous Follows and Attendings to observe and learn various supervision styles

|   |                          |
|---|--------------------------|
| RANCH LOS AMIGOS NATIONAL REHABILITATION CENTER                   | Downey, CA               |
| <i>Cognitive Rehabilitation Practicum Extern</i>                  | September 2021-June 2022 |
| Supervisors: Rajarathnam Sainath, Psy.D. and Tatyana Jones, Ph.D. |                          |

- Collaborated with the multidisciplinary treatment team, including psychiatry, social work, nursing, and primary care professionals, to develop and implement therapeutic behavioral service plans to address patients' needs and goals
- Assessed cognitive status/abilities, capacity to make medical decisions, premorbid psychiatric, personality traits, and impact on treatment and future functioning
- Administered, scored, and interpreted brief neuropsychological screening (e.g., MoCA, CASI, GOAT, Orientation Log (O-Log))
- Facilitated evidence-based individual and group psychotherapy (e.g., CBT, DBT, ACT, MI, and Mindfulness)

#### **SOUTH LA TRAUMA RECOVERY CENTER (SOUTH LA TRC)**

Lynwood, CA

*Practicum Clinical Therapist*

September 2020-June 2021

Supervisor: LaTonya Wood, Ph.D.

- Provided evidence-based (e.g., DBT, CBT, TF-CBT, CTP, ACT) family, adult, adolescent, and child psychotherapy for clients from high-crime, low socioeconomic, culturally and racially diverse backgrounds
- Conducted clinical assessments to assess baseline, mid-treatment, and termination outcomes for victims of violent crimes, including gang or gun violence, domestic violence, assault, and battery
- Created individualized treatment plans to support clients in developing cognitive and behavioral strategies to cope with changes from their physical injuries following trauma experiences
- Provided consultation-liaison services for individuals from Crossroads to connect patients with appropriate psychotherapeutic and social services
- Facilitated case management services for victims of violent crimes to acquire financial, housing, legal, and social needs and foster a cooperative working relationship with a variety of referral resources and services, community organizations, and social services

#### **CLINICAL EXPERIENCE**

##### **EVOLVE TREATMENT CENTERS**

Woodland Hills/Tarzana, CA

*Clinical Program Director*

December 2018- April 2020

Supervisor: Laura Kerwin, Ph.D.

- Analyzed needs, strengths, and outcomes of the clinical program to assess effectiveness and opportunities for growth
- Provided clinical supervision, educated, and trained Associates and staff members
- Recruited and interviewed all staff members and oversaw scheduling for staff members
- Conducted initial crisis assessments and ongoing evaluations to assess baseline, mid-treatment, and termination outcomes for acute high-risk clients in the residential treatment centers
- Provided evidence-based crisis interventions and family, adult, adolescent, and child psychotherapy (e.g., EMDR, Seeking Safety, DBT, CBT, TF-CBT, CTP, ACT)
- Reviewed clinical treatment program services and outcomes and ensured compliance with program standards and objectives, applicable contracts, regulations, and accreditation standards
- Conduct weekly chart audits and quality assurance reviews

##### **FOOD ON FOOT**

Hollywood, CA

*Clinical Program Director*

August 2014- December 2018

Supervisor: Carla Polizzi

- Facilitated case management services to racial/ethnically diverse houseless clients who have multiple medical and psychiatric co-morbidities
- Provided consultation-liaison services for individuals from Los Angeles shelters and social service resources to connect patients with appropriate psychotherapeutic and social services
- Conducted 1:1 weekly individual and group psychotherapy (e.g., DBT, CBT, TF-CBT, CTP, ACT)

- Interview and hire all clinical staff members

TARZANA TREATMENT CENTERS INC.

Tarzana, CA

*Clinical Therapist/Counselor III*

August 2013- August 2015

Supervisor: Tim Petersen, Ph.D.

- Conducted strengths-based, culturally competent individualized intakes, including psychosocial and family variables
- Facilitated crisis intervention, individual, and group mental health and chemical dependency counseling using evidenced-based treatment modalities (e.g., Seeking Safety, CBT, DBT, TF-CBT, CTP, ACT, MI, and Mindfulness)
- Worked closely with Case Managers and other multidisciplinary team members to ensure that all identified problems were addressed for adolescents on probation and in the foster system

## ABSTRACT

Brain injury resulting from intimate partner violence is a pervasive and complex issue with substantial health and social consequences for women globally. Therefore, findings from this review aim to summarize and review the intersection of intimate partner violence-related acquired brain injury among women. This review gives particular attention to the following inquiries: (a) How prevalent is a brain injury resulting from intimate partner violence? (b) What are the risk factors and correlates (i.e., demographic, age, socio-economic status) of brain injuries among survivors of intimate partner violence? (c) What symptoms of brain injuries are observed in survivors of intimate partner violence? (d) How is screening and assessment for brain injuries being approached in women subjected to intimate partner violence? The results from this integrative systematic review demonstrate a wide range in the reported prevalence of intimate partner violence-related acquired brain injury. Studies in this review focused little on the impact of race, ethnicity, and social determinants. The demographics of the participants did not reflect the current literature that individuals from marginalized identities are disproportionately targets of severe IPV. Women at least age 20 and women who were married or lived with their partners seem to be at increased risk for IPV-related acquired brain injury. Outcomes of brain injury in this population include psychological, neurocognitive, and behavioral changes even when controlling for significant sociodemographic factors, PTSD, and severity of assaults. All studies incorporated self-report questionnaires and structured or semi-structured interviews. There are no universal methods for screening and assessment of IPV-related acquired brain injury.

## **Chapter I: Background and Rationale**

### **Statement of the Problem**

The prevalence of women in violent intimate relationships who sustain at least one brain injury (BI) is estimated at 31.5 million women in the United States (Valera et al., 2019). Globally, this prevalence is estimated to outnumber the cases of highly studied and internationally publicized combat veterans, as well as competitive athletes who sustain traumatic brain injuries (Valera et al., 2019). Despite this, the extant literature on the effect of intimate partner violence (IPV) related acquired brain injury (ABI) is scant compared to the latter, which tends to be more publicized and more frequently studied. The numbers are still low after repeated calls for more attention and investigation of this population. Casper and O'Donnell (2020) proposed that one reason for the lack of responsiveness and slow progress on this topic is rooted in gendered assumptions and narratives. That is, these authors assert that a medical origin is used to conceptualize symptoms presenting after impact to the head of male boxers, athletes, and combat veterans. In contrast, a psychosocial model is used to conceptualize similar symptoms of women after impact to the head (Casper & O'Donnell, 2020). Wilson et al. (2007) found that IPV survivors in their sample experienced feeling blamed and shamed for their circumstances and faced systemic healthcare inequities and implicit biases.

Along with little attention in the literature, studies suggest that frontline workers and medical personnel often do not screen or make the necessary referrals for assessment of traumatic brain injuries (TBIs) when working with survivors of partner assaults (Valera et al., 2019; Valera & Berenbaum, 2003). For example, over fifteen years ago, Banks (2007) highlighted that referrals were not often made to psychologists to conduct neuropsychological testing when survivors sustained blunt force trauma to the head, face, and neck. Recent research

found that many professionals are not asking questions to assess for possible TBI when women experiencing IPV seek help (Crowe et al., 2019). Still today, referrals for neurological testing following IPV-related ABI are not routine to assess neurological damage. Moreover, survivors themselves and the general public are unaware of the likelihood of brain injury resulting from partner-inflicted injury to the head, face, and neck (Valera et al., 2019). The literature advocates that treatment plans incorporate neuropsychological testing and that neurorehabilitation interventions be incorporated as clinically indicated (Murray et al., 2016).

A diagnosis of brain injury is often identified and confirmed from data obtained through neuroimaging and neuropsychological assessment. As such, if no one is screening for brain injury in this population, a formal diagnosis cannot be made (Banks, 2007). In addition, psychologists with minimal neuropsychological training may not conceptualize a need for cognitive rehabilitation as a treatment need when working with these individuals. Banks (2007) highlights that cognitive rehabilitation might be necessary for survivors to benefit from the routine case management and psychotherapy interventions traditionally provided to IPV survivors. The author asserts that individuals with undiagnosed brain injuries are instead only diagnosed with post-traumatic stress disorder (PTSD) and borderline personality disorder (BPD) due to overlap in symptoms or co-occurring diagnoses. However, the outcome of memory deficits and concreteness in thinking resulting from acquired brain injury can, according to Banks (2007) make traditional PTSD and BPD treatments insufficient without accompanying neurobiologically informed intervention.

Intimate partner violence is a leading cause of nonfatal injuries among women (Centers for Disease Control and Prevention [CDC], 2018). IPV-related acquired brain injury can lead to deleterious consequences (e.g., negative functional and structural brain connectivity problems,

adverse psychiatric, and mental health outcomes) impacting survivors across multiple life domains and may further complicate a survivor's ability to leave the violent partnership (Haag et al., 2016; St Ivany et al., 2018). Along with blunt force trauma to the head, strangulation is a leading cause of trauma to the brain from sustaining anoxic or hypoxic consequences (Valera & Kucyi, 2016; Valera et al., 2019a). Nonfatal strangulation restricts breathing and oxygenated blood to the brain, which can result in tissue damage or tissue death (Valera & Kucyi, 2016; Valera et al., 2019a). Strangulation can result in a loss of consciousness within seconds and termination of life within minutes (Strack & McClane, 1999).

IPV to the head, neck, and face results in primary and secondary injuries. Primary injuries encompass the damage that occurs at the time of impact. Secondary injuries are the delayed consequences initiated by primary injuries (Brown et al., 2019). Within the literature, there is no universal definition for a traumatic brain injury. Adopted for this review is the definition offered by Kwako et al. (2011). Traumatic brain injury is defined as a “physiological disruption in brain function resulting from an external, physical force, including blunt force and acceleration/deceleration” (Kwako et al., 2011, p.115). Traumatic brain injuries are categorized according to severity (mild, moderate, severe), changes in mental status, loss of consciousness, and posttraumatic amnesia (Faul et al., 2010). The severity of TBIs is evaluated based on physical indicators and scales such as the Glasgow Coma Scale (Teasdale & Jennett, 1974). According to Faul et al. (2010) mild TBIs account for approximately 80% of the traumatic brain injuries reported each year. However, Brown et al. (2019) asserts that “mild” can be anything but mild and can lead to lifelong significant difficulties from brain damage on a vascular and cellular level.



Due to less visible damage compared to more recognizable head and neck injuries associated with domestic violence, acquired brain injuries are often undetected and subsequently untreated. Studies suggest that the effects of a single TBI may last days or months after the injury as secondary injuries emerge (Corrigan et al., 2003; Valera & Berenbaum, 2003). Additionally, individuals in violent relationships often have repetitive acquired brain injuries without the interventions required for healing between injuries, resulting in more severe consequences and recovery time, than a single injury to the brain (Rapoport et al., 2005; Valera & Berenbaum, 2003). Therefore, efforts to increase vigilance for screening and to illuminate IPV-related acquired brain injuries as a significant public health concern are advantageous for survivors, community stakeholders, advocates, clinical and medical professionals, social services organizations, and the public.

TBIs are often not detectable with standard neuroimaging techniques and may require surgical interventions. A typical presentation of mild TBIs in assault survivors is diffuse axonal injury (DAI) in the white matter tracts of the brain (Valera et al., 2019a). Diffuse axonal injury stems from the axonal damage from the force of acceleration/deceleration and rotational movement of being struck or shaken (Baxter & Hellewell, 2019; McKee & Daneshvar, 2015). DAI results in microscopic damage, which is difficult to identify with standard neuroimaging and, therefore, difficult to detect and diagnose. Secondary damages may include axonal damage, scar tissue in the brain, inflammation, blood-brain barrier dysfunction, edema, and hormonal changes (Banks, 2007; Baxter & Hellewell, 2019). The heterogeneity in presentation and etiology adds to the challenges of diagnosing, categorizing, and treating acquired brain injuries. The literature reports that TBI symptoms require different interventions than symptoms of PTSD, depression, and other mental health presentations (Campbell et al., 2018). Furthermore,

there is evidence that the symptoms of ABIs are not healed over time but that the brain may adjust over time, resulting in longstanding changes in the individual without appropriate intervention (Thornton & Carmody, 2009). Therefore, understanding the potential for neurobiological complications on mental health outcomes following assaults from interpersonal violence is necessary to understand clinical presentations, assess the prognosis for recovery, and develop effective interventions and referrals (Banks, 2007; Wong et al., 2013).

Within the literature, there are several terms used to identify the impact of trauma to the brain resulting from partner-inflicted violence (i.e., traumatic brain injury, brain injury, concussion, post-concussion syndrome, acquired brain injury). In reporting specific findings about TBIs alone or strangulation alone, this author will adapt the language used by the study. Otherwise, when both etiologies are considered and, in general, the term this author will use to capture the sequelae of injuries related to traumatic brain injury and non-fatal strangulation in this systematic review is acquired brain injury (ABI).

### **Overview of Current Research**

The vastly detrimental and enduring sequelae of repetitive mild traumatic brain injuries, including concussions, have received robust media and research attention in the context of athletes and combat veterans (Valera et al., 2019a). This focus has resulted in an outpouring of resources continuing to add to the growing body of literature and rehabilitation measures for TBIs in the context of sport-related and combat military TBIs. In comparison, Colantonio (2020) highlighted the challenges in obtaining funding to work on TBIs in a context that impacts millions of women globally. Studies suggest caution when generalizing TBIs from sports injuries and combat with IPV-related TBIs, as there are unique considerations for women who experience IPV-related TBIs. These additional factors include complexities due to differences in

psychological factors, demographics across age and gender, the nature of injuries, associated stigma, ability to access care, and the screening process, knowledge, removal from the environment, and preparedness of the frontline caregivers working with survivors of intimate partner violence in comparison to providers working with athletes and combat veterans (Hunnicuttt et al., 2017; Kwako et al., 2011; Valera & Kucyi, 2016).

### **Acquired Brain Injury in Women Experiencing IPV**

There are likely differences in the biochemical movement and brain insult depending on the mechanism(s) (e.g., violent shaking, slapping, suffocations, strangulation, force falls) that cause the injuries in IPV-related brain injury (Bayly et al., 2012). Studies have found that the greater the incidences of TBIs, the poorer the performance on learning, cognitive flexibility, and memory tasks (Campbell et al., 2018; Haag et al., 2016; Valera & Kucyi, 2016). Levels of anxiety, depression, posttraumatic stress, and worry have been higher for women who experience a traumatic brain injury (Campbell et al., 2018; Valera, 2018). Of interest also are findings that participants who experienced intimate partner violence had a previous TBI and that focus groups have reported increased abuse vulnerability of women participants with TBIs (Haag et al., 2016; St Ivany et al., 2018). Interestingly, this topic is additionally complicated in that some perpetrators of IPV resulting in TBI were found to have a lifetime history of sustaining a TBI themselves, suggesting that, in some cases, increased aggression may be associated with perpetrators' TBI history (Farrer et al., 2012).

Valera and Berenbaum (2003) conducted a clinical study to investigate brain injury in IPV survivors. Results yielded that of the 99 women participants, nearly 75% reported experiencing at least one brain injury related to IPV, while nearly half reported sustaining repetitive brain injuries. The repetition of brain injuries and the time since previous injuries were

sustained were associated with more difficulties in learning tasks, cognitive flexibility, and memory. In addition, findings indicated that the number of TBIs and recency were also associated with the presentation of mental health and psychiatric symptoms (e.g., depression, PTSD, general stress, anxious arousal). These associations were maintained when the researchers controlled for abuse severity.

Valera and Kucyi (2016) examined the cognitive effects and brain networking associated with traumatic brain injury by conducting clinical interviews with 20 participants recruited from domestic violence programs, women's shelters, and word-of-mouth. All participants in the sample were women. The researchers administered neuropsychological measures and reviewed fMRIs from women who experienced intimate partner violence-related traumatic brain injuries. All 20 participants reported at least one IPV-related TBI, while 75% reported multiple TBIs. Five participants also reported sustaining anoxic or hypoxic consequences from strangulation. At least one current post-concussive symptom resulting from their most recent TBI was reported by 89% of the women. Of this group, 63% reported experiencing three or more post-concussive symptoms. Many of the subjects' symptoms were experienced across several functioning domains, including cognitive-behavioral and emotional. The study illuminated and provided systematic evidence for the association between IPV-related brain injury severity and fractions of the neural network associated with learning and memory indices. The relationship remained significant when controlling for the severity of abuse psychopathology or current substance dependence, medication use, and childhood traumas (Valera & Kucyi, 2016)—suggesting unique considerations for first responders and the need for specific treatment planning separate from the standard intimate partner violence responses and interventions.

## **Screening for IPV-related Acquired Brain Injury**

Studies have identified the consequences and highlighted the benefits of a worldwide collaboration of assessment and screening methods for IPV-related brain injury (Esopenko et al., 2021; Valera & Kucyi, 2016). As previously identified, many cases of IPV-related acquired brain injury go undetected and untreated. Often, assessments with the survivors are conducted in retrospect.

Individual differences such as the age of injury, genetics, medical history, and socio-cultural and developmental factors may play a role in the effects of neurobehavioral and neurocognitive functioning in brain injuries. Individual differences add to the complexities of assessing and treating intimate partner violence-related acquired brain injuries. A recent report from the U.S. Government Accountability Office (2020) highlighted limited data on the outcome of IPV-related ABIs and reinforced the need for more research to inform the public. Esopenko et al. (2021) suggested the use of two measures to collect data on demographics: the Revised Tactics Scale (Straus et al., 1996) and the Women's Experience with Battering (Smith et al., 1995). In addition to challenges with relying on self-reported recall measures, head traumas may impact memory. Screening for IPV-related ABI has been complicated by inconsistent methods used in past research to classify injuries (Haag et al., 2019). Goldin et al. (2016) identified two measures to aid in the classification of injuries: the Ohio State University TBI Identification Methods (OSU TBI-ID) and the Brain Injury Screening Questionnaire (BISQ). Several studies have used the Brain Injury Severity Assessment (BISA) created by Valera & Berenbaum (1997) to measure IPV-related TBIs (Smirl et al., 2019; Valera, 2018; Valera & Kucyi, 2016).

In a comprehensive review of neurocognitive and neurobehavioral problems of IPV-related TBIs, Esopenko et al. (2021) explored cognitive measures to evaluate deficits in learning

and memory, processing speed, attention/working memory, and executive functioning due to brain injuries sustained during partner violence. Measures to assess psychological, psychosocial, and behavioral functioning were also offered.

### **Rationale, Primary Aims, and Research Questions**

The literature on acquired brain injury resulting from intimate partner violence is relatively in infancy. Researchers and clinicians have noted a lack of interventions developed to treat ABI across populations (Valera & Kucyi, 2016). The neurological consequences of repetitive acquired brain injuries can impair emotional processing, problem-solving, memory, and alertness. Without the appropriate cognitive rehabilitation, traditional psychotherapy may be less beneficial. As a result, victims of intimate partner violence with ABI may find it more challenging to obtain or progress in treatment and may prolong their stay in the abusive relationship (Valera & Berenbaum, 2003; Valera & Kucyi, 2016). The urgency to screen for acquired brain injury when working with women who have experienced violence in an intimate partnership is crucial because the cognitive consequence of repetitive brain injury adds to the difficulty the survivor faces in leaving the relationship (Valera & Kucyi, 2016). The urgency underscores the emphasis on increasing awareness while providing resources to frontline workers to avoid neglecting IPV-related ABIs.

A collection of large-scale meta- and mega-analyses would aid in efforts to advance understanding and, therefore, treat IPV-related ABIs. Many stakeholders will benefit from consolidating the screening, evaluation, and treatment strategies available to address the survivors' societal and physical environmental needs. Increased education is necessary not only for persons in the health system but also for outside influences such as the legal and social justice sectors.

This systematic review will comprehensively synthesize the extant literature to answer the following four questions:

- How prevalent is a brain injury resulting from intimate partner violence?
- What are the risk factors and correlates (i.e., demographic, age, socio-economic status) of brain injuries among survivors of intimate partner violence?
- What symptoms of brain injuries are observed in survivors of intimate partner violence?
- How is screening and assessment for brain injuries being approached in women subjected to intimate partner violence?

## **Chapter II: Research Methodology**

### **Systemic Review Approach**

This systematic review employed an integrative methodological approach. An integrative approach was chosen to identify qualitative and quantitative studies investigating the intersection of intimate partner violence-acquired brain injury. This current study aimed to:

- a) Elucidate the likelihood of sustaining an acquired brain injury resulting from intimate partner violence.
- b) Explore the field's understanding of the correlates and risk factors of IPV-related acquired brain injury.
- c) Identify the symptoms of IPV-related acquired brain injury to inform timely screening.
- d) Inform appropriate interventions and referrals for this population.

This integrative systematic review followed the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines.

A combination of qualitative and quantitative methodologies seemed appropriate to synthesize all relevant research to address the research questions. The data collected on the intersection of acquired brain injury and intimate violence is sparse; therefore, an integrative methodological approach allowed for the inclusion of non-experimental and experimental research for the broadest method. Furthermore, the non-experimental studies offer in-depth and nuanced data concerning participants' experiences, which may not be captured in the data collected from the often more highly regarded experimental studies. Quantitative studies informed demographics and correlates of an acquired brain injury resulting from intimate partner violence. Qualitative studies helped to summarize current screening methods and intervention protocols.



## **Eligibility Criteria**

### ***Inclusion Criteria***

Intimate partner violence is a multicultural and global problem. This systematic review did not restrict studies based on country of publication because this topic is a global issue. Data obtained from international journal reviews would be relevant to inform the research questions of this review. Therefore, articles written in English from national and international journals were eligible for inclusion.

As previously noted, the topic of interest in this review, the intersection of acquired brain injury due to intimate partner violence, is understudied in the literature and scarcely a focus of assessment and treatment consideration in mental health research. Published and unpublished articles were included to broaden the scope and to avoid publication bias.

The literature on acquired brain injury resulting from intimate partner violence concerns many frontline service providers; therefore, studies were obtained from various disciplines, including mental health, medical, and social work. This author aimed to collect data from all relevant studies that met inclusion criteria.

### ***Study Eligibility Criteria***

There were several targeted categories of variables that each study had to contain for this review. Each study had to include women participants who disclosed a minimum of one acquired brain injury resulting from intimate partner violence. Each article consisted of participants 18 years and older at the time of the study. All articles had to focus explicitly on ABI resulting from IPV. The authors must have completed their studies between 1991-2022.

Given the limited literature on this topic, no research settings were excluded. Samples from all national and international recruitment settings were eligible for inclusion, including

hospitals, forensic settings, residential settings, drop-in centers, college/university campuses, military/veteran settings, and community-based locations. Additionally, community-based, and biomedical research was specifically targeted within the methodologies listed, as individuals who seek assistance after an intimate partner violence incident may receive treatment from community mental health settings and hospital medical centers.

This review considered qualitative, quantitative, and mixed methods research approaches for inclusion. Qualitative research approaches such as case studies, interview studies, ethnography, phenomenology, observational techniques, participatory action research, grounded theory, and narrative research were eligible. Quantitative studies included case-control, experimental, correlational, descriptive, and quasi-experimental methods. A variety of empirically based research designs were eligible, including follow-up studies, clinical case studies, field studies, retrospective studies, and interviews.

### ***Exclusion Criteria***

Excluded from this review were non-English publications, blog posts, posters, conference presentations, videos, newspaper articles, dissertations, theses, literature reviews, and systematic reviews. Articles were excluded for the following reasons: (a) did not explicitly focus on brain injury resulting from intimate partner violence, (b) focused on children, or (c) focused on the perpetrator's role.

### **Search, Screening, and Selection of Studies**

#### ***Information Sources***

Electronic databases were used as the primary search source. Relevant studies were identified by a comprehensive search of the following major health science electronic databases: EBSCO, PsycINFO, PubMed/Medline, Scopus, and ProQuest. The author also searched Google

Scholar to explore resources from private organizations and institutions. Additionally, the author completed a manual search of the reference list of each eligible study for the inclusion of relevant articles.

### ***Search Terms***

The search strategy was refined in consultation with an expert librarian. The selection of search terms was identified using a comprehensive list of controlled lexis and keywords (Appendix A). The search terms have been expanded using applicable synonyms to broaden the search capacity of each database. The primary search terms and synonyms are: brain injury/acquired brain injury/traumatic brain injury/TBI/strangulation/concussion/post-concussion/head injury/executive dysfunction/mTBIs/brain abrasion/anoxic/hypoxic, intimate partner violence/IPV/domestic violence/partner violence/DV/partner abuse/interpersonal violence/dating violence, trauma/blunt force/external force/external object/physical force/violent shaking/slapping/ suffocation/strangulation/force falls/loss of consciousness, treatment/intervention/cognitive rehabilitation/recovery/ psychotherapy/prevention, assessment/neuropsychological assessment/neuropsychological testing/screener/ measures/fMRI/batteries/measures/neuro\*, correlates/symptom\*/risk factors/characteristics/sequel\*/signs/presentation/age/socio-economic status, race, disability, sexuality, religion, symptoms/consequences/outcomes/impairments/memory deficits/concreteness in thinking/functional and structural connectivity problems/adverse psychiatric/physiological disruption in brain functioning/ prognosis/psychiatric/cognitive flexibility/ learning tasks/emotional processing/problem solving/alertness/neurobehavioral/neurocognitive/processing speed/attention/working memory/executive functioning/executive\*, prevalence/number of

incidents/occurrence/frequency/timing/widespread/statistics/  
frequent/universal/pervasive/percentage, and woman/female.

Once search terms and synonyms were identified, the target terms were grouped by contexts and assigned an identification number listed in Appendix A. Appendix B includes the database, search type, search term numeric ID number, search terms and synonyms, search field, and notes.

### ***Search Strategy***

Each electronic search was guided by syntax arranged by a combination of search terms to target articles relevant to each research question. The search documentation record is detailed in Appendix A. Appendix A provides the variations of search syntax used to collect the articles. The author began with board searches using the combination of search syntax and terms identified in Appendix A, such as acquired brain injury + intimate partner violence. The author then added more search terms, such as prevalence + acquired brain injury + intimate partner violence, to streamline results to address the research questions seen in Appendix B. To identify symptomology experienced by survivors of intimate partner violence related acquired brain injury, for example, the author searched using acquired brain injury + intimate partner violence + symptoms.

### ***Screening and Selection of Studies***

Screening and selection of studies were completed by the author and her three research assistants (RAs). The RAs had a mental health background and research interest in the dissertation topic. The general characteristics of the studies outlined in Appendix C include each article's authors and year of publication, titles, abstracts, and inclusion criteria. Appendix C was used to document the screening process. The search for relevant study selection was completed

in three phases. In the initial phase, each article's title, abstract, and keywords were screened for preliminary inclusion. After completing the initial screening, a full-text screen was conducted for eligibility. Lastly, a final decision was made to include a study for data extraction. The author worked with her RAs to extract data relevant to address the research questions. A catalog record was established and maintained for the three screening phases. After reading the full-text articles and collecting sources, the author followed up with her Chairperson. The Chairperson reviewed a random set of articles to assess appropriateness and compliance with the inclusion and exclusion criteria and made suggestions for changes. The author would make revisions accordingly. A PRISMA flow chart (Figure 1) details each stage in the study selection process. The PRISMA flow chart illustrates the steps for the selection process. All duplicate results, non-English publications, blog posts, posters, conference presentations, videos, newspaper articles, dissertations, theses, literature reviews, and systematic reviews were removed. Studies were excluded if they did not meet the eligibility criteria. The flow chart consists of the reasons why excluded studies were not included. The flow chart contained the combined results from all the database searches, the total duplicate results, the total excluded sources, the total full-text articles not received, and the final number of articles included in this systematic review. Selected sources were maintained in the author's Mendeley account, a hard drive on the author's computer, and a Google Drive folder.

## **Data Extraction and Coding**

### ***The Data Extraction Form***

This integrative systematic review synthesized the extant literature on the prevalence, risk factors, and assessment of women with acquired brain injury resulting from intimate partner violence. To collect and organize relevant data from each study, the author used a modified

version of the Cochrane Effective Practice and Organization of Care (EPOC). The data extraction form was individualized to include critical areas of data inquiry to be collected for this review (See Appendix D). Variables were identified to extract critical data points from qualitative and quantitative studies guided by the research questions. The variables were categorized as the following: 1) study identification, 2) general information, 3) design characteristic and methodological information, 4) participant information, 5) IPV-related ABI prevalence, 6) IPV-related ABI symptomology and characteristics, 7) screening and assessment, 8) analysis and statistical information, 9) results, and 10) conclusion, limitations, and follow-up.

## **Data Collection and Extraction**

### ***Study Documentation and Identification***

The *study identification* is the first part of the data extraction form. This section contains the following variables: a) document name, b) document ID, c) authors and year, and d) full documentation title. The author created the *document identification* using a three-number code starting at 100 followed by the last name of the document's first author and the publication date, such as 100 Corrigan 2003. The same three-digit number starting at 100 used in the *document identification* will be used for the document ID. This number continued in sequence for all articles selected, such as 100 Corrigan 2003, 101 Hunnicutt 2019, and 102 Monahan 1999.

### ***Data Extraction***

Broad categories and specific variables were used to gather qualitative and quantitative data. The broad categories and specific variables extracted for all included studies are as follows:

1. General information
2. Design characteristics and methodological features
3. Participant information

4. IPV-related ABI prevalence
5. IPV-related symptomology and characteristics
6. Screening and assessment methods
7. Analysis and statistical information
8. Results
9. Conclusion, limitations, and follow-up

Consultation with the dissertation Chairperson was utilized to support adherence to eligibility criteria, study characteristics, and results. In addition, the Chairperson was consulted on all uncertain items.

### ***General Information***

The *general information* section contains the following variables: a) date form completed, b) source type, c) source name, and d) document language. The first variable was used to indicate the date the document extraction form was completed for each study. Source type and source name were used to identify resource name and form of publication. The last variable in this section specifies the language used throughout the study language.

### **Design Characteristic and Methodological Features**

In the *design characteristic and methodological features* section, the author included the following variables: a) the aim of the study, b) general methods, c) design or specific research approach, d) study location, e) treatment setting, and f) ethics approval. The author identified the general aim of each study by describing the goals each resource intended to address. The following two variables identified where the study was facilitated to allow the author to record regional trends in point of contact, locations for interventions, screening, and to inform

dissemination of resources. Lastly, the final variable will be used to document if approval was received from an Institutional Review Board.

### ***Participant Information***

The author included selected variables to elucidate the risk factors and correlates of brain injuries resulting from intimate partner violence. The variables were documented in several sections of the Data Collection and Extraction Form. The first section is the *participant information*. The *participant information* variables are a) population description, b) recruitment methods, b) participant gender, c) participant age, d) participant race/ethnicity, e) participant socioeconomic status, f) relationship status, g) level of education, and h) participant employment status. These variables provided detailed information to help the author synthesize the risk factors and correlates of brain injury resulting from interpersonal violence. Additionally, participant age and gender were also included to document that the study met the inclusion criteria.

### ***IPV-related ABI Prevalence***

The author documented the *prevalence* of brain injury resulting from interpersonal violence. This section contains the following variables: a) prevalence, b) sample size, and c) frequency.

### ***IPV-related ABI Symptomology and Characteristics***

The *IPV-related ABI symptomology and characteristics* section also helped the author to synthesize risk factors and correlates associated with intimate partner violence-related brain injury. This section contained the following variables: a) mechanism of injury, b) symptomology/outcome, and c) respondents with multiple brain injuries.



### ***Screening and Assessment Methods***

In this section of the Data Extraction Form, the author captured how studies and frontline workers assess and screen IPV-related-BI. This section documents how research variables were measured. The author included the reliability and validity of standardized measures. A non-standardized method of data collection was also used. The following variables are included in this section: a) screening, b) assessment, c) intervention/treatments, d) referrals, e) reported, and f) hospitalization.

### ***Analysis and Statistical Information***

The author documented the approach used to analyze the selected research data, which included a) descriptive statistics, b) inferential statistics, c) qualitative analysis, and d) other.

### ***Study Results***

The *study results* section outlined and described the key findings from each source to inform the research questions. The key findings helped to cluster the reporting of results for this review. As such, several or all the following variables were included in the *study results*: prevalence, risk factors and correlates, symptomology or characteristics, screening, assessment, whether associations or no associations were found, and emerging trends impacting key findings.

### ***Conclusion and Follow-up***

The final section of the data extraction form, *conclusion, limitations, and follow-up* documented the following findings from each study: a) research question(s) answered by the study, b) critical takeaways, c) strengths and limitations, d) clinical implication e) recommendation for future investigation f) references to other relevant studies and, g) other.

### ***Quality Appraisal***

A quality appraisal strategy was used to assess each study included in this integrative systematic review. The author documented the appraisal using a quality appraisal form developed by the Pepperdine University Dissertation Research Coordinator. The Quality Appraisal Form was used to evaluate each study's appropriateness, accuracy, and strengths (See Appendix E). To do so, the following nine variables were evaluated: 1) strength of literature foundation and rationale for study, 2) clarity and specificity of research aims/objectives/questions/hypotheses, 3) quality of research design or methodological approach, 4) sample selection and characteristics 5) data collection tools, 6) data collection processes, 7) analysis and presentation of data, 8) discussion of study limitations and, 9) consideration of culture and diversity.

First, the author identified the study methodology and design approach. Then she used a rating scale of either “strong,” “good/adequate,” “weak,” or “missing” to the nine quality appraisal variables. Variables rated strong received a value of three points, variables rated good/adequate received a value of two points, variables rated weak received a value of one point, and variables missing from the study were rated zero points. Lastly, the author assigned an overall rating to the study. Studies assigned all “3”s were deemed exemplary, mostly “3”s were rated strong, mostly “2”s were deemed good/adequate, and mostly “1”s were ranked weak. Articles with weak quality appraisals were excluded from this review.

### **Database Management, Synthesis and Analysis Plan**

#### ***Database Development***

A single Microsoft Excel spreadsheet was created to gather and manage the data extracted from the data extraction and quality appraisal form. This central spreadsheet helped to

synthesize both qualitative and quantitative studies. This comprehensive Excel spreadsheet stored all criteria variables and relevant data from all included studies of this systematic review. Data synthesis in this comprehensive database facilitated viewing themes, patterns, differences, and associations across studies.

### ***Data Analysis and Synthesis***

The research questions guided the information collected and synthesized for this integrative systematic review. Once all the data was collected, the author arranged studies that informed the same research question. Articles were grouped that answered the following: (a) estimated the prevalence of an acquired brain injury due to intimate partner violence, (b) assessed the risk factors and correlates (i.e., demographic, age, socio-economic status) of acquired brain injuries among survivors of intimate partner violence, (c) identified the symptomology and characteristic of acquired brain injuries observed in survivors of intimate partner violence, and (d) informed the screening and assessment of acquired brain injuries. The author and her RAs reviewed all included studies and extracted data from the studies. The author then coded all the variables collected from the analyses. Once completed, the author entered the coded information into a separate spreadsheet grouped by each research question.

### ***Reporting the Results***

All studies' critical data and key findings were stored in the Reporting of Results evidence table (See Appendix F). The Evidence Table housed the following information for each study in this review: a) article author(s) and publication year, b) title, c) demographics, d) sample size, e) prevalence, f) correlates/risk factors, g) symptom/consequences, h) assessment/screening, i) recruitment setting, j) sought medical attention, and k)

conclusion/comments. Additionally, the author used a chart or graph to display synthesized findings.

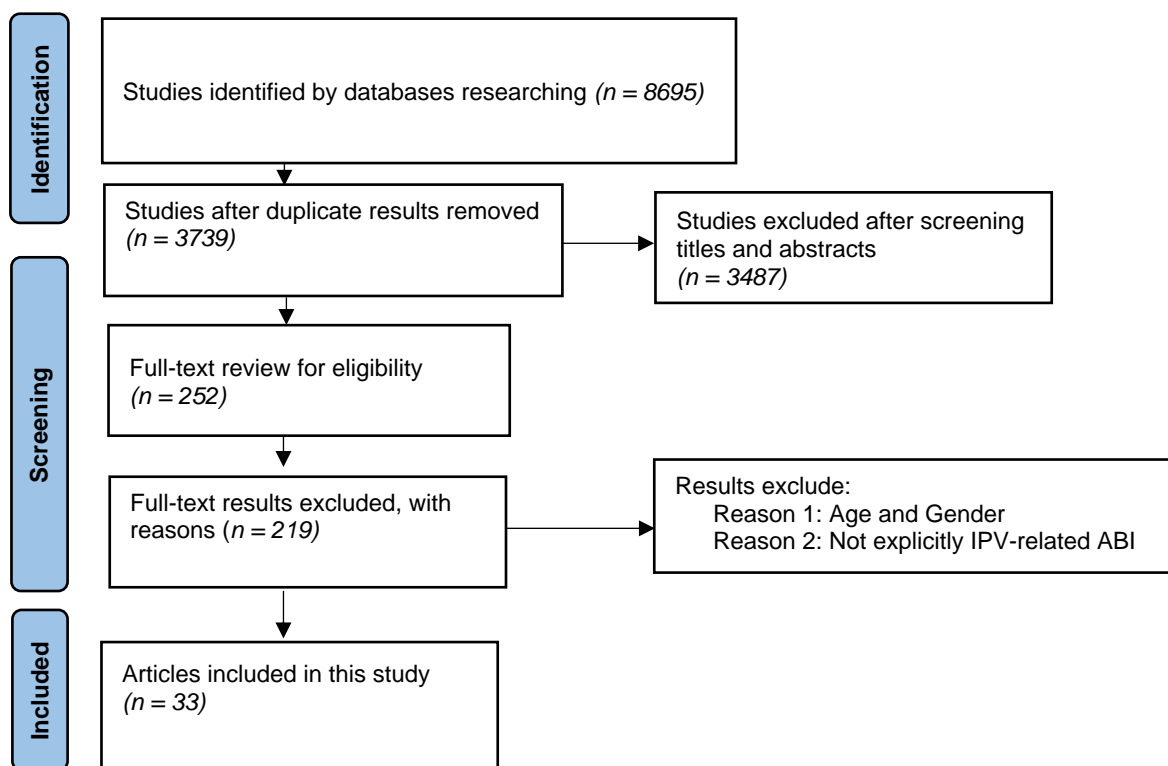
## Chapter III: RESULTS

### Characteristics of the Included Studies

A total of 8,695 results were received using four electronic databases: PsychInfo, PubMed, Scopus, and ProQuest. Duplicate results were removed using Microsoft Excel and Mendeley's automated features. In total, 4956 duplicate results were removed before the abstract screening process. Results not written in English, posters, books, newspapers, blogs, magazines, dissertations, theses, conference papers, and proceedings were removed from the results. While screening titles and abstracts, articles were excluded based on inclusion criteria. In total, 3,487 additional articles were deleted, leaving 252 articles for full-text review. After a comprehensive full-text evaluation, 219 results were excluded due to not addressing the research questions, not explicitly focusing on IPV-related BI, and not meeting age and gender criteria. In sum, 33 studies were included in this systematic review (See Figure 1 PRISMA CHART)

**Figure 1**

*PRISMA Flow Diagram*



General characteristics of the included studies are provided in Appendix C. A quality appraisal was completed for all included studies. After the quality appraisal, articles rated as excellent, good, or sufficient quality were included in this systematic review.

All 33 studies were published between 1991 and 2022, were written in English, and included female participants. Three articles also had a small percentage of male participants. The methodology of these 33 studies included case studies, quantitative, qualitative, and mixed methods. Several studies utilized secondary data from a more extensive study or obtained data from medical records. Participants were recruited from emergency rooms, local community agencies, healthcare clinics, women's shelters, the National Veteran Association database, domestic violence programs, law enforcement referrals, word of mouth, social media, and online advertisements and flyers. The articles included data from rural, urban, metropolitan, and suburban communities predominately within the United States. Four studies were conducted outside the United States (Maldonado-Rodriguez et al., 2021; Manoranjan et al., 2022; Smirl et al., 2019; Wong et al., 2020). Among the 33 articles, there was a lack of unified terms used to categorize the injuries caused by blows to the head and damage to the brain caused by strangulation. As such, the following terms were observed: head injury, traumatic brain injury, acquired brain injury, and partner-inflicted brain injury.

Thirteen studies provided data to inform the prevalence, correlates, symptoms, and assessment of IPV-related acquired brain injury. Twenty-three articles reported on the prevalence of IPV-related acquired brain injury in their sample. Twenty-six articles included data on reported symptoms. Twenty-seven articles reported on the assessment of IPV-required traumatic brain injury.

## Quality Appraisal

A quality appraisal was conducted for the 33 studies in this report (See Table 1). The overall results of the quality appraisal are displayed in Table 1. 12.1% of the studies were scored “exemplary,” 78.7% of the studies were “strong,” and 9.0% of the studies were scored “good/adequate.”

**Table 1**

*Quality Appraisal of Included Studies*

| OVERALL RATING | NUMBER | PERCENTAGE |
|----------------|--------|------------|
| Exemplary      | 4      | 12.1%      |
| Strong         | 26     | 78.7%      |
| Good           | 3      | 9.0%       |

The data collected in this systematic review was largely obtained from retrospective self-report studies with small sample sizes, convenient samples, and from studies without a control group. As a result, many authors called for longitudinal research, highlighted selection bias, cautioned the interpretation of their findings, and cautioned against generalizing their results to national populations.

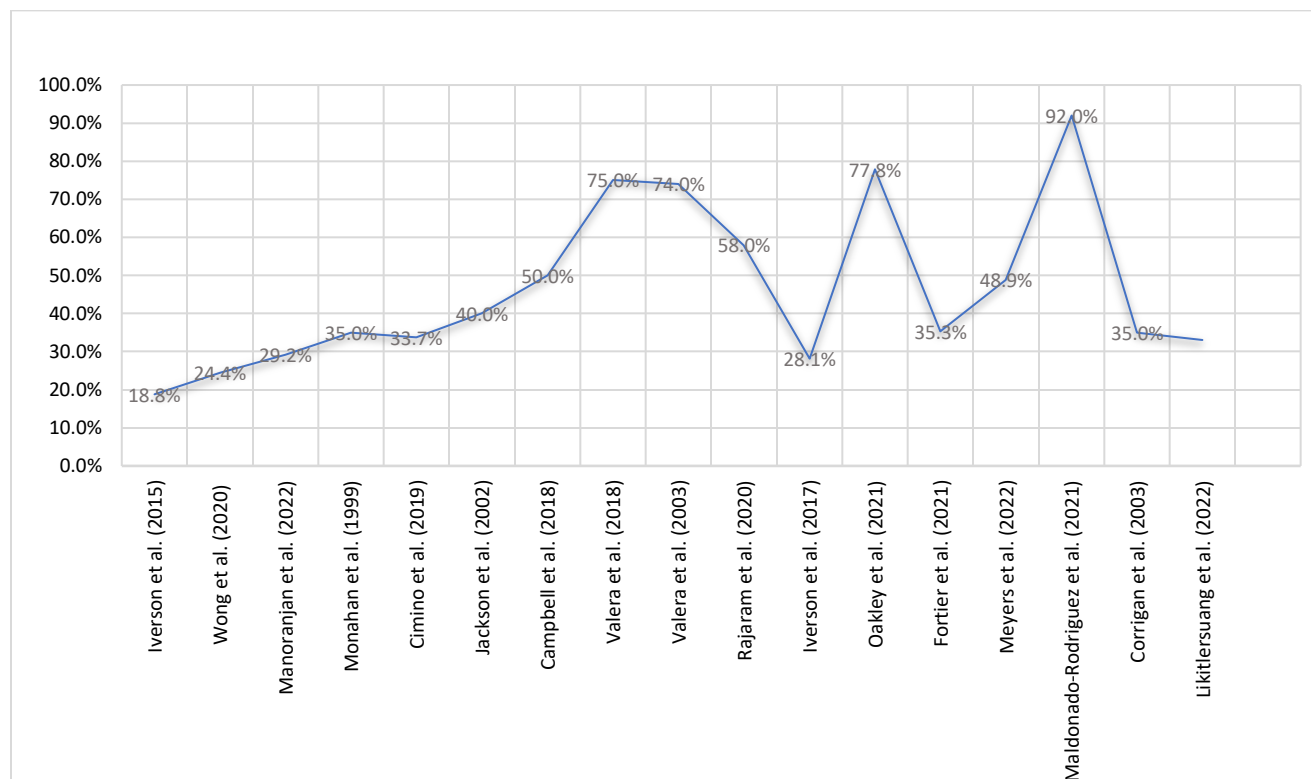
## Findings on the Prevalence of Acquired Brain Injury due to Intimate Partner Violence

This systematic review synthesized the estimated prevalence of acquired brain injury resulting from intimate partner violence to answer research question one. Twenty-three studies reported on the prevalence of IPV-related ABI in their sample. Most studies inferred an mTBI or acquired brain injury diagnosis after participants self-reported a period of loss of consciousness or change in consciousness or strangulation-related brain injury caused by hypoxia and anoxia. Across articles, findings varied and suggested that the prevalence of acquired brain injury ranged

from 19% to 92% among survivors of intimate partner violence (See Figure 2 Findings on Estimated Prevalence).

**Figure 2**

*Findings on Estimated Prevalence*



Twenty-three studies examined the prevalence of either single or multiple episodes of ABI. Repeated ABI ranged from 38% to 87%. Studies suggest that IPV survivors often experience repetitive incidences of brain injury. Six articles found that women in physically abusive relationships are likely to experience repetitive IPV-related ABI and up to 3 to 4 blows to the head weekly (Campbell et al., 2018; Jackson et al., 2002; Joshi et al., 2012; Meyer et al., 2021; Rajaram et al., 2020; Valera & Berenbaum, 2003; Valera & Kucyi, 2016). Four studies identified women with neurological symptoms due to strangulation during partner abuse. IPV



survivors were found to have multiple incidences of strangulation ranging from 38% to 88% (Joshi et al., 2012; Messing et al., 2018; Smith et al., 2001; Wilbur et al., 2001).

It is estimated that only 10% to 74% of survivors of IPV-related TBI seek medical attention for their injuries (Campbell et al., 2018; Joshi et al., 2012; Kwako et al., 2011; Monahan & O’Leary, 1999; Rajaram et al., 2020; Roberts & Kim, 2005; Smith et al., 2001; Valera & Berenbaum, 2003; Wilbur et al., 2001). In a qualitative study by St Ivany et al. (2018) the lives of women with IPV-related ABI were explored to identify the context of decisions to seek medical attention. From this study, the following themes emerged: (a) feeling judged for experiences of IPV, (b) dealing with consequences if others learned of their disabilities resulting from abuse, (c) fear of medical treatment, (d) increased isolation as protection, (e) focused on living from day-to-day (f) calculating the risk retaliation by their partner.

### **Findings on the Risk Factors and Correlates of Acquired Brain Injuries Among Survivors of Intimate Partner Violence**

#### ***Participant Age***

Most of the studies recruited participants who were 18 years and older, except for one article that included individuals who were 17 years and older. Two studies analyzed the correlates of age and ABI (See Table 2). The data collected by Cimino et al. (2019) was obtained from a larger sample that aimed to recruit Black women who experienced forced sex and were at risk for HIV. Therefore, their sample was cautioned not to be interpreted to represent all abused or Black women. The second study by Rajaram et al. (2020) was not obtained using a randomized sample or consistent recruitment intervals. For sixteen months, these authors used an episodic approach. The authors recruited participants from three organizations whenever they had a staff member trained in BI and knew how to screen for these injuries.

**Table 2***IPV-related ABI and Age Group*

| <i>Study: Cimino et al., 2019</i>  |  |
|------------------------------------|--|
| <b>Age Groups</b>                  | <b>Women with probable TBI</b>   |
| >20                                | 8.42%  |
| 20-to-29                           | 17.9%  |
| 30-to-39                           | 9.47%  |
| 40-to-49                           | 6.32%  |
| <i>Study: Rajaram et al., 2020</i> |  |
| <b>Age Groups</b>                  | <b>Women who screened positive for TBI compared to women who screened negative</b> |
| 19-to-25                           | 43% vs. 57%  |
| 26-to-40                           | 61% vs. 39%  |
| > 40                               | 75% vs. 25%  |

*Participant Gender*

Thirty-one studies recruited only female participants. Three studies also included male IPV survivors in their samples. Within these three studies, male respondents accounted for 3% to 5% of the sample size (Brown et al., 2019; Hunnicutt et al., 2019; Saleem et al., 2022). No analysis of the relationship between gender and IPV-related ABI was conducted among the studies.

*Participant Race and Ethnicities*

Twenty-four studies revealed the race and ethnicity of the participants within their samples. In total, 2155 participants were included in those twenty-four studies. The 2155 participants were diverse and identified themselves as 40% White, 31% African American/Black, 12% Latina/Hispanic, 8% Native American/Alaska Native, 7% mixed race or other, and < 1% Asian/Pacific Islander. Two studies focused specifically on Black or African American women (Campbell et al., 2018; Cimino et al., 2019) and one study enlisted only Chinese women survivors (Wong et al., 2020). Ten studies did not identify their participants'

race and ethnicity or only provided this data separately in supplemental resources. Studies noted that the demographics of their participants do not reflect the literature that individuals from marginalized identities are disproportionately targets of severe IPV (Hunnicutt et al., 2019; Meyer et al., 2021). One study found that women with a history of IPV-related TBI in their sample were more likely to be non-White (Iverson et al., 2017). In a sample of 1008 women survivors of IPV, Messing et al. (2018) found that African American women were at higher risk for attempted, completed, and repeated nonfatal strangulation. The researchers also found Native American women are more likely to endorse loss of consciousness resulting from strangulation than White women.

### ***Relationship Status***

Relationship status across the 33 articles ranged from divorced 15% to 80%, married 8% to 24%, in a committed relationship, and living together 2% to 19%, in a committed relationship but not living together or separated 2% to 19%, single or dating 0.8% to 26%, and other 2% to 4%. The duration of the most recent relationship ranged from 0 to 34 years. The number of years since the more recent abusive relationships ended ranged from 0 to 6.9 years. No analysis of the correlation between relationship status and IPV-related ABI was conducted.

### ***Education and Income***

The highest level of education completed across the 33 articles ranged from: (a) some high school 2% to 57%, (b) high school diploma/GED 13% to 77%, (c) some college or associate degree 7% to 46%, (d) bachelor's degree 3% to 66%, (e) graduate degree 3% to 25%, and (f) other 1% to 25%. Household income varied across the 30 articles, ranging from \$0 to \$100,000+. One study found that the two most listed zip codes provided by their participants represented the most impoverished areas (Corrigan et al., 2003). However, it was unclear what percentages of

the 35% of participants identified to have a probable IPV-related ABI lived within the most impoverished zip codes. One study found that women with a history of IPV-related TBI were more likely to report an annual income of less than \$25,000 (Iverson et al., 2017).

### ***Correlates of Violence and Symptoms***

Three articles found that survivors who reported more frequently gruesome physical violence and escalation in the description of assaults had a positive association with IPV-related brain injuries (Cimino et al., 2019; Hunnicutt et al., 2019; Valera & Berenbaum, 2003). The most common mechanisms of injury reported included being hit with a closed fist, violent shaking, being pushed into objects and furniture, being hit with an object, slamming the head on a wall or another hard object, being stomped in the head and strangulation and choking (Manoranjana et al., 2022; Meyer et al., 2021; Monahan & O’Leary, 1999; Oakley et al., 2021). Joshi et al. (2012) found survivors were more likely to associate “strangulation” with the use of an object (i.e., example cord, rope, clothing) and “choking” with the use of a body part.

Several studies found that strangulation resulted in health consequences similar to a TBI, including neurological changes (Campbell et al., 2018; Joshi et al., 2012; Messing et al., 2018; Smith et al., 2001; St Ivany et al., 2018; Wilbur et al., 2001). In addition to physical abuse, three studies found psychological abuse to be more frequent in survivors of IPV with head injuries than those without head injuries. Several studies found that escalating psychological abuse may be a risk factor for brain injury in abused women (Cimino et al., 2019; St Ivany et al., 2018; St Ivany et al., 2021; Wong et al., 2020).

Five studies found that women with a history of IPV-related TBI with current symptoms were more likely to have co-occurring PTSD, depression, and mental health symptoms (Cimino et al., 2019; Iverson & Pogoda, 2015; Iverson et al., 2017; Iverson et al., 2019; St Ivany et al.,

2018). Two studies found that women with a probable TBI history had significantly more childhood maltreatment, forced sex, and partner-inflicted physical, sexual, and psychological abuse (Cimino et al., 2019; St Ivany et al., 2018).

### ***Additional Associations of IPV-related ABI***

Hunnicut et al. (2019) found strong correlations between probable IPV-related TBI and the following: (a) if the abuser faced legal consequences, (b) the increase in time since the abusive relationship ended, and (c) if the participant sought help. The researchers offered that this correlation may suggest two possibilities. One is that the respondents in their study may have benefited from leaving the abusive relationship by seeking help. The second proposal was that the individuals who were likely to have sustained a probable TBI sought help because of the severity of the violence. In a situational analysis, St. Ivany et al. (2021) identified cultural narratives in rural America that contribute to the underreporting and normalization of IPV-related ABI.

### **Findings on the Most Common Symptoms/Consequences/Outcomes Endorsed by Survivors of IPV-Related Acquired Brain Injury**

Research question three focused on the most common symptoms and consequences endorsed by IPV survivors with a diagnostic history of IPV-related ABI or deemed to have a “probable” IPV-related ABI. Four studies found that 30% to 77% of women who sustained IPV-related TBI reported prolonged symptoms potentially from brain injury (Corrigan et al., 2003; Jackson et al., 2002; Saleem et al., 2022; Valera & Berenbaum, 2003). The estimated loss of consciousness (LOC) among the studies ranged from 30% to 81%. Additionally, over 10% could not identify if they had a loss of consciousness. Corrigan et al. (2003) using emergency room

data, identified that LOC is typically accompanied by a period of either or both retrograde or posttraumatic amnesia.

IPV-related acquired brain injury was associated with cognitive, emotional, functional, and structural brain connectivity changes (Valera & Berenbaum, 2003; Valera & Kucyi, 2016; Valera et al., 2019a; Wong et al., 2020). Six studies found the symptoms of IPV-related acquired brain injury to be associated with cognitive, physical, and psychological symptoms independent of PTSD (Iverson et al., 2019; Monahan & O’Leary, 1999; Saleem et al., 2022; Valera & Berenbaum, 2003; Valera & Kucyi, 2016; Valera et al., 2019a). In two studies assessing IPV survivors with and without head injury, the women who reported IPV-related head injuries were more likely to report more significant physical and emotional symptoms (Monahan & O’Leary, 1999; Wong et al., 2020).

### ***Psychological Symptoms***

Regarding psychological symptoms, Twelve studies found that women with probable IPV-related TBI reported significantly higher severity of depression, comorbid PTSD, and other psychological symptoms (Campbell et al., 2018, Cimino et al., 2019; Iverson & Pogoda, 2015; Iverson et al., 2017; Iverson et al., 2019; Joshi et al., 2012; Meyer et al., 2021; Roberts & Kim, 2005; Smirl et al., 2019; Smith et al., 2001; St Ivany et al., 2018; Wilbur et al., 2001). Iverson et al. (2017) found women with a history of IPV-related TBI to be almost six times more likely to meet all DSM-5 criteria for PTSD compared to women who sustained TBIs not caused by IPV. These results were held after adjusting for sociodemographic factors and past-year partner abuse. Three studies found women who sustained multiple incidences of strangulation to endorse psychological symptoms, including anxiety, depression, insomnia, suicidality, nightmares, and extreme fear (Joshi et al., 2012; Smith et al., 2001; Wilbur et al., 2001).

In 2019, Iverson et al. explored the psychological correlates in a sample of female military veterans. The researchers found that women who reported partner sustained TBI with persistent symptoms at Time1 reported increased psychological and physical health challenges 18 months later (Time 2), even when adjusting for PTSD and military sexual trauma. These individuals were also associated with having sustained more recent IPV than other individuals in the sample. In 2015, Iverson and Pogoda looked at three groups of women: IPV-related TBI history with current symptoms, IPV-related TBI history without current symptoms, and no IPV-related TBI history. IPV-related TBI was strongly associated with significantly higher symptoms ratings on measures assessing depression and had more frequent VA healthcare utilization in the past year compared to women who experienced IPV without TBI history (Iverson & Pogoda, 2015).

### ***Cognitive Symptoms***

Regarding cognitive symptoms, nineteen studies found a correlation between IPV-related acquired brain injury and cognitive processes (Campbell et al., 2018; Corrigan et al., 2003; Iverson et al., 2017; Iverson et al., 2019; Jackson et al., 2002; Joshi et al., 2012; Karakurt et al., 2021; Maldonado-Rodriguez et al., 2021; Messing et al., 2018; Meyer et al., 2021; Monahan & O’Leary, 1999; Oakley et al., 2021; Saleem et al., 2022; Smirl et al., 2019; Smith et al., 2001; Valera & Berenbaum, 2003; Valera & Kucyi, 2016; Valera et al., 2019a; Wilbur et al., 2001). Seven studies suggested their findings indicated differences in neural network functioning in the brains of IPV survivors with acquired head injuries compared to groups without head trauma (Iverson et al., 2017; Iverson et al., 2019; Karakurt et al., 2021; Maldonado-Rodriguez, et al., 2021; Valera & Kucyi, 2016; Valera et al., 2019a).

Two studies used resting-state functional magnetic resonance imaging to examine interconnectivity between brain networks to assess brain dysfunction among participants with a history of IPV-related ABI (Valera & Kucyi, 2016; Karakurt et al., 2021). Karakurt et al. (2021) observed notable differences in resting-state connectivity, mental health symptoms, and relationship dynamics between women with head trauma compared to women without head trauma. Their findings suggested an imbalance of normal functioning between the default mode network (DMN) and resting-state connectivity. The DMN plays a role in the suppression or deactivation of various brain activities during goal-oriented tasks, and resting-state connectivity is what the brain does in the absence of stimulus or goal-oriented tasks (Karakurt et al., 2021). Valera and Kucyi (2016) examined the interconnectivity between the default mode network and the salience network. Typically, when working optimally, while a neurotypical individual engages in focused attention, the brain activity of the salience network increases, while the activity of the default mode network decreases (Valera & Kucyi, 2016). The authors found that dysfunction in the interconnectivity of the salience and default mode networks was associated with poorer performance on memory and learning measures. The authors noted an association between recency and the number of IPV-related TBIs, independent of abuse severity. Valera and Kucyi found that the severity of TBIs was negatively correlated with inter-network intrinsic functional connectivity. The researchers also found these regions to correlate positively with cognitive performance related to memory and learning.

In a second study, Valera et al. (2019a) explored fractional anisotropy (FA) to assess the microstructural connectivity in a sample of IPV survivors. FA has been shown to have abnormalities in other TBI populations, such as athletes. Comparable to results observed in other populations, they found a negative relationship between FA connectivity and IPV-related mTBIs.



They also investigated the relationship between FA and performance on several measures of cognitive functioning. As a result of their small sample size, they could not observe these relationships. However, their efforts indicated a possible relationship between cognitive functioning involving memory and learning that could be established with adequate statistical power.

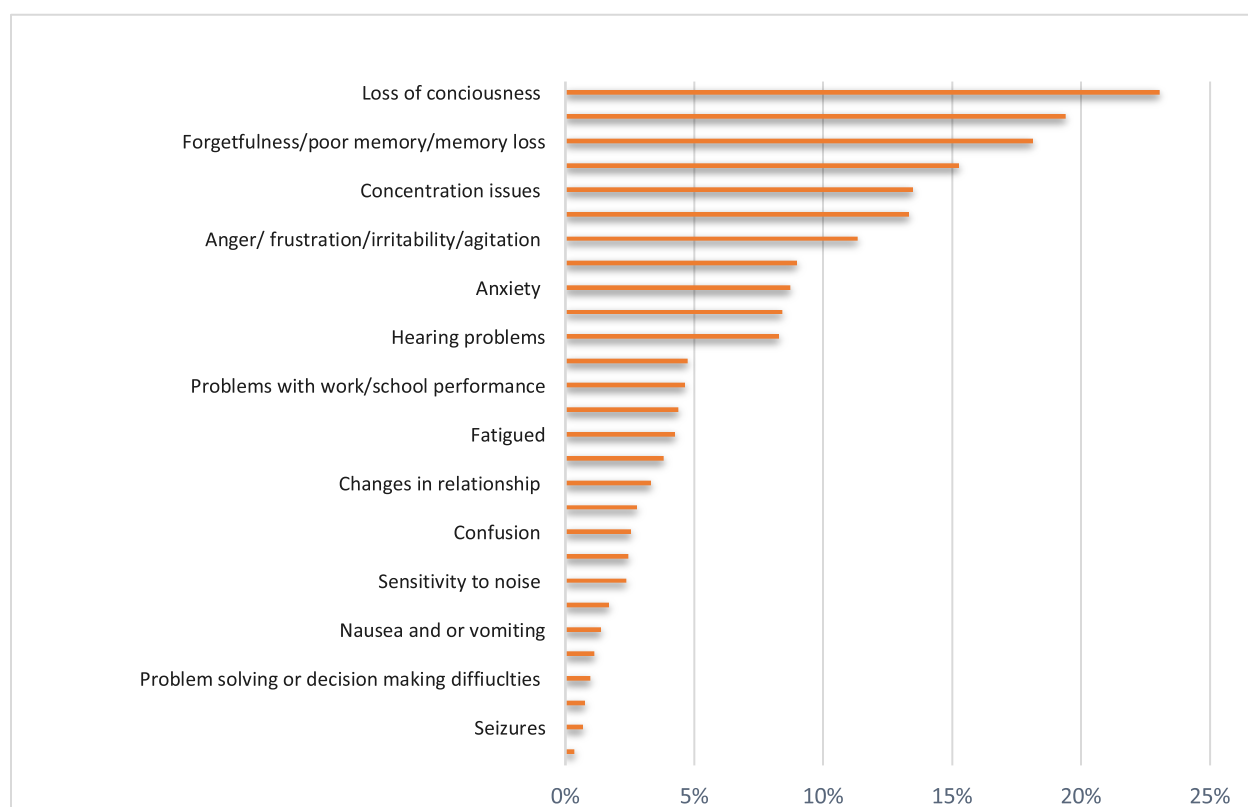
Maldonado-Rodriguez et al. (2021) in a sample of women recruited from shelters and other community organizations, found that IPV-related BI, along with comorbid anxiety, depression, and PTSD, was associated with global and motor functioning during a complex cognitive-motor task. Jackson et al. (2002) found that over 60% of subjects in their study reported problems with memory, attention switching, and concentration. Poorer performance on tasks requiring memory, cognitive flexibility, and learning was associated with the quantity and recency of IPV-related TBIs, including increased comorbid mental health and psychiatric symptomology (Valera & Berenbaum, 2003). Likitlersuang et al. (2022) used neuroimaging analyses on a sample of 45 survivors recruited from the community. These researchers observed significant brain structure and connectivity differences between individuals with IPV-related TBI and TBI from other etiologies. Campbell et al. (2018) explored neurological changes in a community sample of women of African descent. They divided the group of women with an IPV history into two groups: IPV with probable TBI and IPV history without TBI. The researchers found that women who had endorsed sustaining a probable IPV-related TBI were considerably more likely to experience a significant number of central nervous system symptoms (i.e., difficulty with concentration, memory problems, blacking out, seizure-like activities) than their counterparts who did not endorse a possible IPV-related brain injury. The results were consistent when controlling for demographics, IPV, PTSD, and depression.

Three studies found women who sustained multiple incidences of strangulation to have neurological symptoms, including dizziness, loss of consciousness, and stroke (Joshi et al., 2012; Smith et al., 2001; Wilbur et al., 2001).

Across the 33 articles, the percentages of commonly endorsed symptoms and outcomes of IPV-related ABI are displayed in Figure 3, including loss of consciousness, headaches, memory problems, dizziness, concentration, and mood-related difficulties.

**Figure 3**

*Outcomes of IPV-related ABI*



**Findings on the Screening and Assessment of IPV-Related Acquired Brain Injury**

The fourth research question of this review aimed to elucidate the current screening and assessment procedures for identifying an IPV-related acquired brain injury. All studies incorporated a method of self-report questionnaires or clinically administered structured or semi-

structured interviews to gather all or some of the following: (a) demographics, (b) assault history, (c) symptomology, and (d) medical history to assess for possible or probable ABI. Self-reports included instances of impact to the head, face, neck, strangulation, or choking followed by altered or loss of consciousness. Self-reports are currently standard practice for identifying IPV-related mTBI. There is no clinically objective test to assess mild traumatic brain injuries (Manoranjan et al., 2022). One preliminary screening method used was a modified HELPS Brain Injury Screening Tool (Picard et al., 1991). The HELPS tool is not diagnostic and is used as a screening tool for possible TBI, which would then indicate cause for further neurological assessment. Seven studies used a modified version of the HELP screening tool (Gagon & DePrince, 2016; Hunnicutt et al., 2019; Jackson et al., 2002; Manoranjan et al., 2022; Oakley et al., 2021; Rajaram et al., 2020; Saleem et al., 2022).

Valera and Berenbaum (1997) developed their own semi-structured interview screening tool, the Brain Injury Severity Assessment Interview (BISA). The BISA was designed to elicit the potential for TBI among IPV survivors. The BISA has not been formally tested for validity and reliability. However, it was shown to have sensitivity for reduced functional connectivity and dysfunction in brain regions associated with learning tasks and memory (Valera & Kucyi, 2016; Valera et al., 2019a). Several studies used the BISA in this review. In some instances, modifications were made to include incidences of strangulation and asphyxiation (Maldonado-Rodriguez et al., 2021; Smirl et al., 2019).

Three articles used the Modified Veterans Affairs TBI Screening Tool in their articles (Iverson & Pogoda, 2015; Iverson et al., 2017; Iverson et al., 2019). Several studies used a semi-structured interview and their own study assessment (Cimino et al., 2019; Meyer et al., 2021; Monahan & O’Leary, 1999).

Two articles assessed for IPV-related brain injury using the Revised Conflict Tactics Scale (CTS-2). The CTS-2 (Straus et al., 1996) is an instrument used to measure conflict in IPV relations. This measure is widely used and has been tested for validity and reliability. However, the CTS only has one question about the number of head injuries or loss of consciousness and does not measure the severity or frequency of injuries.

The Boston Assessment of Traumatic Brain Injury-Lifetime for Intimate Partner Violence (BAT-L/IPV) emerged as the only validated semi-structured interview to diagnose TBIs in survivors of IPV (Fortier et al., 2021; Likitlersuang et al., 2022). The BAT-L/IPV is a validated semi-structured interview specifically designed to assess exposure to head injury in IPV survivors (Likitlersuang et al., 2022). The BAT-L/IPV was designed to take a conservative approach to screening positive for TBI by factoring in other etiologies that may produce acute TBI symptoms. This semi-structured interview demonstrates higher specificity to diagnose TBI and rule out symptoms not associated with TBI.

While many studies used self-reports to assess the cognitive symptoms of survivors, Wong et al. assessed cognitive function during face-to-face interviews. Coincidentally, from face-to-face interviewing, these researchers found no difference in cognitive function between the injured group and those without brain injury. Additionally, assessment tools included neuropsychological batteries, trauma assessments, mood screeners, magnetic resonance imaging, and medical records when available.

## **Chapter IV: DISCUSSION**

### **Purpose of This Review**

While working with a Veteran survivor of intimate partner violence, the primary author of this review was stunned to learn the client did not receive screening for a traumatic brain injury after several incidences of blunt force trauma to the head and strangulation during the assaults. The objectives of this integrative systematic review were to elucidate the likelihood of women sustaining an acquired brain injury resulting from intimate partner violence, explore the field's understanding of correlates and risk factors associated with acquired brain injuries in this population, identify the symptoms, and evaluation of IPV-related acquired brain injury to promote timely screening and inform appropriate interventions and referrals for women who are at risk for sustaining repeated brain injuries due to domestic violence. At the completion of this review, the author aimed to report these findings to inform survivors, frontline responders, clinicians, public health officials, and stakeholders. This discussion section reflects on the results from each research question, offers critiques of the extant literature, and solicits a call to action for this overlooked public health concern.

### **Reflections on Prevalence**

The prevalence of IPV-related varied considerably from 19% to 92%. The 33 articles had multiple definitions and criteria for brain injury and mTBIs. Some authors required respondents to have endorsed a loss of consciousness. In contrast, others asserted that the absence of a loss of consciousness does not signify the exclusion of brain injury. It was also noted that survivors may not be aware of a change in consciousness because of retrograde and posttraumatic amnesia. These discrepancies likely had an impact on the estimated prevalence of IPV-acquired brain

injury. Universal definitions and criteria for brain injury and mTBIs may improve understanding of the prevalence of IPV-related ABI.

The true prevalence of ABI due to partner abuse is likely higher than estimated due to many injuries not being reported and data collection challenges. Several approaches were used to collect data from the participants in the studies. One method was to have participants complete self-report questionnaires and place the questionnaires in sealed envelopes. While this approach helped to protect privacy and confidentiality, a consequence was that several questionnaires were returned with missing information. Another method was interviewing participants face-to-face to ensure critical questions were asked along with follow-up inquiries. A potential drawback of this method was that the interviewer's presence could have impacted full disclosure due to social pressures, stigma, and trust in health and legal professionals. Several themes emerged that might impact the disclosure of ABI by abused women, including prioritizing safety, feeling judged for experiences of IPV, dealing with consequences if others learned of their disabilities resulting from abuse, fear of medical treatment, increased isolation as protection, a focus on living day-to-day, and calculating the risk of retaliation by their partner. These themes underscore the dilemmas faced by abused women are multidimensional, and that the investigation of IPV-related ABI must go beyond the individual level. Abused women must weigh the benefits and risks of seeking help. Not only do they face repercussions from their abuser, but they may also find it beneficial to maintain their silence from systems that blame, and shame abused women. Service providers must take a holistic and person-centered approach with survivors who sustain IPV-related acquired brain injuries to improve outcomes impacted by social determinates, interactions with organizations, and systems to have a better understanding of the experiences and needs of survivors.

The recruitment settings, methods, and sampling among the studies in this review varied. Samples were recruited from shelters, hospital emergency departments, community-based environments, and the VA population. It is important to note that access to healthcare can vary based on location, demographics, population, and other factors. The sample characteristics and recruitment environment may have contributed to the wide prevalence range.

It is critical to ascertain the prevalence of IPV-related ABI to understand its burden on the national and international population. The prevalence of IPV-related ABI is helpful for public health professionals and service organizations to secure funding to strengthen research, increase awareness, provide training for service providers, create resources, establish appropriate interventions, and collaborate with national and international agencies on this global health issue. Additionally, the prevalence of this problem is useful for this writer, psychologists, and others engaging in advocacy efforts.

### **Reflections on Risk Factors and Correlates**

IPV-related ABI impacts individuals from all sociodemographic and socio-economic backgrounds. However, the impact of race, ethnicity, and social determinants was largely overlooked among the studies in this review. Studies also focused little on diversity and the intersection of identities with this population. The racial demographics of the 2155 survivors across studies yielded that 40% of the participants identified as White, 31% were African American/Black, 12% were Latina/Hispanic, 8% were Native American/Alaska Native, 7% were mixed race, and < 1% were Asian/Pacific Islander. Within the studies in this review, many of the respondents were White, reflecting the majority U.S. societal composition. According to the 2020 Census, the White population is the largest race in the United States (Jones, 2022a, June 10). The high prevalence of White participants may also reflect access to care with a

demographic that may have already been under medical observation and reflect racial inequities in access to medical care and other social determinants (Hunnicut et al., 2019). This review's race and ethnicity outcomes do not reflect the general IPV population (Hunnicut et al., 2019; Meyer et al., 2021). Prior research has shown individuals from marginalized identities (i.e., African American, Native American) to be at higher risk of severe IPV (Sokoloff & Dupont, 2005; Stockman et al., 2015). Analysis of these areas is needed to identify differing risks and care needs among survivors.

This review focused on the outcome of biologically female participants who sustain ABI due to intimate partner violence. Thirty-one studies recruited only female participants. Three studies also included a minimal number (3% to 5%) of male IPV survivors in their samples. Given that three of the studies had a minority of male participants, it was difficult to make inferences regarding gender differences in those studies. While an analysis of gender was not conducted within these articles, prior research analyses on ABI among biological males and females found that women obtain worse ABI outcomes than men after a head injury (Ertl et al., 2019; Farace & Alves, 2000).

Women at least age 20 and women who were married or lived with their partners seem to be at increased risk for IPV-related ABI. Abused women who are married or living with their partners may feel increased isolation and a greater risk of leaving their partners. Increased psychological abuse also seemed associated with brain injury. The clinical implication of this is that psychological abuse should also be taken seriously by service providers as a potential precursor for physical violence including acquired brain injuries.

Studies estimated that approximately 10% to 74% of survivors sought medical attention (Campbell et al., 2018; Joshi et al., 2012; Kwako et al., 2011; Monahan & O'Leary, 1999;



Rajaram et al., 2020; Roberts & Kim, 2005; Smith et al., 2001; Valera & Berenbaum, 2003; Wilbur et al., 2001). There are many reasons why women find it challenging to leave abusive relationships. The most dangerous time for an abused woman is when she makes the decision to leave an abusive relationship and when she begins to separate herself from the abuser (Kim & Gray, 2008).

The clinical practice implications of the risk factors and correlates of IPV-related TBI is that safety planning should include not only service needs but also psychoeducation about the impact of brain injury and strangulation, including the increased risk of long-term consequences from repeated TBI and strategies to protect the head during an attack (Monahan, 2018).

Protective strategies and safety planning must consider the impact of ABI. Cognitive limitations and neurological difficulties resulting from brain injury can make leaving even more challenging and may impede access to care (Monahan & O'Leary, 1999; Valera & Kucyi, 2016). The medical and clinical environments where women are treated should include informational brochures and pamphlets. Additionally, frontline workers and advocates should know available community, state, and regional resources.

IPV-related ABI is further complicated by some perpetrators also being found to have a history of TBI. In a systematic review, more than 50% of IPV male offenders were shown to have sustained prior TBIs (Farrer et., 2012). The changes in impulse control, cognition, heightened anger, and aggression that a TBI can cause may help to explain these findings. While this area of research is hugely under-investigated, these findings suggest that TBI may be a risk factor for IPV. The clinical implication is that women may feel further fearful to come forth to seek medical attention due to heightened anger, aggression, and poor impulse control of the perpetrator's violence and that prison reform must include cognitive rehabilitation for these

offenders. Additionally, providers should be aware that many adolescent and adult trauma offenders may also be survivors of childhood trauma.

### **Reflections on Symptoms and Outcomes**

Intimate partner violence is complex. The topic of brain injury is multifaceted. Women subjected to IPV are navigating an environment in and of itself of prolonged psychological stress. The complexities of the intersection of IPV and ABI make it challenging to tease apart the etiology of presenting symptomology. Further complicating the matter is that the cognitive, affective, and somatosensory symptoms secondary to IPV-related acquired brain injury are not easy to recognize, unlike the physical symptoms of IPV. These symptoms are often documented in medical records as PTSD, mood disorders, and personality diagnoses. However, these “invisible” injuries may have lifetime consequences, and undetected acquired brain injury increases the possibility of sustaining repetitive injuries (Banks, 2007; Campbell et al., 2018). The studies in this review demonstrated that PTSD, depression, and cognitive difficulties are issues for women with IPV-related ABI even when controlling for significant sociodemographic factors, PTSD, and severity of assaults (Campbell et al., 2018; Iverson et al., 2017; Valera & Kucyi, 2016).

The dynamics of IPV-related ABI reinforces the need for frontline providers to ask IPV survivors specific questions about head, neck, and face injuries, along with specific inquiries regarding emotional, behavioral, and cognitive functioning. Many acquired brain injuries do not result in visible injuries. They may present with diagnostic challenges due to survivors reporting issues and clinicians’ lack of awareness of the psychological, cognitive, and behavioral presentations of acquired brain injuries. ABI symptoms such as sleep problems, confusion, headaches, and irritability are often attributed solely to psychiatric problems such as depression

or PTSD (Banks, 2007). It is essential that comorbid ABI and PTSD symptoms not be misinterpreted as resistance (Valera, 2018).

As a result of the low percentage of survivors who sought medical attention, the injuries reported by participants are often not confirmed by medical records. Still, this review identified studies that have found that brain injuries contribute to the psychological and cognitive outcomes of IPV-related ABI while controlling for the effects of PTSD and abuse severity. Therefore, the symptomology experienced by IPV after ABI is not just the result of being in a stressful environment. It is likely true that both contribute to the difficulties endorsed by this population. The results of this review on the symptomology of IPV-related ABI call for changes to current clinical practice accommodations and recommendations for abused women. While obtaining historical information, the results of this review suggest not only asking if a survivor ever sought medical attention for a head injury but also inquiring about times an injury was sustained and whether the survivor thought to seek medical attention but did not (Monahan & O'Leary, 1999). While working with this population, recommendations include treatment providers minimizing distraction, providing short breaks, writing information down, and providing multiple reminders for appointments (Gagnon & DePrince, 2016). Furthermore, psychotherapy providers and organizations must consider how provider practices and organizational policies might present additional barriers for survivors of IPV with ABI. Traditional psychotherapy often includes a 45 to 60-minute session duration, a 24-hour cancellation policy, and expectations for minimum participation in psychotherapy. Providers are recommended to take a flexible approach to psychotherapy with this population. Cognitive symptoms resulting from brain injury may necessitate multiple reminders for sessions, shorter session durations, and more flexible expectations for participation in psychotherapy.

## **Reflection on Screening and Assessment**

No universal guidelines exist for screening IPV-related ABI (Monahan, 2018). Studies have identified the consequences and highlighted the benefits of a worldwide collaboration of assessment and screening methods for IPV-related brain injury (Esopenko et al., 2021; Valera & Kucyi, 2016). The methods across this review varied. There was a notable limited number of neuroimaging studies for this population compared to the range of studies on TBI in military veterans and competitive athletes. Neuroimaging, like MRIs, is expensive and lacks the sensitivity to detect mTBI. Therefore, neuropsychological testing is recommended after preliminary screeners (Valera & Kucyi, 2016). Primarily, survivors were assessed retrospectively. As such, they were identified to have a “probably” brain injury or deemed “likely” to have a mTBI. Many researchers in this review called for improved screening measures (Campbell et al., 2018; Corrigan et al., 2003; Iverson & Pogoda, 2015; Monahan & O’Leary, 1999; Valera & Berenbaum, 2003).

As previously noted, there are structural barriers faced by IPV survivors. Many of the studies employed an interview format to assess the prevalence of IPV-related acquired brain injury. The interviewers’ presence may have impacted the participants’ disclosure comfort level due to survivors’ vulnerabilities, social pressures, stigma, and trust in medical and health providers. This factor, along with the lack of consistency in the terminology used to identify brain injury among this population, likely adds to the variance in the reported prevalence of IPV-related ABI. However, standardized screening guidelines could help mitigate the barriers to accurate reporting.

Screening and early intervention can lead to improved outcomes and are pivotal to increasing understanding of the scope of the impact of IPV-related acquired brain injury. Early

screening can also lead to timely follow-up and coordination of care. Interventions aimed at stopping the cycle of abuse require survivors to have the capacity for safety planning and execution of steps towards safety prioritization and executive functioning, which numerous and frequent acquired brain injuries can impair (Gagnon & DePrince, 2016; Jackson et al., 2002). Screening is essential when a survivor encounters frontline responders or medical personnel to receive appropriate treatment and referrals. Timely screening is necessary, particularly in the first 72-96 hours to assess for moderate to severe TBI, imminent stroke from strangulation or carotid dissection, coma, brain damage or death (Campbell et al., 2018; Corrigan et al., 2003; Iverson et al., 2017; Iverson & Pagoda, 2015; Jackson et al., 2002; Monahan & O’Leary, 1999; Smock & Sturgeon, 2017). There is no point in screening for IPV-related ABI unless the next step after screening is to follow up by offering appropriate resources and referrals.

All assessment interactions, including intakes with IPV survivors, should include inquiry to signal possible medical attention needed and safety risks. Women in ongoing abusive relationships should have continuous assessments. Screening must be followed by interventions to address psychological, cognitive, and behavioral needs. There is a need for screening tools to account for cultural nuances that factor in the unique vulnerabilities, care needs, and challenges faced by this population and that have been evaluated for specificity and sensitivity (Saleem et al., 2022).

Providers such as physicians and emergency room personnel may have limited screening time. Using a brief screener as a preliminary method to signal possible acquired brain injuries seems feasible. While individuals who work with DV survivors should be knowledgeable about IPV and trauma-informed care, they do not need to be experts in ABI. They just need to be able

to sensitively discuss treatment results and make appropriate referrals for comprehensive evaluations.

### **Limitations and Potential Contributions**

There are several limitations to note in this review. The majority of the studies included were reviewed, synthesized, and coded by the primary author, making the findings vulnerable to unintentional bias in the reporting of data and the conclusion of this review. To mitigate the chance for error, the data collection was cross-checked by a second reviewer for alignment with the literature. The synthesis and analysis of this review were completed manually and, therefore, are subject to human error. Additionally, there were differences in the methodological approaches across studies, and the author did not cross-examine statistical power between studies.

Many of the studies were pilot studies. Several quantitative studies in this report had a small sample size and moderate effect size on constructs (Iverson et al., 2019; Likitlersuang et al., 2022; Manoranjan et al., 2022). The author used the term acquired brain injury, which does not differentiate between TBI and strangulation. However, there is no clear differentiation between TBIs resulting from impact to the head versus strangulation-related injuries among the studies. Additionally, strangulation-related anoxic/hypoxic injuries are not always considered a source of TBI in research and clinical contexts.

Three studies included men in their sample; however, this author made every attempt to isolate data relevant to women. Nonetheless, it was challenging to differentiate gender variances in those studies. The studies in this review were gathered from multiple geographical regions. However, there were limited data on these regions, and the author did not address the correlates of each region. While the author intended to synthesize IPV-related ABI findings globally,

international articles were excluded when not written in English. Only three articles written in English were obtained from outside the United States. Therefore, these findings may not reflect outcomes of IPV-related ABI on a global level.

The author of this review and the research assistants did not receive comprehensive training on neurobiology or the sequelae of brain injury and, therefore, are limited in their comprehension of neurological dysfunction.

Of note, a systematic review of the prevalence and outcomes of IPV-related brain injury was published by Haag et al. (2019). This occurred after this author had received approval to proceed with this study and was discovered after the article selection and screening process. Nonetheless, this systematic review can potentially contribute to the literature. In this systematic review, the author investigated the literature on acquired brain injuries resulting from intimate partner violence. The author offered a detailed synthesis of the common symptoms across the 33 studies to inform timely screening for ABI among this population. This review has added to the body of literature that informs mental health providers of the potential for acquired brain injury when working with female survivors who have experienced partner violence. Aware that limited research is available on the intersection of ABI and IPV, the author intentionally included sources from various disciplines utilizing qualitative and quantitative methodological approaches. The disciplines referenced in this review include mental health, medicine, and social work. The results of this review help mental health professionals, case managers, and domestic violence advocates increase urgency and knowledge acquisition to make appropriate interventions and referrals and to consider structural barriers to disclosure and help-seeking when working with survivors with IPV-related ABI.

## **Recommendations for Future Research**

Acquired brain injury is an overlooked outcome of intimate partner violence internationally. There were minimal analyses on the risk factors and correlates of acquired brain injuries among survivors of IPV. The impact of race, ethnicity, social determinants, diversity, and intersection of identities was largely overlooked among the studies in this review. Therefore, future research should analyze the relationships between IPV-related ABI and other variables, including age, race, ethnicity, gender, relationship status, education, income, and other factors.

There are structural factors that help to maintain the invisibility of this public health issue. IPV-related ABI is “invisible” because it is often unrecognized by survivors and service providers (Murray et al., 2016). In a qualitative study, women with probable IPV-related TBI had a history of interactions with systems that asserted the authority to take away survivors’ autonomy in the name of providing protection. These systems and organizations include legal, child protective services, foster care, military, shelter, and health care (St Ivany et al., 2018). Survivors reported feeling stigmatized and blamed during interactions with first responders, medical professionals, and legal personnel. These authors call for further investigating the intersection of IPV-related ABI and interactions with these systems and organizations (St Ivany et al., 2018). Consequently, survivors continue to face the consequences of IPV unseen and alone. No study in this review investigated IPV-related ABI beyond the individual level. That is, no study broadened the scope of their inquiry to the systemic structures that maintain the invisibility of IPV-related brain injuries, including access to healthcare, the lack of trust that survivors have in medical providers, stigma, sexism, oppression, injustice, and inequalities. Future studies should consider the structural barriers that keep survivors hidden and distanced



from appropriate resources and referrals. Future exploration is needed in this area to inform practice, policy, and legal reform to protect survivors.

Future research should improve the approaches of frontline service providers, including ways to empower them with the necessary knowledge of IPV-related ABI and specific steps that can be taken across disciplines. One study explored the use of CARE tools by service providers as a framework for addressing acquired brain injuries and the mental health difficulties of survivors of intimate partner violence (Kemble et al., 2022). Additionally, there is a need for culturally appropriate and population-specific, valid, reliable, and standardized screening tools (Saleem et al., 2022). As stated previously, individual differences add to the complexities of assessing and treating intimate partner violence-related acquired brain injuries.

Most of the studies in this review had a small sample size. While a small sample size is acceptable for qualitative studies, quantitative studies with small sample sizes may be problematic. Future studies should include larger samples and longitudinal studies. Additionally, future examination should seek samples that represent the overall IPV population.

## **Conclusion**

The findings of this review support the conclusion that IPV-related ABI is a complex issue with substantial health and social consequences. Current evidence shows a) a relationship between IPV-related ABI and measures of psychological stress and cognitive functioning, b) a concerning prevalence of single and multiple IPV-related ABI, and c) a relationship between ABIs and salient areas of neural functioning and connectivity. The cognitive difficulties resulting from IPV-related ABI may influence a woman's ability to leave the abusive relationship (Monahan & O'Leary, 1999).

The findings of this review highlight that many women do not seek medical attention for their IPV-related head injuries and may only have interacted with nonmedical service providers. Collaboration across multiple professional disciplines and settings encountered by IPV survivors, including primary care, community, military, and legal, would be advantageous for abused women (Hunnicuttt et al., 2017). Therefore, it would benefit nonmedical service providers who interact with this population to provide additional opportunities for screening, care coordination, and intervention for ABI (Gagnon & DePrince, 2016). The need for collaboration is further highlighted because nonmedical community providers can offer insight into working with the IPV population, while medical professionals are more versed with ABI. Coordination with the legal system is also beneficial, as women may have difficulty recalling details of the assault or remembering court appointments. This review calls for timely screening, assessment follow-up, appropriate referrals, and treatment recommendations. The current information and data on IPV-related ABI pave the way for a more comprehensive exploration of this critical issue.

From the studies included in this review, it is evident that this topic requires greater attention than it is currently receiving. The results of this review highlight the need for standardized practice, attention to individual factors, and a need to explore this issue on a systemic and organizational level. Individual differences such as the age of injury, genetics, medical history, and socio-cultural and developmental factors may play a role in the effects of neurobehavioral and neurocognitive functioning in brain injuries. Individual differences add to the complexities of assessing and treating survivors.

The finding of this review suggests several considerations for clinical providers and organizations engaging in psychotherapy with IPV survivors with ABIs. The symptomology and systematic challenges faced by this population necessitate a flexible approach to psychotherapy

that is holistic and person-centered. Providers must examine how common practice and organization policies may contribute to the structural barriers that maintain the disengagement and isolation of survivors of IPV with ABIs.

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## APPENDIX A

### List of Search Terms

## APPENDIX A

## List of Search Terms

| Search Term ID# | Primary Term              | Synonyms/ Alternate Forms   |
|-----------------|---------------------------|---|
| 01              | Brain injury              | traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain  |
| 02              | Intimate Partner Violence | IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence  |
| 03              | Trauma                    | blunt force or external force or external object or physical force or violent shaking or slapping or suffocation or strangulation or force falls or loss of consciousness   |
| 04              | Symptom                   | consequences or outcomes or impairments or memory deficits or concreteness in thinking or functional and structural connectivity problems or adverse psychiatric or physiological disruption in brain functioning or prognosis or psychiatric or cognitive flexibility or learning tasks or emotional processing or problem solving or alertness or neurobehavioral or neurocognitive or processing speed or attention or working memory or executive functioning |
| 05              | Prevalance                | number of incidents, or occurrence or frequency or timing or widespread or statistics or frequent or universal or pervasive or percentage   |
| 06              | Assessment                | neuropsychological assessment or neuro* or neuropsychology testing or screeners or measures or fMRIs or batteries   |
| 07              | treatment                 | intervention or cognitive rehabilitation or recovery or psychotherapy or prevention   |
| 08              | Correlates                | risk factors or symptomatology or characteristics or sequel* or signs or symptoms or presentation or age or socio-economic status or race or sexuality or disability  |
| 09              | Women                     | female or woman   |



## APPENDIX B

### Comprehensive Search Plan

## APPENDIX B

## Comprehensive Search Plan

| Search Type         | Databases or Sources | Search Term ID(s)  | Search Syntax or Instructions   | Fields to Search          |
|---------------------|----------------------|--------------------|---|---------------------------|
| Electronic Database | Psych INFO           | 01, 02, 03, 08, 09 | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND Trauma or blunt force or external force or external object or physical force or violent shaking or slapping or suffocation or strangulation or force falls or loss of consciousness AND correlates or risk factors or symptomatology or characteristics or sequel* or signs or symptoms or presentation or age or socio-economic status or race or sexuality or disability AND women or female or woman | Title, Keywords, Abstract |
| Electronic Database | Psych INFO           | 01, 02, 06, 07, 09 | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND Assessment or neuropsychological assessment or neuro* or neuropsychology testing or screeners or measures or fMRIs or batteries AND treatment or intervention or cognitive rehabilitation or recovery or psychotherapy or prevention AND Women or female or woman  | Title, Keywords, Abstract |

|                     |                             |                          |   |                           |
|---------------------|-----------------------------|--------------------------|---|---------------------------|
| Electronic Database | Psych INFO                  | 01, 02, 05, 09           | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND number of incidents, or occurrence or frequency or timing or widespread or statistics or frequent or universal or pervasive or percentage AND women or female or woman  | Title, Keywords, Abstract |
| Electronic Database | Psych INFO                  | 01, 02, 04, 09           | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND symptoms or consequences or outcomes or impairments or memory deficits or concreteness in thinking or functional and structural connectivity problems or adverse psychiatric or physiological disruption in brain functioning or prognosis or psychiatric or cognitive flexibility or learning tasks or emotional processing or problem solving or alertness or neurobehavioral or neurocognitive or processing speed or attention or working memory or executive functioning AND women or female or woman | Title, Keywords, Abstract |
| <b>Search Type</b>  | <b>Databases or Sources</b> | <b>Search Term ID(s)</b> | <b>Search Syntax or Instructions</b>  | <b>Fields to Search</b>   |

|                     |                 |                    |   |                           |
|---------------------|-----------------|--------------------|---|---------------------------|
| Electronic Database | PubMed/ Medline | 01, 02, 03, 08, 09 | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND Trauma or blunt force or external force or external object or physical force or violent shaking or slapping or suffocation or strangulation or force falls or loss of consciousness AND correlates or risk factors or symptomatology or characteristics or sequel* or signs or symptoms or presentation or age or socio-economic status or race or sexuality or disability AND women or female or woman | Title, Keywords, Abstract |
| Electronic Database | PubMed/ Medline | 01, 02, 06, 07, 09 | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND Assessment or neuropsychological assessment or neuro* or neuropsychology testing or screeners or measures or fMRIs or batteries AND treatment or intervention or cognitive rehabilitation or recovery or psychotherapy or prevention AND Women or female or woman  | Title, Keywords, Abstract |
| Electronic Database | PubMed/ Medline | 01, 02, 05, 09     | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND number of incidents, or occurrence or   | Title, Keywords, Abstract |

|                     |                   |                |   |                           |
|---------------------|-------------------|----------------|---|---------------------------|
|                     |                   |                | frequency or timing or widespread or statistics or frequent or universal or pervasive or percentage AND women or female or woman  |                           |
| Electronic Database | PubMed/ Medline 1 | 01, 02, 04, 09 | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND symptoms or consequences or outcomes or impairments or memory deficits or concreteness in thinking or functional and structural connectivity problems or adverse psychiatric or physiological disruption in brain functioning or prognosis or psychiatric or cognitive flexibility or learning tasks or emotional processing or problem solving or alertness or neurobehavioral or neurocognitive or processing speed or attention or working memory or executive functioning AND women or female or woman | Title, Keywords, Abstract |

| Search Type         | Databases or Sources | Search Term ID(s)  | Search Syntax or Instructions   | Fields to Search          |
|---------------------|----------------------|--------------------|---|---------------------------|
| Electronic Database | Scopus               | 01, 02, 03, 08, 09 | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND Trauma or blunt force or external force or external object or | Title, Keywords, Abstract |

|                     |        |                    |  |                           |
|---------------------|--------|--------------------|--|---------------------------|
|                     |        |                    | physical force or violent shaking or slapping or suffocation or strangulation or force falls or loss of consciousness AND correlates or risk factors or symptomatology or characteristics or sequel* or signs or symptoms or presentation or age or socio-economic status or race or sexuality or disability AND women or female or woman  |                           |
| Electronic Database | Scopus | 01, 02, 06, 07, 09 | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND Assessment or neuropsychological assessment or neuro* or neuropsychology testing or screeners or measures or fMRIs or batteries AND treatment or intervention or cognitive rehabilitation or recovery or psychotherapy or prevention AND Women or female or woman | Title, Keywords, Abstract |
| Electronic Database | Scopus | 01, 02, 05, 09     | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND number of incidents, or occurrence or frequency or timing or widespread or statistics or frequent or universal or pervasive or percentage AND women or female or woman   | Title, Keywords, Abstract |
| Electronic Database | Scopus | 01, 02, 04, 09     | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND symptoms or   | Title, Keywords, Abstract |

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  | consequences or outcomes or impairments or memory deficits or concreteness in thinking or functional and structural connectivity problems or adverse psychiatric or physiological disruption in brain functioning or prognosis or psychiatric or cognitive flexibility or learning tasks or emotional processing or problem solving or alertness or neurobehavioral or neurocognitive or processing speed or attention or working memory or executive functioning AND women or female or woman |  |
|--|--|--|--|--|

| Search Type         | Databases or Sources | Search Term ID(s)  | Search Syntax or Instructions  | Fields to Search          |
|---------------------|----------------------|--------------------|--|---------------------------|
| Electronic Database | ProQuest             | 01, 02, 03, 08, 09 | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND Trauma or blunt force or external force or external object or physical force or violent shaking or slapping or suffocation or strangulation or force falls or loss of consciousness AND correlates or risk factors or symptomatology or characteristics or sequel*or signs or symptoms or presentation or age or socio-economic status or race or sexuality or disability AND women or female or woman | Title, Keywords, Abstract |
| Electronic Database | ProQuest             | 01, 02, 06, 07, 09 | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND Assessment or neuropsychological assessment or neuro* or neuropsychology testing or screeners or measures or fMRIs or batteries AND treatment or intervention or cognitive rehabilitation or recovery or psychotherapy or prevention AND Women or female or woman   | Title, Keywords, Abstract |

|                     |          |                |   |                           |
|---------------------|----------|----------------|---|---------------------------|
| Electronic Database | ProQuest | 01, 02, 05, 09 | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND number of incidents, or occurrence or frequency or timing or widespread or statistics or frequent or universal or pervasive or percentage AND women or female or woman  | Title, Keywords, Abstract |
| Electronic Database | ProQuest | 01, 02, 04, 09 | brain injury or traumatic brain injury, strangulation, or TBI or concussion or post-concussion or head injury or executive dysfunction or mild traumatic brain injury or brain abrasion or anoxic brain or hypoxic brain AND intimate partner violence or IPV or partner violence or domestic violence or DV or partner abuse or interpersonal violence or dating violence AND symptoms or consequences or outcomes or impairments or memory deficits or concreteness in thinking or functional and structural connectivity problems or adverse psychiatric or physiological disruption in brain functioning or prognosis or psychiatric or cognitive flexibility or learning tasks or emotional processing or problem solving or alertness or neurobehavioral or neurocognitive or processing speed or attention or working memory or executive functioning AND women or female or woman | Title, Keywords, Abstract |



## APPENDIX C

### Screening and Selection Record

## APPENDIX C

### Screening and Selection Record

| DOC ID | Authors                     | Year | Title  | TITLE AND/OR KEYWORD<br>SCREEN- DECISION -<br>DATE | ABSTRACT SCREEN- DECISION -<br>DATE | FULL-TEXT<br>SCREEN? | Exclusion :<br>Systematic<br>review | INCL: Published<br>between 1991 and<br>2023 | INCL (SO):<br>Written in<br>English | INCL:<br>Dissertatio<br>n | INCL: Brain<br>Injury | INCL: Intimate<br>partner<br>violence |
|--------|-----------------------------|------|--|--|-------------------------------------|----------------------|-------------------------------------|---|-------------------------------------|---------------------------|-----------------------|---------------------------------------|
| 100    | Corrigan et al.<br>(2003)   | 2003 | Early Identification of Mild Traumatic Brain Injury in Female Victims of Domestic Violence   |  |                                     | X                    | no                                  | yes   | yes                                 | no                        | yes                   | yes                                   |
| 101    | Hunnicut et al.<br>(2019)   | 2019 | Exploring Correlates of Probable Traumatic Brain Injury among Intimate Partner Violence Survivors  |  |                                     | X                    | no                                  | yes   | yes                                 | no                        | yes                   | yes                                   |
| 102    | Brown et al. (2019)         | 2019 | Exploring the Use of Neurofeedback Therapy in Mitigating Symptoms of Traumatic Brain Injury in Survivors of Intimate Partner Violence.     |  |                                     | X                    | no                                  | yes   | yes                                 | no                        | yes                   | yes                                   |
| 103    | Monahan & O'Leary<br>(1999) | 1999 | Head Injury and Battered Women   |  |                                     | X                    | no                                  | yes   | yes                                 | no                        | yes                   | yes                                   |
| 104    | Gagnon & DePrince<br>(2016) | 2016 | Head injury screening and intimate partner violence: A brief report  |  |                                     | X                    | no                                  | yes   | yes                                 | no                        | yes                   | yes                                   |
| 105    | Meyers et al. (2021)        | 2021 | Head Trauma in a Community-Based Sample of Victims of Intimate Partner Violence: Prevalence, Mechanisms of Injury and Symptom Presentation |  |                                     | X                    | no                                  | yes   | yes                                 | no                        | yes                   | yes                                   |
| 106    | Kemble et al. (2022)        | 2022 | How CARE Tools Are Being Used to Address Brain Injury and Mental Health Struggles With Survivors of Domestic Violence                      |  |                                     | X                    | no                                  | yes   | yes                                 | no                        | yes                   | yes                                   |
| 107    | Wong et al. (2020)          | 2020 | Impact of mild traumatic brain injury on physical, mental and cognitive functioning of abused women admitted to emergency units            |  |                                     | X                    | no                                  | yes   | yes                                 | no                        | yes                   | yes                                   |
| 110    | Rajaram et al. (2020)       | 2020 | Intimate Partner Violence and Brain Injury Screening   |  |                                     | X                    | no                                  | yes   | yes                                 | no                        | yes                   | yes                                   |

|     |                                      |      |  |  |  |   |    |     |     |    |     |     |
|-----|--------------------------------------|------|--|--|--|---|----|-----|-----|----|-----|-----|
| 111 | Lititersuang et al.<br>(2022)        | 2022 | Neural Correlates of Traumatic Brain Injury in Women Survivors of Intimate Partner Violence: A Structural and Functional Connectivity Neuroimaging Study                     |  |  | X | no | yes | yes | no | yes | yes |
| 113 | Manoranjn et al.<br>(2022)           | 2022 | Prevalence and Perception of Intimate Partner Violence-Related Traumatic Brain Injury  |  |  | X | no | yes | yes | no | yes | yes |
| 114 | St Ivany et al. (2021)               | 2021 | Acquired Brain Injuries and Intimate Partner Violence: A Situational Analysis of Help Seeking Barriers in Rural Northern New England ( <b>care providers and survivors</b> ) |  |  | X | no | yes | yes | no | yes | yes |
| 115 | Iverson et al (2019)                 | 2019 | Association between traumatic brain injury from intimate partner violence and future psychosocial health risks in women  |  |  | X | no | yes | yes | no | yes | yes |
| 117 | Karakurt et al (2021)                | 2021 | Brain Injury and Mental Health among the Victims of IPV: A Case-Series Exploratory Study   |  |  | X | no | yes | yes | no | yes | yes |
| 118 | Valera and Kucyi<br>(2016)           | 2016 | Brain injury in women experiencing intimate partner-violence neural mechanistic evidence of an "invisible" trauma  |  |  | X | no | yes | yes | no | yes | yes |
| 119 | Maldonado-Rodriguez et al.<br>(2021) | 2022 | Characterization of Cognitive-Motor Function in Women Who Have Experienced Intimate Partner Violence-Related Brain Injury-   |  |  | X | no | yes | yes | no | yes | yes |
| 120 | Smirl et al. (2019)                  | 2019 | Characterizing symptoms of traumatic brain injury in survivors of intimate partner violence  |  |  | X | no | yes | yes | no | yes | yes |
| 124 | Gimino et al., (2019)                | 2019 | The Effect of Intimate Partner Violence and Probable Traumatic Brain Injury on Mental Health Outcomes for Black Women  |  |  | X | no | yes | yes | no | yes | yes |
| 125 | Campbell et al., 2018                | 2018 | The Effects of Intimate Partner Violence and Probable Traumatic Brain Injury on Central Nervous System Symptoms  |  |  | X | no | yes | yes | no | yes | yes |

|     |                          |       |   |  |  |   |    |     |     |    |     |     |
|-----|--------------------------|-------|---|--|--|---|----|-----|-----|----|-----|-----|
| 126 | Iverson et al. (2017)    | 2017  | Traumatic brain injury and PTSD symptoms as a consequence of intimate partner violence  |  |  | X | no | yes | yes | no | yes | yes |
| 127 | Oakley et al. (2021)     | 2021  | Traumatic Brain Injury Screening and the Unmet Health Needs of Shelter-Seeking Women with Head Injuries Related to Intimate Partner Violence  |  |  | X | no | yes | yes | no | yes | yes |
| 128 | Jackson et al. (2002)    | 2002  | Traumatic Brain Injury: A Hidden Consequence for Battered Women   |  |  | X | no | yes | yes | no | yes | yes |
| 129 | Iverson et al. (2015)    | 2015  | Traumatic Brain Injury Among Women Veterans   |  |  | X | no | yes | yes | no | yes | yes |
| 130 | Valera & Berenbaum, 2003 | 2003  | Brain Injury in Battered Women  |  |  | X | no | yes | yes | no | yes | yes |
| 131 | Roberts & Kim (2005)     | 2005  | Exploring the effects of head injuries among battered women: a qualitative study of chronic and severe woman battering  |  |  | X | no | yes | yes | no | yes | yes |
| 133 | St Ivany et al. (2018)   | 2018  | Living in Fear and Prioritizing Safety: Exploring Women's Lives After Traumatic Brain Injury From Intimate Partner Violence   |  |  | X | no | yes | yes | no | yes | yes |
| 134 | Valera et al. (2019a)    | 2019a | White Matter Correlates of Mild Traumatic Brain Injuries in Women Subjected to Intimate-Partner Violence: A Preliminary Study   |  |  | X | no | yes | yes | no | yes | yes |
| 136 | Saleem et al. (2022)     | 2022  | Prevalence and Risk Factors for Intimate Partner Physical Violence-Related Acquired Brain Injury Among Visitors to Justice Center in New York   |  |  | X | no | yes | yes | no | yes | yes |
| 138 | Fortier et al. (2021)    | 2021  | The Boston Assessment of Traumatic Brain Injury-Lifetime Semistructured Interview for Assessment of TBI and Subconcussive Injury Among Female Survivors of Intimate Partner Violence: Evidence of Research Utility and Validity |  |  | X | no | yes | yes | no | yes | yes |
| 139 | Joshi et al. (2012)      |       | "I Didn't Know I Could Turn Colors": Health Problems and Health Care Experiences of Women Strangled by an Intimate Partner  |  |  | X | no | yes | yes | no | yes | yes |
| 142 | Smith et al. (2001)      | 2001  | Frequency and Relationship of Reported Symptomatology in Victims of Intimate Partner Violence: The Effect of Multiple Strangulation Stacks  |  |  | X | no | yes | yes | no | yes | yes |
| 144 | Messing et al. (2018)    | 2018  | Differentiating among Attempted, Completed, and Multiple Nonfatal Strangulation in Women Experiencing Intimate Partner Violence   |  |  | X | no | yes | yes | no | yes | yes |
| 145 | Wilbur et al. (2001)     | 2001  | Survey Results of Women Who Have Been Strangled While in Abusive Relationships  |  |  | X | no | yes | yes | no | yes | yes |



## APPENDIX D

### Data Collection and Extraction Form

## APPENDIX D

### Data Collection and Extraction Form

This form can be used as a guide for developing your own data extraction form. Sections can be expanded and added, and irrelevant sections can be removed. It is challenging to design a single form that meets the needs of all reviews, so it is important to consider carefully the information that YOU need to collect and design your form accordingly. The information included on this form should be comprehensive as it serves as the data for your study and informs the database for your synthesis and analysis. Content from this form may be used in the text of your review, your 'Evidence Table of Included Studies,' quality appraisal, statistical analysis, etc...

Notes on using a data extraction form:

- Be consistent in the order and style you use to describe the information for each included study.
- Record any missing information as unclear or not described to make it clear that the information was not found in the study report(s), not that you forgot to extract it.
- Include instructions, coding systems, and decision rules on this data collection form or in an accompanying document. It is important to practice using the form and give training to anyone else using it.
- You will need to protect the document in order to use the form fields (Tools / Protect document)

Extractor's Initials \_\_\_\_\_

Date Extracted \_\_\_\_\_

#### Study Identification

|   |
|---|
| <b>Document Name</b>  |
|   |
| <b>Document ID#</b>   |
|   |
| <b>Authors and Year</b> (Last name of authors and year of publication e.g., Davis, Adams, Jones 2011) |
|   |
| <b>Full Document Title</b>  |
|   |
| <b>Notes:</b>   |
|   |

### General Information

|                             |  |
|-----------------------------|--|
| <b>Date form completed:</b> |  |
| <b>Source Type:</b>         |  |
| <b>Source Name:</b>         |  |
| <b>Document Language:</b>   |  |
| <b>OTHER:</b>               |  |
| <b>Notes:</b>               |  |

### Design Characteristics and Methodological Features

|   | Descriptions as stated in report/paper | Location in text |
|---|--|------------------|
| <b>Aim of Study</b>                           |  |                  |
| <b>General Method</b><br>(Quant, Qual, Mixed) |  |                  |
| <b>Design or Specific Research Approach</b>   |  |                  |
| <b>Study Location</b>                         |  |                  |
| <b>Treatment Setting</b>                      |  |                  |
| <b>Ethics Approval</b>                        |  |                  |

**Notes:**

### Participant Information

| Component  | Descriptions as stated in document | Location in text |
|--|------------------------------------|------------------|
| Population Description (from which study participants are drawn) |                                    |                  |
| Recruitment Methods  |                                    |                  |
| Participation Gender   |                                    |                  |
| Participant Age  |                                    |                  |
| Participant Race/ Ethnicity                                      |                                    |                  |
| Participant Socioeconomic Status                                 |                                    |                  |
| Relationship Status  |                                    |                  |
| Level of Education   |                                    |                  |
| Participant Employment Status                                    |                                    |                  |
| <b>Notes:</b>  |                                    |                  |



### IPV-related ABI Prevalence

|                    |  |
|--------------------|--|
| <b>Sample size</b> |  |
| <b>Prevalence</b>  |  |
| <b>Frequency</b>   |  |
| <b>Note:</b>       |  |

### IPV-related ABI symptomology and characteristics

| <b>Component</b>  | <b>Descriptions as stated in document</b> | <b>Location in text</b> |
|---|---|-------------------------|
| <b>Mechanism of Injury</b>  |   |                         |
| <b>Symptomology/Outcome:</b> <ul style="list-style-type: none"> <li>• Loss of consciousness</li> <li>• Headaches</li> <li>• Dizziness</li> <li>• Memory loss</li> <li>• Relationship</li> <li>• Concentration</li> <li>• Work/ performance</li> <li>• PTSD</li> <li>• Anxiety</li> <li>• Depression</li> <li>• Other</li> </ul> |   |                         |
| <b>Respondents with multiple brain injury</b>   |   |                         |
| <b>Note:</b>  |   |                         |

### Screening and Assessment

|                   |  |
|-------------------|--|
| <b>Screening</b>  |  |
| <b>Assessment</b> |  |

|  |  |
|--|--|
|  |  |
| <b>Intervention</b>                      |  |
| <b>Referral</b>                          |  |
| <b>Treatment</b>                         |  |
| <b>Reported</b>                          |  |
| <b>Hospitalization/Medical Attention</b> |  |
| <b>Note:</b>                             |  |

### Analysis and statistical Information

|                                       | Description as stated in report/paper | Location in text |
|---------------------------------------|---------------------------------------|------------------|
| <b>Descriptive Statistics used</b>    |                                       |                  |
| <b>Inferential Statistics used</b>    |                                       |                  |
| <b>Qualitative Analyses conducted</b> |                                       |                  |
| <b>Other</b>                          |                                       |                  |
| <b>Notes:</b>                         |                                       |                  |

## Results

|                                    | Description as stated in report/paper | Location in text |
|------------------------------------|---------------------------------------|------------------|
| Key results on research question 1 |                                       |                  |
| Key results on research question 2 |                                       |                  |
| Key results on research question 3 |                                       |                  |
| Key results on research question 4 |                                       |                  |
| Notes:                             |                                       |                  |

## Conclusions, Limitations and Follow-up

|   | Description as stated in report/paper | Location in text |
|---|---------------------------------------|------------------|
| 1. Research questions answered by the study |                                       |                  |
| 2. Critical takeaways                       |                                       |                  |
| 3. Strengths and limitations                |                                       |                  |
| 4. Clinical Implications                    |                                       |                  |
| 5. Recommendation for future investigation  |                                       |                  |
| 6. References to other relevant studies     |                                       |                  |

|                  |  |  |
|------------------|--|--|
|                  |  |  |
| 7. <b>Other</b>  |  |  |
| 8. <b>Notes:</b> |  |  |

## APPENDIX E

## Individual Study Quality Appraisal Form for Systematic Reviews

## APPENDIX E

## Individual Study Quality Appraisal Form for Systematic Reviews

Developed by Shelly P. Harrell, Ph.D., Pepperdine University

Author(s) and Year: \_\_\_\_\_ Study ID# \_\_\_\_\_

1. **Methodology:** Quantitative                      Qualitative                      Mixed Methods2. **Specific**    **Design/Inquiry**    **Approach:**  
\_\_\_\_\_**RATING SCALE:**    **Strong=3**    **Good/Adequate=2**    **Weak=1**    **Missing=0**    **N/A**3. **Strength of Literature Foundation and Rationale for Study:** \_\_\_\_\_

(POSSIBLE CONSIDERATIONS: current and relevant references, background literature sufficiently comprehensive, Need/Rationale for study clearly stated, etc.)

4. **Clarity and specificity of Research Aims/Objectives/Questions/Hypotheses:** \_\_\_\_\_5. **Quality of research design or methodological approach:** \_\_\_\_\_GENERAL CONSIDERATIONS: provides rationale for design chosen, appropriateness for research questions,  
clear description of design and methodological approach, strength of design characteristics utilized

QUANTITATIVE CONSIDERATIONS: internal and external validity considered in design; potential confounds

identified and addressed in some way, specific design-based "risk of bias" criteria considered such as

randomization, blinding

QUALITATIVE CONSIDERATIONS: consistent with specific practices relevant to the inquiry strategy (e.g., phenomenological study, case study, grounded theory, etc.), triangulation, audit trail

6. **Sample Selection and Characteristics:** \_\_\_\_\_

GENERAL CONSIDERATIONS: detailed description of sample characteristics, adequacy of sample characteristics in the context of research aims, detailed description of recruitment and selection of participants; rationale provided for sample size; inclusion and exclusion criteria indicated as relevant

QUANTITATIVE CONSIDERATIONS: representativeness of sample, adequacy of sample size in context of design, extent of selection or sample bias

QUALITATIVE CONSIDERATIONS: sample size appropriate for inquiry strategy; rationale for purposeful sample characteristics

**7. Data Collection Tools (Scales, Observation, Interviews, etc.): \_\_\_\_\_**

GENERAL CONSIDERATIONS: rationale for selection, appropriateness for assessing variables, development

of study-specific tool or process clearly described, piloting, pretesting;

QUANTITATIVE CONSIDERATIONS: psychometric properties (reliability, validity, utility)

reported, adequacy of psychometric properties, normative or standardization data described

QUALITATIVE CONSIDERATIONS: appropriateness for inquiry strategy and purpose; interview or other data collection process described clearly and comprehensively

**8. Data Collection Processes: \_\_\_\_\_**

(POSSIBLE CONSIDERATIONS: data collection procedures clearly described in sufficient detail, intervention strategies and implementation described in detail, quality of data collected, design-specific considerations such as attrition in RCTs, saturation in grounded theory, etc.)

**9. Analysis and Presentation of Data: \_\_\_\_\_**

GENERAL CONSIDERATIONS: appropriateness of analysis for research questions and type of data; results presented clearly and comprehensively; usefulness and clarity of any tables, graphs, and charts

QUANTITATIVE CONSIDERATIONS: power and effect size reported; relevant statistics reported clearly;

effective use of tables

QUALITATIVE CONSIDERATIONS: textual data and/or direct quotes reported and used effectively; transparent

description of the development of themes from raw data

**10. Discussion of Study Limitations: \_\_\_\_\_**

GENERAL CONSIDERATIONS: identifies and discusses limitations in the context of design/strategy utilized QUANTITATIVE CONSIDERATIONS: addresses various forms of bias, internal validity, external validity (generalizability), ecological validity

QUALITATIVE CONSIDERATIONS: transferability, credibility, transparency,

**11. Consideration of culture and diversity: \_\_\_\_\_**

(POSSIBLE CONSIDERATIONS: attention to diversity within sample, includes culturally appropriate methods

and tools, avoids biased language, uses appropriate terminology, etc.)

**12. OVERALL RATING:**  
**WEAK**

(e.g., mostly "1"s)

**EXEMPLARY**

(e.g., all "3"s)

**STRONG**

(e.g., mostly "3"s)

**GOOD/ADEQUATE**

(e.g., mostly "2"s)

## APPENDIX F

## Report of Results



## APPENDIX F

### Report of Results

| DOC ID | Authors                     | Title  | Demographics | Participants Age | Participants Gender | Part. Race/Ethnicity | Relationship Status | Socioeconomics /Level of Education | Prevalence | Sample Size | Frequency | Correlates |
|--------|-----------------------------|--|--------------|------------------|---------------------|----------------------|---------------------|------------------------------------|------------|-------------|-----------|------------|
| 100    | Corrigan et al. (2003)      | Early Identification of Mild Traumatic Brain Injury in Female Victims of Domestic Violence   | X            |                  |                     |                      |                     |                                    | X          |             |           |            |
| 101    | Hunnicuttt et al. (2019)    | Exploring Correlates of Probable Traumatic Brain Injury among Intimate Partner Violence Survivors  | X            |                  |                     |                      |                     |                                    | X          |             |           | X          |
| 102    | Brown et al. (2019)         | Exploring the Use of Neurofeedback Therapy in Mitigating Symptoms of Traumatic Brain Injury in Survivors of Intimate Partner Violence.     | X            |                  |                     |                      |                     |                                    |            |             |           |            |
| 103    | Monahan & O'Leary (1999)    | Head Injury and Battered Women   | X            |                  |                     |                      |                     |                                    | X          |             |           |            |
| 104    | Gagnon & DePrince (2016)    | Head injury screening and intimate partner violence: A brief report  | X            |                  |                     |                      |                     |                                    | X          |             |           | X          |
| 105    | Meyers et al. (2021)        | Head Trauma in a Community-Based Sample of Victims of Intimate Partner Violence: Prevalence, Mechanisms of Injury and Symptom Presentation | X            |                  |                     |                      |                     |                                    | X          |             |           | X          |
| 106    | Kemble et al. (2022)        | How CARE Tools Are Being Used to Address Brain Injury and Mental Health Struggles With Survivors of Domestic Violence                      | X            |                  |                     |                      |                     |                                    |            |             |           |            |
| 107    | Wong et al. (2020)          | Impact of mild traumatic brain injury on physical, mental and cognitive functioning of abused women admitted to emergency units            | X            |                  |                     |                      |                     |                                    | X          |             |           |            |
| 110    | Rajaram et al. (2020)       | Intimate Partner Violence and Brain Injury Screening   | X            |                  |                     |                      |                     |                                    | X          |             |           | X          |
| 111    | Likitlersuang et al. (2022) | Neural Correlates of Traumatic Brain Injury in Women Survivors of Intimate Partner Violence: A   | X            |                  |                     |                      |                     |                                    | X          |             |           |            |

|     |                                   |   |   |  |  |  |  |  |   |  |  |   |
|-----|-----------------------------------|---|---|--|--|--|--|--|---|--|--|---|
| 113 | Manoranjana et al. (2022)         | Prevalence and Perception of Intimate Partner Violence-Related Traumatic Brain Injury   | X |  |  |  |  |  | X |  |  | X |
| 114 | St Ivany et al. (2021)            | Acquired Brain Injuries and Intimate Partner Violence: A Situational Analysis of Help Seeking Barriers in Rural Northern New England (care providers and survivors) | X |  |  |  |  |  |   |  |  | X |
| 115 | Iverson et al (2019)              | Association between traumatic brain injury from intimate partner violence and future psychosocial health risks in women   | X |  |  |  |  |  | X |  |  | X |
| 117 | Karakurt et al (2021)             | Brain Injury and Mental Health among the Victims of IPV: A Case-Series Exploratory Study  | X |  |  |  |  |  |   |  |  | X |
| 118 | Valera and Kucyi (2016)           | Brain injury in women experiencing intimate partner-violence: neural mechanistic evidence of an "invisible" trauma  | X |  |  |  |  |  | X |  |  | X |
| 119 | Maldonado-Rodriguez et al. (2021) | Characterization of Cognitive-Motor Function in Women Who Have Experienced Intimate Partner Violence-Related Brain Injury-  | X |  |  |  |  |  | X |  |  |   |
| 120 | Smirl et al. (2019)               | Characterizing symptoms of traumatic brain injury in survivors of intimate partner violence   | X |  |  |  |  |  | X |  |  |   |
| 124 | Cimino et al., (2019)             | The Effect of Intimate Partner Violence and Probable Traumatic Brain Injury on Mental Health Outcomes for Black Women   | X |  |  |  |  |  | X |  |  | X |
| 125 | Campbell et al., 2018             | The Effects of Intimate Partner Violence and Probable Traumatic Brain Injury on Central Nervous System  | X |  |  |  |  |  | X |  |  | X |
| 126 | Iverson et al (2017)              | Traumatic brain injury and PTSD symptoms as a consequence of intimate partner violence  | X |  |  |  |  |  | X |  |  |   |
| 127 | Oakley et al. (2021)              | Traumatic Brain Injury Screening and the Unmet Health Needs of Shelter-Seeking Women with Head Injuries Related to Intimate Partner Violence                        | X |  |  |  |  |  | X |  |  | X |

| Demographics | Participants Age | Participants Gender | Part. Race/Ethnicity | Relationship Status | Socioeconomics /Level of Education | Prevalence | Sample Size | Frequency | Correlates | Symptoms | Multiple brain injury reported | Mechanism of Injury | Assessment /treatment | Recruitment | Sought medical attention |
|--------------|------------------|---------------------|----------------------|---------------------|------------------------------------|------------|-------------|-----------|------------|----------|--------------------------------|---------------------|-----------------------|-------------|--------------------------|
| x            |                  |                     |                      |                     |                                    | x          |             |           |            | x        |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    | x          |             |           | x          | x        |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    |            |             |           |            | x        |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    | x          |             |           |            | x        |                                |                     | x                     | x           | x                        |
| x            |                  |                     |                      |                     |                                    | x          |             |           | x          | x        |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    | x          |             |           | x          | x        |                                |                     | x                     |             |                          |
| x            |                  |                     |                      |                     |                                    |            |             |           |            |          |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    | x          |             |           |            | x        |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    | x          |             |           | x          | x        |                                |                     | x                     | x           | x                        |
| x            |                  |                     |                      |                     |                                    | x          |             |           |            | x        |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    | x          |             |           | x          | x        |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    |            |             |           | x          | x        |                                |                     |                       | x           |                          |
| x            |                  |                     |                      |                     |                                    | x          |             |           | x          |          |                                |                     | x                     |             |                          |
| x            |                  |                     |                      |                     |                                    |            |             |           | x          | x        |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    | x          |             |           | x          | x        |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    | x          |             |           |            | x        |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    | x          |             |           |            | x        |                                |                     | x                     | x           |                          |
| x            |                  |                     |                      |                     |                                    | x          |             |           | x          | x        |                                |                     | x                     | x           |                          |