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Memory in Adult Female Victims of Intimate Partner Violence

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Walden University
2018

Abstract

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MSc, Walden University, 2008

BS, University of Connecticut, 1999

Dissertation Submitted in Partial Fulfillment

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Abstract

Intimate partner violence (IPV) is a national and global health problem. Recent data from the Centers for Disease Control and World Health Organization suggest that 1 in 3 women will become a victim of violence by an intimate partner in her lifetime. Memory and learning have been shown to be affected in in-vivo animal studies under acute and chronic stress conditions. Using Bertalanffy's general systems theory, this study examined the impact of IPV on short-term memory in adult female survivors by comparing their performance to a control group (adult females with no IPV in the past 5 years) on measures of verbal and nonverbal memory, learning, and working memory. Participants also completed measures of depression, post-traumatic stress disorder (PTSD), and were asked about their history of mild traumatic brain injury (mTBI). Participants included community members and treatment seeking adult females from a Nevada city. A total of 23 women participated in this study (M = 30 years), of which, 7 were included in the control group (no history of IPV in the past 5 years) and 16 were included in the IPV group (history of IPV within the past 5 years). Using multivariate analysis of variance with depression, PTSD, and mTBI as covariates, no statistically significant differences were found between these 2 groups on all measures. Future studies with high power may yield significant results on measures of learning and should be an area of focus. IPV participants with PTSD tended to perform worse on tests of learning compared to the control group (d = .33; p = .16). Future research in this area is recommended to help improve treatment outcomes for survivors, reduce the stigma associated with IPV, and improve domestic violence laws.

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Dedication

To the ones who sacrificed the most for my educational pursuits: Misty and Dominick, I love you and cherish your unending love. To my cousin, Lenny: Your drive for success and advanced training in engineering inspired me to take this arduous path. Your ability to balance work, family, and laughter is something I envy and am so ready for! You are dearly missed.

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Chapter 1: Introduction to the Study

Introduction

Intimate partner violence (IPV) is a national and global health problem (CDC, 2012; WHO, 2012b). In a cross-cultural study involving 12 countries and 24,000 women, the World Health Organization (WHO; 2005) found that on average, 29 to 62% of heterosexual women have been a victim of physical or sexual abuse by their intimate partner during their life. That is roughly 1 out of every 2 to 3 women. In addition, of the 24,000 women surveyed, 20 to 75% reported that they had experienced emotional abuse by their intimate partner within the past year (WHO, 2005). Although men can be victims, according to the WHO (2012b), the majority of IPV victims are women. Studies have also found that although women can be just as aggressive toward their partners as men (Leisring, 2009), women sustain greater injuries than men (Caldwell, Swan, & Woodbrown, 2012). Goldsmith (2016) found that heterosexual women were 6 to 7 times more likely to sustain a serious physical injury from their intimate partner compared to heterosexual men.

Violence within an intimate relationship can be either physical, sexual, or psychological. Some of the health effects women experience as a result of this form of violence include sexually transmitted diseases, unintended pregnancies, gastrointestinal disorders, overall poor health, depression, and post-traumatic stress disorder (PTSD; WHO, 2012b). Research has shown that psychological and physical abuse can negatively affect cognitive functions such as memory in children (see Amen, 2005; Diener, Flor, & Wessa, 2010; Gustafsson et al., 2013). Only a few studies could be found that

investigated the specific relationship between IPV and memory functioning in adult female victims. Therefore, this study investigated the effect of IPV on adult female victims' memory function.

Understanding the effect IPV has not only on victims' psychological and emotional health, but on their cognitive faculties as well will allow healthcare providers to be better equipped to assess and treat victims of partner violence. It will also help policy makers strengthen laws established to help victims. By understanding the cognitive effects IPV may have on its victims, advocates against violence towards women may find that their voices are louder. This chapter describes why this topic of investigation is important, how it will contribute to the literature, and its social change implications. This chapter includes a description of the theoretical basis grounding this study and a discussion on the assumptions and limitations of this study.

Background of the Study

The literature on IPV shows that there is an indirect relationship between IPV and memory impairments resulting from the psychological effects of IPV (e.g., depression, PTSD; Parihar, Hattiangady, Kuruba, Shuai, & Shetty, 2011; Scott et al., 2015). It is well known that many victims of IPV develop depression and PTSD (Diener et al., 2010; Hirth & Berenson, 2012; Iverson et al., 2011; Johnson, Giordano, Longmore, & Manning, 2014). The literature has clearly shown a link between depression and impairments in memory (Everaert, Duyck, & Koster, 2014; Halvorsen et al., 2012), as well as PTSD and memory impairments (Koessler et al., 2010; Larson, Zollman, Kondiles, & Starr, 2013). However, only five studies were located within a 10-year span

(2005–2015) that examined the direct relationship between IPV and memory function (see Gustafsson et al., 2013; Johnson, Greenhoot, Glisky, & McCloskey, 2005; Jouriles et al., 2008; Minshew & D'Andrea, 2015; Twamley et al., 2009). Of these five studies, only two investigated this relationship in adult female victims of IPV (see Minshew & D'Andrea, 2015; Twamley et al., 2009). This study investigated the direct relationship between IPV and memory function in adult female victims in order to fill a gap in the literature and improve our understanding on the outcomes of IPV.

Problem Statement

The majority of research related to IPV over the past 5 years has focused on the psychological outcomes in victims (see Chandra, Satyanarayana, & Carey, 2009; Lee, Pomeroy, & Bohman, 2007; Neergaard, Lee, Anderson, & Gengler, 2007), characteristics of perpetrators, and treatment outcomes for both perpetrators and victims (see Finkel et al., 2012; Lawson, Kellam, Quinn, & Malnar, 2012; Rauer & El-Sheikh, 2012; Rowe, Doss, Hsueh, Libet, & Mitchell, 2011). Several studies have shown that IPV results in reduced memory in children (Gustafsson et al., 2013; Jouriles et al., 2008) and only two neuropsychological studies have been conducted that examined the effect of IPV on memory in adult female victims (see Minshew & D'Andrea, 2015; Twamley et al., 2009).

Victims of IPV who are abused physically are at a high risk for sustaining brain injuries that affect their overall functioning due to the compounding effects of multiple brain injuries (Amen, 2005). In addition to the risk for brain injuries, victims of IPV are at risk for developing PTSD and depression (Iverson et al., 2011; Johnson, Zlotnick, & Perez, 2011). Both PTSD and depression have been linked to memory impairments

(Diener et al., 2010; Rose & Ebmeier, 2006). By understanding the relationship between IPV and memory, healthcare providers will be able to better assess for and treat IPV related brain injuries, mental health providers will be able to better assess for and treat IPV related PTSD and depression, and policy makers will be able to strengthen laws created to protect victims of partner violence.

Purpose of Study

The purpose of this quantitative study was to describe the relationship between IPV and memory in adult female victims.

Research Questions and Hypotheses

Based on the indirect relationship found in the literature between IPV and memory impairment (Burriss, Ayers, Ginsberg, & Powell, 2008; Chandra et al., 2009), this author hypothesized that memory impairment would be found in adult female victims of IPV. The following research question and hypotheses were addressed in this study.

RQ1: Is memory impairment associated with prolonged or severe IPV in adult female victims?

H_{0CMI}: Adult female victims of IPV will perform as well as or better than control subjects on tests of verbal and nonverbal memory as measured by the Tests of Memory and Learning, 2nd edition (TOML-2), Composite Memory Index (CMI).

H_{1CMI}: Adult female victims of IPV will perform worse than control subjects on tests of verbal and nonverbal memory as measured by the TOML-2, CMI.

H_{0LI}: Adult female victims of IPV will perform as well as or better than control subjects on tests of learning as measured by the TOML-2, Learning Index (LI).

H_{1LI}: Adult female victims of IPV will perform worse than control subjects on tests of learning as measured by the TOML-2, LI.

H_{0ACI}: Adult female victims of IPV will perform as well as or better than control subjects on tests of attention and concentration as measured by the TOML-2, Attention and Concentration Index (ACI).

H_{1ACI}: Adult female victims of IPV will perform worse than control subjects on tests of attention and concentration as measured by the TOML-2, ACI.

Theoretical Base

General systems theory, described by Ludwig von Bertalanffy, states that "an event or phenomenon should be viewed holistically as a set of elements interacting with one another (i.e., as a system)" (APA, 2007, p. 404). Each element in a system influences the role of other elements in the system, whereby all elements in a system interact with each other producing order (APA, 2007). Bertalanffy (1972) suggested that the organization of its subparts is what makes all living things unique. Therefore, it is not enough to simply study the subparts of an organism, one must look at all aspects of an organism, including the organization of its subparts.

The general systems theory is used to explain the biopsychosocial model or system of mental health. In the biopsychosocial model, mental health professionals assess the impact of biological, psychological, and social factors (elements) on an individuals' mental health (APA, 2007). A biopsychosocial approach is used as the framework for this quasi-experimental study. A more detailed discussion of this conceptual framework is included in Chapter 2.

Nature of the Study

A quantitative study investigating the direct relationship between IPV and memory in adult female victims was proposed. This study aimed to answer if memory impairment is associated with prolonged or severe IPV. Data was collected through a web-based survey for prescreening subjects and face-to-face for the collection of IPV risk, memory function, and symptomatology for depression, PTSD, and history of traumatic brain injury (TBI). The data was analyzed in SPSS version 24 using a between-subjects design. A more detailed description of the methodology and investigational procedures used for this study can be found in Chapter 3.

Definition of Terms

Depression: A mood state that is characterized by feelings of sadness, pessimism, and despondency (APA, 2007). When this type of mood lasts for a period of 2 weeks or longer, is accompanied by a loss of interest or pleasure in most activities once pleasurable, a change in appetite, weight, and/or sleep pattern, decreased energy, difficulty thinking, making decisions, and/or concentrating, and/or thoughts of suicide, this is considered a major depressive episode (APA, 2000).

Intimate Partner Violence (IPV): Behavior that occurs in an intimate relationship that causes psychological, sexual, and/or physical harm. Behaviors can include psychological abuse, sexual coercion, controlling behaviors, and physical aggression (WHO, 2012a). Prolonged IPV is defined as remaining in a relationship where any form or severity of IPV occurs at least once a year for more than 1 year. The Revised Conflict Tactics Scales (Straus, Hamby, Boney-McCoy, & Sugarman, 1996) is commonly used in

the assessment of IPV. It measures relationship conflict over a 12-month period. It is common knowledge that many victims of IPV stay with their abusive partners for many years. There is no longitudinal data on the relationship between memory and IPV in adult victims. Therefore, this study investigated this relationship where IPV has occurred for more than 1 year. Severe IPV is defined as incurring or inflicting harm on a partner due to kicking, biting, hitting, attempting to hit with an object, beating up, choking, burning, forced sex, or threatening with or use of a knife or gun (McKinney, Caetano, Rodriguez, & Okoro, 2010).

Posttraumatic Stress Disorder (PTSD): A psychiatric disorder characterized by recurring memories and/or re-experiencing of a traumatic event in which the person's life was threatened with death or serious injury or the person witnessed an event where serious injury or death occurred or was threatened and this traumatic event was accompanied by feelings of intense fear, hopelessness, or horror. Other symptoms include avoidance of stimuli associated with the trauma, hyperarousal, significant impairment in a person's social or occupational functioning, and symptoms have occurred for over 1 month (APA, 2000).

Assumptions

This study assumed that female victims of IPV sustain greater physical injuries than male victims of IPV in heterosexual relationships because men are generally physically stronger than women. Therefore, the impact from any physical assault on a woman from a man would be greater than the impact incurred from a woman onto a man.

This study also assumed that female victims of IPV might endure physical abuse resulting in brain injury and/or psychological abuse resulting in depression and/or PTSD.

Scope and Delimitations

This study aimed to investigate the direct relationship between IPV and memory in adult female victims. The dependent variable (memory) was identified for investigation because the literature, reviewed in Chapter 2, shows an indirect relationship between the independent variable (IPV) and dependent variable. Adult female victims were identified as the research population because statistics from national and international government agencies reveal this population to be most at risk of becoming a victim of IPV. Adult male victims of IPV were not included as part of this investigation due to time constraints related to the nature of this study. Same-sex relationships were excluded from the scope of this study since females are more likely to be victimized and more likely to sustain greater injury from male intimate partners (Caldwell et al., 2012; WHO, 2012b). Minors were also not included in the scope of this research due to time constraints and the nature of this study.

Limitations

Data on IPV and memory function was collected in person. Participants may be reluctant to disclose details of the complete truth related to their intimate relationships and nature of abuse they endured due to the data collection method. Participants knew that their memory function was being tested, which can cause anxiety in some people, affecting test results. This author made a conscious effort to create a calm and welcoming test environment and informed participants that all of their information was confidential

and anonymous. Participants were identified by a unique alphanumeric code, which was not associated with any identifying personal information from the participant (i.e., last name, social security number, date of birth). Two self-report questionnaires were provided to subjects to assess for depressive (BDI-II) and posttraumatic stress symptoms (PCL-5). Although both questionnaires have good reliability and validity, self-report measures are inherently limiting by their very nature. This researcher informed subjects that they could ask for help or clarification when completing these self-report measures. This researcher also reviewed the subjects' responses for completion and clarification.

Participants were asked a series of questions about their intimate relationships over the past year to 5 years, including history of violence using the Conflict Tactics Scales-2 (CTS-2). The CTS-2's reliability and validity have been proven, however participants' recollection of abuse may have been exaggerated or minimized due to the very nature of encoding and storing memories. The CTS-2 was developed to assess violence in intimate relationships only over the past year, therefore the psychometric properties for adjusting the CTS-2 to assess violence in intimate relationships between the past 12 months to 5 years is unknown.

Memory was assessed using the Tests of Memory and Learning, 2nd edition (TOML-2). This standardized measure primarily assesses the examinee's short-term memory; however, it also measures an examinee's functions of attention, concentration, learning, and delayed recall. The TOML-2 generates an individual's verbal memory index, nonverbal memory index, composite memory index, verbal delayed recall index, learning index, attention and concentration index, sequential memory index, free recall

index, and associative recall index. This researcher administered all core and supplementary tests (excluding the two delayed recall tasks) to each participant in order to capture a picture of participants' memory functioning.

Significance of the Study

Past research has shown an association between trauma and cognitive and physiological dysfunction (D'Andrea & Pole, 2012; Pole, 2007). However, these studies did not examine the relationship between IPV and memory. Other studies have shown an indirect association between IPV and memory impairment by studying the emotional effects of IPV, such as PTSD and depression (see Diener et al., 2010; Parihar et al., 2011; Scott et al., 2015). In a comprehensive literature search in PsycARTICLES, Academic Search Complete, MEDLINE with full text, PsycARTICLES, and SocINDEX with full text within the past 10 years, five articles were found that examined the direct relationship between IPV and memory function. Three of the five articles examined the effect of IPV on children's memory while only two studies examined memory function in adult female IPV victims.

By examining the direct relationship between IPV and memory in adult female victims of IPV, not only will this study attempt to fill a gap in the literature on this subject, it will provide important information to emergency room staff on the need to assess for and treat victims of IPV. Instead of just looking for bruising and treating broken bones, the ER nurse and physician may need to perform a mental status exam (MSE), for example, to assess for possible memory impairment. Patients with MSEs showing possible impairments could be referred to a neuropsychologist for further

evaluation. Many victims of IPV are reluctant to reveal the abuse they are enduring; therefore, most victims will not voluntarily disclose the abuse to an ER nurse or physician (Hurley et al., 2005). Emergency room healthcare providers are usually the first line of healthcare sought by an IPV victim (Hurley et al., 2005). Therefore, it is vital that ER staff recognize the signs of intimate partner abuse and are well educated in how to treat these patients. This study can affect positive social change by helping to improve our understanding of the possible effects of IPV on memory, which could lead to changes in how healthcare providers assess and treat someone for IPV. It can also force law enforcement to take domestic disputes more seriously and may cause policymakers to strengthen laws on violence against women.

Summary

IPV is a national and global health problem. Women are at risk of sustaining greater physical injuries than men when involved in a violent intimate relationship due to the difference (on average) in physical strength between men and women. According to national and international government statistics, women are more likely than men to become victims of IPV (CDC, 2012; WHO, 2012b). Victims of IPV also sustain psychological injuries such as depression and PTSD. An indirect relationship between IPV and memory impairment has been noted in the literature. A between-subjects design was used to investigate the direct relationship between memory and IPV in adult female victims.

Chapter 2 reviews the current literature on mild traumatic brain injuries (mTBIs), depression, and PTSD associated with IPV as well as memory function associated with

each of these variables. Chapter 2 will describe the theoretical framework used to ground this study and summarize the search strategies used for this exhaustive literature review.

Chapter 2. Literature Review

Introduction

Violence against women is recognized as a major global public health issue by national and international government organizations. According to the Centers for Disease Control and Prevention (CDC; 2014) and the WHO (2013), 1 in 3 women, nationally and globally, has been a victim of violence by an intimate partner during her lifetime. In the opening letter of the WHO's 2014 *Global Status Report on Violence Prevention*, the director of the WHO, administrator of the United Nations Development Programme, and the executive director of the United Nations Office on Drugs and Crime urged healthcare providers to improve their services provided to victims of IPV, increase their role in the prevention of IPV, and improve their research efforts on this issue (WHO, 2014).

Recent research related to the impact on victim's health has largely focused on how emergency room and primary care physicians and nurses can improve their screening and treatment for victims of IPV (Efe & Taşkın, 2012; Gilbert, El-Bassel, Chang, Wu, & Roy, 2012; Iverson, Wells, Wiltsey-Stirman, Vaughn, & Gerber, 2013; Svavarsdottir, 2010). In a 2009 study of Lebanese women's attitudes toward the involvement of primary care physicians' screening and treatment of IPV, Usta, Antoun, Ambuel, and Khawaja (2012) found that most of the women surveyed would feel more comfortable talking with their doctor about their partner's abuse rather than a family member or neighbor. According to the women surveyed, confiding in a healthcare provider reduced the shame they feel and felt that their healthcare providers can not only

help them find support in the community and/or provide documentation for legal charges, but they can play a large role in educating women who may not even be aware that their relationship with their partner is not okay and that they do not have to suffer in silence. The women surveyed in Usta et al. made some interesting remarks related to their culture's view of women, which women on every continent, from every ethnicity, economic class, educational level, and age also experience.

> The society forces women to wear a mask…Culture and tradition forbid us from speaking…The way women are brought up, they are not allowed to raise their voice…She will be the talk of the town if she speaks. (Usta et al., 2012, p. 217)

It is important to note that the Lebanese women surveyed by Usta et al. (2012) highlighted the need for physicians to establish trust as a requirement for the healthcare system intervening on this issue. One woman provided an example of physicians' lack of awareness and/or assistance with this issue. She stated that her neighbor went to the hospital after the neighbor's brother had beaten her and the attending physician did not even ask her how she got her bruises, which was traumatizing for her since she felt unsafe. Women in Sweden also reported feeling unsafe and retraumatized when they sought help from their country's healthcare system. Twelve Swedish women residing in a women's shelter reported feeling powerless, lonely, devalued, betrayed, and hopeless when they reported their partner's abuse to healthcare providers, police, and social service workers. They felt that reporting the violence was pointless and did not lead to any help (Pratt-Eriksson, Bergbom, & Lyckhage, 2014).

Screening in emergency rooms is very important since victims of IPV are at a high risk for sustaining a TBI and symptoms of mTBI (e.g., headache, lightheadedness, fatigue, nausea, mood changes; NICHD, 2013; Ponsford et al., 2012) may go unnoticed or mistaken for another condition by both victims and physicians. In a study of almost 3500 women, Thompson et al. (2006) found that 30% of women, who reported being a victim of IPV, were physically assaulted by their partner. Face, head, and neck injuries are the most commonly reported types of injuries among IPV victims (Sheridan & Nash, 2007; Wong et al., 2014). Blunt force injury to the face or head, and strangulation of the neck can all result in TBI (Neto et al., 2014; Wong et al., 2014). TBI, even mild type, can cause significant sequelae, such as PTSD, depression, and cognitive dysfunction (Kwako et al., 2011; Pavawalla, Schmitter-Edgecombe, & Smith, 2012; Peskind et al., 2011). Victims of IPV are likely to develop PTSD and/or depression even in the absence of a TBI (Iverson et al., 2011; Johnson et al., 2011). Additionally, both PTSD and depression are strongly associated with memory impairment (Elgamal, Denburg, Marriott, & MacQueen, 2010; Moradi, Salimi, & Fathi-Ashtiani, 2011).

A review of the psychological and medical literature over the past decade yielded five studies that investigated the direct relationship between IPV and memory. Three studies looked at memory functioning in children and the other two studies looked at the effect on memory in adult female victims of IPV. This study examined the effect of IPV on memory in adult female victims and aimed to provide additional research on this global health issue with the goal of advancing awareness, treatment, and prevention of IPV.

This chapter begins with a summary of the search strategies used for this literature review followed by a discussion of the general systems theory, the theoretical framework used for this study. An exhaustive literature review of key variables was performed and a summary of this literature is presented.

Literature Search Strategy

The following databases were used to complete a thorough review of recent and past literature that focused on the key variables of this study: PsycINFO, Academic Search Complete, MEDLINE with full text, PsycARTICLES, and SocINDEX with full text. EBSCOhost was used to access these databases. Google Scholar was also used to locate specific articles within Walden University's electronic library database system. The following key terms were searched under the "SU Subjects" field in the above list of databases: *IPV, intimate partner violence, domestic violence, battered women, memory, hippocampus, amygdala, stress, chronic stress, brain injury, traumatic brain injury, TBI, PTSD,* and *depression.* The following key term was searched under the "AB Abstracts" field within the PsycARTICLES database: *general systems theory*. The following key term combination was searched under the "SU Subjects" field within the PsycARTICLES database: *general systems theory OR biopsychosocial model*. A more detailed list of search term combinations is provided in the Appendix. Only scholarly peer reviewed journals and academic journals published from January 1, 2005 to December 31, 2015 were included in this literature review.

Theoretical Framework: General Systems Theory

The research question under investigation is based on the general systems theory, described by Ludwig von Bertalanffy. General systems theory states that "an event or phenomenon should be viewed holistically as a set of elements interacting with one another (i.e., as a system)" (APA, 2007, p. 404). Each element in a system influences the role of other elements in the system, whereby all elements in a system interact with each other producing order (APA, 2007). Bertalanffy suggested that the organization of its subparts is what makes all living things unique. Therefore, it is not enough to simply study the subparts of an organism, one must look at all aspects of an organism, including the organization of its subparts (Bertalanffy, 1972). The general systems theory is based on the principles and laws that govern mathematical disciplines, such as chemistry and physics. Bertalanffy (1950) took these mathematically based principles and laws and argued that they could be applied to all scientific disciplines that dealt with systems.

Previous Applications of the General Systems Theory

Use of the general systems theory in early research on family violence was used as a framework for causation. Straus (1973) was the first to suggest that interpersonal violence was rooted in an imbalance in the family system. He proposed that violence within the nuclear family was simply an element within this system and fluctuated just as other elements within any system fluctuate. When a husband loses his job, for example, and is struggling to find a new job, he may react with violence out of frustration. But under normal circumstances, when the husband is not under distress, he does not react with violence when frustrated. Gelles and Maynard (1987) presented a case study of a

family where violence was perpetrated by the husband toward his wife and children. The 16-year-old son was brought to therapy because he began hitting his mother. Gelles and Maynard demonstrated the use of a systems approach in family therapy with this case study rather than separating the victims and perpetrators in this family, as is often the case (e.g., perpetrators receive individual anger management therapy and victims are given resources and education about how to remain safe).

Researchers more recently have used the general systems theory to develop statistical models that help explain married couples' functioning and prediction of marriage success, which measures divorce rate and marital satisfaction (Gottman, Swanson, & Swanson, 2002). Other researchers studying trauma and stress used the general systems theory to propose a new model of mental health care (Xenakis, 2014) and evaluate the physiological changes associated with trauma-induced stress (Stein, Kennedy, & Twamley, 2002).

Xenakis (2014) proposed a more integrated approach to the evaluation and treatment of mental health clients suffering from PTSD and/or other sequelae of stress and war. Xenakis urged other mental health care providers to work with medical providers in evaluating and treating their client's physical health along with treating their psychological symptoms. His model is based on the numerous clients he has treated in his private practice and war detainees he has interviewed as a human rights advocate. Many of his patients had undiagnosed mTBI or chronic post-concussion syndrome as well as undiagnosed thyroid, hormonal, and/or adrenal conditions.

Stein et al. (2002) examined the cognitive functioning of 39 female IPV victims and 22 non-victimized females. Of the 39 victims, 17 had current PTSD symptoms and 22 reported no lifetime history of PTSD. Their study found a small statistically significant difference between IPV victims and control subjects on their working memory, visuoconstruction, and executive functioning measures. Overall, all of the IPV victims, regardless of PTSD status, performed worse on tests that measured sustained attention, working memory, and response inhibition compared to control subjects. IPV victims with current PTSD symptoms also performed worse on a set-shifting task, which is a measure of executive functioning, compared to controls. Stein et al. did not find any significant difference between IPV victims and controls on verbal learning and memory tests.

Rationale

The general systems theory is used to explain the biopsychosocial model or system of mental health. In the biopsychosocial model, mental health professionals assess the impact of biological, psychological, and social factors (elements) on an individuals' mental health (system; APA, 2007). A biopsychosocial approach is used as the framework for this quasi-experimental study.

This study is expected to build upon the general systems theory by showing how an external, stress provoking event (IPV) alters our cognitive functioning (memory impairment) due to an imbalance in our biochemistry and/or damage to brain tissue. The physiological stress response in humans begins with a signal being sent to the amygdala, which will trigger a signal to be sent to the hypothalamus when the initial signal sent to

the amygdala is interpreted as dangerous. When this danger signal is received by the hypothalamus, an autonomic response from the adrenal glands is triggered, leading to the release of epinephrine and glucose. Chronic or prolonged stress causes the hypothalamus to release corticotrophin-releasing hormone (CRH), which causes the pituitary gland to release adrenocorticotropic hormone (ACTH). ACTH travels to the adrenal gland triggering the release of cortisol (Harvard Health Publications, 2011).

High levels of cortisol in the body have been shown to have damaging effects on the hippocampus. Studies have shown that increased levels of cortisol are associated with atrophy of the hippocampus (Castilla-Ortega et al., 2011) and negatively affects long-term potentiation (LTP; i.e., learning and memory) in the hippocampus (Calabrese et al., 2012). The hippocampus is a major structure of the limbic system involved in learning and spatial memory. It contains many corticosterone receptors, namely mineralocorticoid receptors (MRs) and glucocorticoid receptors (GRs). *In vivo* studies have presented further evidence of the link between stress and memory impairment by discovering how different parts of the hippocampus respond to a rise in cortisol.

Dorey, Piérard, Chauveau, David, and Béracochéa (2012) found that when 6-month-old male mice were subjected to electric footshocks (acute stressors), cortisol levels rose within the dorsal hippocampus (DH) first then spiked within the ventral hippocampus (VH) 105 mins after the stressful event. Specifically, Dorey et al. discovered that MRs were initially activated in the DH following the rise in cortisol levels but then GRs were activated in the DH and subsequently the VH when concentrations of cortisol exceeded a certain concentration. They also found that the

increased levels of cortisol were associated with impairments in completing a spatial task, which was previously learned. This study supports Maggio and Segal's (2007) research findings that showed a correlation between increased corticosterone concentrations and enhanced LTP in the VH and a reduction in LTP in the DH. The DH primarily processes cognitive memories while the VH primarily processes emotional memories (Maggio & Segal, 2012). Therefore, Maggio and Segal (2012) theorize that as a result of the enhancement and inhibition of LTP in the VH and DH, respectively, a stressful event will suppress the transmission of cognitive information sent to cortical structures and increase the transmission of emotional information sent to the amygdala. A BOLD (blood oxygenation level-dependent) fMRI study performed on women with a history of IPV and PTSD showed increased activity in the amygdala compared to control subjects during an emotional face-matching task (Fonzo et al., 2010). These results support Maggio and Segal's (2012) theory of enhanced transmission of emotional information to the amygdala.

The general systems theory states that all elements of a system function together to produce order (APA, 2007). In biology, the law of homeostasis states that an animal's body strives to maintain an internal biochemical balance, thus allowing it to live in extreme types of environments. When a biochemical change occurs in one part of the animal, other parts of the animal's body will also change to compensate for this change (Randall, Burggren, & French, 1997). When a human's internal temperature increases for example, the body will sweat. Sweating is the human body's natural mechanism for cooling the body down, thus maintaining a balanced internal temperature. In psychology,

the general systems theory is combined with the law of homeostasis under the framework of the biopsychosocial model. When external events in our life increase our stress level, our internal environment changes – our biochemical makeup changes. Our body responds to this external stress by altering our mood, cognition, and/or physical health. Early studies on IPV used the general systems theory to understand why IPV occurs within committed relationships. This study used the general systems theory to understand the effects of IPV on victims. Specifically, this study provides additional information on the effects of IPV related stress on memory in adult female victims.

Literature Review

IPV and TBI

In 2013, the WHO released a new report on the prevalence and health effects of IPV and nonpartner sexual violence against women around the world. They surveyed women and female adolescents on every continent, in every economic class, ranging in age from 15 to 69 years. They found that, on average, 26% of women worldwide experienced some form of violence by their partner. The most vulnerable age group was women 35 to 44 years, where 1 in every 3 women has experienced physical and/or sexual violence by a partner (WHO, 2013).

The most reported area of injury, with a frequency of 50–80%, is the head, neck, and face (Sheridan & Nash, 2007). One study found that 92% of the women surveyed had been hit in the head or face by their partner at least once during their lifetime, 91% had been hit in the head within the past year, 2-5 times, and 88% had been hit in the head by their partner within the past 5 years, 2-5 times (Jackson, Philip, Nuttal, & Diller, 2002).

Jackson et al. also found that 40% of the women surveyed reported a loss of consciousness at least once and 77% reported post-concussive syndrome symptoms (e.g., dizziness, nausea, confused, feeling "out of it") following the assault. In a recent study conducted in China, Wong et al. (2014) set out to examine the patterns of head, neck, and face (HNF) injuries in Chinese women admitted to the emergency departments of two regional hospitals in Hong Kong. During a two-year period (01/2010 to 12/2011), they found that 78% of abused women admitted to the emergency department suffered an injury within the HNF area. The most common etiology was by a punch with a fist (60%), followed by slapping (18%), then pushing, shoving, or grabbing (15%). In approximately 7% of the cases reviewed, the woman was choked. Additional earlier studies indicated that approximately one-half to two-thirds of IPV victims' perpetrators attempted to strangle them (Sutherland, Bybee & Sullivan, 2002; Wilbur et al., 2001). Wong et al. (2014) found that the back part of the head was the most frequently affected region with a high percentage of hematomas in the parietal and occipital regions of the brain.

In a survey of 53 women who have been victims of partner violence, 92% reported that they were hit in the head or face by their partner. Of these women, the majority reported being hit in the head or face multiple times within the past year and almost half of these women reported losing consciousness at least once (Jackson et al., 2002). Valera and Berenbaum (2003) found that approximately three-quarters of the 99 women they questioned sustained at least one mild brain injury due to their partner's abuse, approximately half sustained multiple mild brain injuries at the hands of their

partner, and almost one-third of the women surveyed sustained at least one brain injury as a result of their partner choking them.

Victims of IPV who are abused physically are at a high risk for sustaining brain injuries that affect their overall functioning due to the compounding effects of multiple brain injuries (Amen, 2005). According to the American Psychiatric Association (2013), multiple concussions, even if mild, can lead to a persistent decline in cognitive function. The American Congress of Rehabilitation Medicine (ACRM; 1993) concur and add that a mTBI can result in persistent emotional and physical symptoms, in addition to persistent cognitive symptoms, such as problems with attention, memory, or executive function, leading to functional disability. Some researchers are now arguing that the cognitive symptoms reported by battered women are similar to those reported by professional athletes who have sustained multiple head injuries such as, boxers, soccer, and football players (Jackson et al., 2002).

IPV related TBI and memory dysfunction. There is very little research on the cognitive effects of IPV related TBI. Most of the research that has been done includes self-reported symptoms by the victims, which are commonly reported symptoms by individuals with verified brain injuries. Some of the common symptoms victims of partner violence have reported include: headaches, dizziness, problems concentrating and remembering, and trouble sleeping (Corrigan, Wolfe, Mysiw, Jackson, & Bogner, 2003; Valera & Berenbaum, 2003). In a pilot study by researchers at Columbia University, New York University Medical Center, and Boston College, 45% of female victims of partner violence reported that they have trouble paying attention more than once a day and 32%

reported that they have trouble remembering things more than once a day (Jackson et al., 2002). In one of the few studies found that used objective measures to evaluate cognitive functioning in victims of partner violence, Valera and Berenbaum (2003) found a negative correlation between the severity of brain injury and cognitive functioning, including memory and learning. However, they did not report the specific neuropsychological results, they only made comparisons between cognitive functioning and the severity of brain injury and abuse. Therefore, it is not known from this study how female victims of partner violence actually performed on tests of memory and learning. Valera and Berenbaum used the following standardized tests: Digit Span Test – a subtest of the Revised Wechsler Adult Intelligence Scale was used to measure short-term memory and The California Verbal Learning Test (CVLT) was used to measure verbal learning and memory. The authors chose the above tests along with the Trail Making Test, Parts A & B and The Ruff Figural Fluency Test for their documented reliability and validity and for the estimated completion time. The authors stated that they did not want to choose a battery of tests that would be "too time consuming or too taxing for the women being tested" (p.798).

The head, neck, and face are the most commonly injured areas on victims of IPV (Sheridan & Nash, 2007; Wong et al., 2014; WHO, 2013). These injuries can cause a mTBI (Wong et al., 2014). Symptoms of a mTBI can often be dismissed by victims or misdiagnosed by physicians (Cassidy et al., 2004). Standard brain imaging techniques often appear normal (ACRM, 1993). Some symptoms of a mTBI include: headaches,

nausea, fatigue, dizziness, trouble sleeping, sensitivity to light or sound, problems concentrating or remembering, and changes in mood (ACRM, 1993; Mayo Clinic, 2014).

The American Psychiatric Association (2013) states that multiple concussions, even mild concussions, can cause significant cognitive deficits. Of women 35 to 44 years of age worldwide, 1 out of every 3 women will sustain a physical injury by an intimate partner and of females 15 to 69 years of age worldwide, 1 out of every 4 will sustain a physical injury by an intimate partner (WHO, 2013). On average, it takes a women seven times before she leaves her abusive partner for good (The National Domestic Violence Hotline, 2013). In more than half of reported incidents of IPV, the majority of victims have sustained multiple injuries throughout the duration of their relationship (Sheridan & Nash, 2007). With 50 to 80% of victims sustaining an injury to their head, neck, or face (Sheridan & Nash, 2007), and in more than half of reported incidents of IPV the perpetrator has attempted to strangle the victim (Sheridan & Nash, 2007; Sutherland et al., 2002; Wilbur et al., 2001), the probability is high that victims of IPV have sustained multiple mTBIs.

IPV and PTSD

In addition to the risk for brain injuries, victims of IPV are at risk for developing PTSD (Iverson et al., 2011; Iverson, Litwack et al., 2013; Kelly, 2010; Norwood & Murphy, 2012; Sullivan, Cavanaugh, Buckner, & Edmondson, 2009). In a study conducted between 2003 and 2005 in South India at the National Institute of Mental Health and Neurosciences, Chandra et al. (2009) surveyed 105 women and found that 56% reported a history of IPV. Of these 59 women, 12% met criteria for PTSD. In a

survey of 33 Hispanic women living in the northeastern U.S., currently experiencing IPV, 70% met criteria for PTSD (Kelly, 2010). The low prevalence of PTSD among IPV victims surveyed in Chandra et al. could be a result of their inclusion criteria. Chandra et al. did not assess the frequency, duration, or length of time since the last IPV incident. They only asked subjects about their lifetime history of IPV, so a woman who experienced one incident of physical, emotional, or sexual abuse 15 years ago would have been included in this data, whereas Kelly (2010) surveyed women currently experiencing IPV. In comparison to women with no history of IPV, Chandra et al. found that all of the women with a history of IPV scored higher on the Post-Traumatic Symptom Checklist (PCL). Chandra et al. also found a direct positive correlation between the severity of physical and emotional abuse and the severity of PTSD symptoms after controlling for depression.

In a 2006 longitudinal study, conducted by Georgetown University Medical Center scientists, 405 women with a history of IPV exposure were recruited from multiple programs that focused on providing IPV related services to victims (e.g., DV shelter for women, DV criminal and protection order courts). All participants had been exposed to violence by their partners within the year prior to the start of this study, with 68% reporting a violent incident within the month prior to baseline questioning. History and severity of violence by an intimate partner, childhood abuse, and PTSD symptoms were measured. Approximately 30% of the women reported PTSD symptoms at the end of the data collection period, regardless of the frequency of abuse exposed to during the data collection year. Women who were re-abused during the study year reported slightly

more hyperarousal, numbing, and re-experiencing symptoms, with statistically significant differences found for symptoms of numbing and hyperarousal between the two groups of women (i.e., not re-abused, re-abused) (Krause, Kaltman, Goodman, & Dutton, 2006).

IPV related PTSD and memory dysfunction. Most of the literature on PTSD and memory focused on subjects' explicit and implicit memory rather than learning or memory consolidation dysfunction. Only three articles (Minshew & D'Andrea, 2015; Stein et al., 2002; Twamley et al., 2009) were found in a review of the literature from five databases (PsycINFO, Academic Search Complete, MEDLINE with full text, PsycARTICLES, and SocINDEX with full text) that examined memory in IPV victims with PTSD. Minshew and D'Andrea (2015) assessed implicit and explicit memory in adult female victims of IPV. Stein et al. (2002) and Twamley et al. (2009) both examined the neuropsychological functioning of adult female victims of IPV.

In a mixed sample of treatment seeking and community based female victims of IPV, Stein et al. (2002) found a statistically significant difference in working memory, visuoconstruction, and executive functioning tasks (auditory attention, response inhibition) between IPV victims and non-victimized control participants, regardless of the presence of PTSD. In victims with PTSD, only an executive function task, set-shifting, was found to be statistically significantly different from control subjects. In a community based sample of women from southern California, Twamley et al. (2009) found that 17% of women who reported IPV within the past 5 years and who also currently met criteria for full or partial PTSD, performed less than 1.5 *SD* below the norm on a measure of visual memory. Additionally, they found that 13% of women who reported experiencing

IPV within the past 5 years and met criteria for PTSD fell within the impaired range (<1.5 *SD* below the mean) on a measure of visuoconstruction and 17% fell within the impaired range on a measure of reasoning. In comparison to controls, Twamley et al. found a direct negative correlation between the severity of PTSD symptoms and processing speed as well as a direct negative correlation between the severity of dissociative symptoms and reasoning performance when controlled for depression. Twamley et al. excluded measures of verbal learning and memory due to their previous (non-cited) findings, stating that they found no significant difference in verbal learning and memory between women with IPV related PTSD and control subjects.

PTSD and memory dysfunction. Although there are a limited number of studies examining the relationship between PTSD and memory performance in IPV victims, the majority of the research on PTSD and memory performance in other trauma victims supports the above memory dysfunction findings in IPV victims (see Koessler et al., 2010; Larson et al., 2013; Thomaes et al., 2013; Verfaellie, Lafleche, Spiro III, & Bousquet, 2014). Researchers from the VA healthcare systems in Philadelphia and Connecticut, and researchers from San Diego State University, Yale University, and Yale-New Haven Hospital performed a quantitative meta-analysis of the neurocognitive functioning in individuals with PTSD (Scott et al., 2015). Of the 60 studies they reviewed, which included a total of 4,108 participants, of which 1,779 participants had PTSD, participants with PTSD performed significantly worse on measures of verbal learning, processing speed, attention/working memory, and verbal memory compared to non-traumatized control subjects. The largest difference in mean scores between non-

traumatized subjects and subjects with PTSD was found on measures of verbal learning (d = -.62) followed by processing speed (d = -.59), attention/working memory (d = -.50), and verbal memory (d = -.46).

Moradi et al. (2011) found memory impairments in Iranian veterans with PTSD. They based their research on previous studies that suggested that memory deficits associated with PTSD are a result of the anxiety associated with PTSD (see Kesebir, Luszczynska, Pyszczynski, & Benight, 2011). However, Carlozzi, Reese-Melancon, and Thomas (2011) argue that memory impairment in individuals with PTSD is largely subjective and when tested objectively, no significant difference in memory is found compared to controls. Carlozzi et al. suggest that the depression associated with PTSD mediates the (subjective) memory deficits associated with PTSD.

Diener et al. (2010) evaluated verbal declarative memory in adults with PTSD and compared them to traumatized adults without PTSD and a control group of non-traumatized adults. They used the CVLT to measure participants' verbal declarative memory and found a significant reduction in performance in participants with PTSD compared to traumatized participants without PTSD as well as the non-traumatized control group. They also found a relationship between verbal memory performance and hyperarousal symptoms in the PTSD group, which the authors suggest may be a reason for unsuccessful memory formation in individuals with PTSD and thus propose that individuals with PTSD have trouble learning, not necessarily with memory consolidation.

Victims of IPV are exposed to multiple forms of abuse multiple times in their relationship. Due to the duration of abuse, victims suffer from chronic stress and chronic

posttraumatic stress symptoms. The severity of physical, sexual, and/or psychological abuse by an intimate partner is positively correlated with the severity of PTSD symptoms (Kuijpers, van der Knaap, Winkel, Pemberton, & Baldry, 2011; Sullivan et al., 2009). The symptoms are the most severe when a victim is currently experiencing abuse from a partner (Kelly, 2010; Scott et al., 2015). Statistically, victims of IPV perform significantly worse on tests of memory and executive functioning compared to controls (Stein et al., 2002). The extent and range of memory problems of victims of IPV with PTSD is unclear since only two studies were found examining these variables. However, other trauma survivors with PTSD have been found to perform significantly worse on tests of verbal learning, verbal memory, and working memory (Scott et al., 2015).

IPV and Depression

In addition to PTSD and mTBI, victims of IPV commonly suffer from severe depressive symptoms (Blasco-Ros, Sánchez-Lorente, & Martinez, 2010; Cavanaugh, Messing, Del-Colle, O'Sullivan, & Campbell, 2011; Cengiz Özyurt, & Deveci, 2011; Hirth & Berenson, 2012; Johnson et al., 2014). Johnson et al. (2014) investigated the relationship between IPV and depressive symptoms in adult and adolescent female victims. They found a significant positive correlation between depressive symptoms and IPV exposure, with no significant difference between age groups.

Blasco-Ros et al. (2010) performed a longitudinal study on the course of depressive, anxious, and PTSD symptoms and suicidal behavior in adult female victims of IPV over a 3-year period. Blasco-Ros et al. recruited 91 women in Spain, 33 reported experiencing physical and psychological abuse by their male partner, 23 reported

experiencing psychological abuse only by their male partner, and 35 subjects were included in a matched control group. In the first group of women, women who reported experiencing both physical and psychological abuse at the start of the study, 73% were no longer enduring physical abuse by their male partners at the 3-year follow-up interview. The authors reported that 52% of the original 33 women reported experiencing psychological abuse only, however. This group of women reported a significant decrease in depressive, anxious, and PTSD symptoms upon follow-up 3 years later. In the second group of women, those who reported only experiencing psychological abuse at the start of the study, only 17% reported that their partners were no longer abusing them psychologically at the 3 year follow-up interview. The majority (83%) reported that they were still experiencing psychological abuse. While there may have been a statistically significant reduction in the severity of depressive symptoms in both groups of abused women over the course of this 3 year study, the data shows that both groups actually continued to report depressive symptoms that fell within the mild to moderate range on the Beck Depression Inventory at both times of test administration. Therefore, no change in depressive symptoms was actually reported, which correlates with the presence of abuse, be it psychological or psychological and physical at the 3-year follow-up interview.

Cavanaugh et al. (2011) compared the frequency of suicidal threats and attempts in 662 adult female victims of IPV receiving IPV services in a major city on the east coast of the United States. Subjects included women from a diverse ethnic, racial, economic, and educational background. The mean age of women included in this study

was 31 years of age. Almost half of the women were employed either full-time, part-time, or seasonally. Approximately half of the women were of Latin decent, 28% identified as African-American, 11% identified as Caucasian, and 9% identified as Other. The majority of women (86%) had children under the age of 18 years living in their home. Of the women surveyed, 1 in 5 reported that they had threatened or attempted to commit suicide during her lifetime. Cavanaugh et al. used the Danger Assessment (DA) risk assessment instrument for intimate partner femicide to assess the category of risk in all subjects. They found that women who fell within the "high danger" category on the DA were almost 3 times as likely to threaten or attempt suicide compared to women who fell within the "variable danger" category. Women who fell within the "extreme danger" category were almost four times as likely to threaten or attempt suicide compared to women who fell within the "variable danger" category.

Sato-DiLorenzo and Sharps (2007) also used the DA to examine the relationship between the severity or dangerousness of intimate partner relationships and victims' mental health and health behavior problems. Sato-DiLorenzo and Sharps recruited 177 women from a domestic violence shelter in a major city on the east coast of the United States. The majority (77%) of women identified as African-American, 11% identified as Caucasian, 3% identified as Latin, and 4% identified as Other. The mean age of women who participated in this study was 33 years and the majority of women (84%) had children with a mean age of 2 years. Sato-DiLorenzo and Sharps found that higher DA scores were associated with mental health symptoms such as, anxiety ($p = 0.0024$),

depression ($p = 0.017$), problems concentrating ($p = 0.001$), memory loss ($p = 0.008$), and suicidal attempts ($p = 0.013$).

Depression and memory dysfunction. Memory impairment is a common symptom associated with depression. It is believed that our attention and interpretation are influenced by our emotional state, which will influence what and how well we remember. Everaert et al. (2014) examined the relationship between these biases in attention and interpretation on memory among depressed individuals and a path analysis verified the theory that the orientation of a person's attention influences their interpretation bias, which then influences their memory bias. Halvorsen et al. (2012) compared the executive functioning, working memory, attention, and psychomotor speed between currently depressed individuals, previously depressed individuals, and a control group of individuals who reported no lifetime history of depression. Halvorsen et al. also verified previous studies that showed a correlation between depression and memory deficits. The currently depressed group performed significantly worse than the recovered depressed group and controls on tests of working memory. Both depression groups (currently and recovered) performed worse on tests of processing speed compared to the control group. Their findings reveal that individuals who have ever been diagnosed with mild to moderate depression will have some mild cognitive impairment during the course of their depression.

Hammar, Isaksen, Schmid, Årdal, and Strand (2011) assessed verbal and visual memory in individuals with major depressive disorder. Hammar et al. recruited 48 subjects, 24 patients from the Haukelan University Hospital in Bergen, Norway with a

diagnosis of recurrent major depressive disorder (MDD) and 24 control subjects. Patients were excluded if they ever had a history of brain damage, psychotic episodes, or substance or alcohol abuse. The patient group included 18 females and 6 males. The control group included 17 females and 7 males and were recruited from friends and family of employees of the University of Bergen and Haukeland University Hospital. The mean age of participants was 38 years and 37 years for the patient and control groups, respectively. Hammar et al. used the California Verbal Learning Test, 2nd edition (CVLT-II) and the Rey Complex Figure Test (RCFT) to measure the participant's verbal and visual memory, respectively. Hammar et al. found that participants with recurrent MDD performed significantly worse on the immediate free recall subtest of the CVLT-II compared to the control group and performed significantly worse on the delayed recall and recognition subtests of the RCFT compared to controls. However, participants with recurrent MDD performed just as well as control subjects on subsequent verbal memory subtests of the CVLT-II (e.g., level of learning, short delay free recall, short delay cued recall, long delay free recall, long delay cued recall, recognition total hits).

Exposure to unpredictable chronic stress, such as that experienced by victims of IPV, has been found to negatively affect the hippocampus, specifically its generation of neurons (Liu et al., 2008; Parihar et al., 2011). Reduced hippocampal neurogenesis has been associated with depressive and anxious symptoms and decline in memory (Li et al., 2008; Liu et al., 2008; Montaron et al., 2006). A group of scientists in China investigated the effect of chronic mild stress on the hippocampus (Wu et al., 2014). Specifically, Wu et al. studied how chronic mild stress affects the left and right sides of the hippocampus

and subsequently affects learning and memory. Wu et al. found that rats in the chronic mild stress group displaying symptoms indicative of depression, had a reduced performance on a learning and memory test compared to the control group and found a significant change in the density and function of the left hippocampus. Wu et al. theorize that the asymmetrical damage found in the hippocampus of rats, which were put through a series of stressors considered equivalent to a human with chronic mild stress, contributes to the deficits observed in learning and memory in the rats.

Summary

Female victims of IPV typically endure years of psychological, physical, and/or sexual abuse. It typically takes a woman seven attempts before she leaves her abusive partner for good (The National Domestic Violence Hotline, 2013). One in three women, worldwide, between the ages of 35 to 44 years will experience physical or sexual abuse by her partner (WHO, 2013). One in four women, 15 to 69 years, worldwide, will be physically or sexually abused by her partner in her lifetime (WHO, 2013). Male perpetrators of IPV commonly hit their partner's head and face (Jackson et al., 2002; Sheridan & Nash, 2007) and frequently attempt to strangle their female partners (Sutherland et al., 2002; Wilbur et al., 2001). Research is beginning to show the prevalence and severity of injuries inflicted on women by their male partners. Some researchers equate these injuries to those sustained by professional athletes, such as boxers, soccer, and football players (Jackson et al., 2002).

Female victims of IPV are at a high risk for sustaining a mTBI (Wong et al., 2014), which can lead to significant cognitive impairments (APA, 2013), in part because

symptoms may be initially undetectable or dismissed by both victims and physicians (ACRM, 1993; Cassidy et al., 2004). Female victims of IPV often suffer from depression and PTSD. The chronic stress victims of IPV endure causes physiological changes in their endocrine system, which leads to changes in the structure and functioning of their hippocampus and thus memory.

Although there has been more focus on IPV in the media and within the academic community over the past 5 years, only a limited number of articles have focused on the neurocognitive effects of IPV in victims. This literature review highlighted the need for research on the neurocognitive effects of IPV; in particular the affect IPV has on memory function in victims. Chapter 3 describes the methodology and research design for this study. Chapter 3 also includes a description of all measures used to collect the data as well as the statistical approach used for analysis.

Chapter 3: Research Design

Introduction

The purpose of this quantitative study was to describe the relationship between IPV and memory function in adult female victims. This chapter describes the research design and rationale, methodology (including data analysis procedures), and a description of the ethical procedures and validity of the test measures and research design.

Research Design and Rationale

This study measured memory function in adult female victims of IPV and compared their performance to a non-victimized group. Both victimized and non-victimized subjects were assessed for depressive and posttraumatic stress symptoms as well as evaluated for any history of mTBI. This quasi-experimental study used a between-subjects design. Previous studies investigating neuropsychological functioning in adult female victims of IPV used a similar research design (see Stein et al., 2002; Twamley et al., 2009).

Methodology

Population

According to the WHO (2013) and CDC (2014), 1 in 3 women, nationally and globally, has been a victim of violence by an intimate partner during her lifetime. The most vulnerable age group according to the WHO (2013) is women 35 to 44 years. In 2015, 38,163 (92%) women and 2,741 (7%) men sought services for domestic violence in their respective communities in the state of Nevada (NNADV, 2015). Clark County made up nearly 71% of the total reported cases of domestic violence in the state of Nevada in

2015. Las Vegas is the most populated city in Clark County, making up nearly 97% of the 2,147,641 residents of Clark County, NV (Clark County, 2015).

Sampling Procedures

Participants were recruited from the city of Las Vegas, NV using a brochure advertising recruitment for a study on memory in females 18 to 59 years of age with up to $50.00 compensation for time and travel to those who qualify. The brochure included a URL address for interested participants to begin the screening process. Brochures were distributed randomly at local supermarkets, pharmacies, libraries, urgent care clinics, and in the teacher's lounge of a local high school. Brochures were also made available to those seeking treatment at a local domestic violence organization and medium-sized community mental health clinic.

Participants for this study included women 18 to 59 years of age with a history of exposure to violence by an intimate partner within the past 5 years. The comparison group included women 18 to 59 years of age without a lifetime history of exposure to violence by an intimate partner. Participants were fluent in the English language and had at least an eighth grade reading ability. Participants were excluded from this study if they were: 1) currently abusing alcohol or another substance, 2) abused alcohol or another substance for a period of 5 years or more, 3) and were initially excluded if they had any of the following diagnoses: bipolar disorder, schizophrenia, attention-deficit/ hyperactivity disorder (ADHD), learning disability, or neurological illness. Changes in exclusion criteria were made during the recruitment process and are noted in Chapter 4.

The preliminary screener was created from surveymonkey.com. Preliminary questioning focused on inclusion and exclusionary criteria. Participants were asked to read and electronically sign a consent form at the start of this online questionnaire. Participants who met study criteria were given a phone number to call to schedule an appointment for additional study-related data collection. This researcher established a U.S. number for participants to call through Google Voice, and this number was used solely for the purposes of this study. This phone number was disconnected at the end of the data collection period.

Preliminary data collected through SurveyMonkey's web-based survey programming was stored by surveymonkey.com until 90 days following deletion of survey questions and responses, per the website's privacy policy. Individual response data was accessed by this researcher using this web-based survey tool and manually entered into a Microsoft Excel spreadsheet for qualifying participants. Qualifying participants were asked to create an eight digit alphanumeric identifier at the end of the survey, which allowed this researcher to begin data collection on qualifying participants. Surveymonkey.com has SSL encryption capability and an anonymity option, both of which were used in this data collection process. Participants were not asked to enter any personal identifying information (e.g., name, date of birth, social security number). This survey tool was used in place of phone screening due to time and personal constraints.

Participants asked to follow up for additional testing following the online preliminary questioning met with this researcher at a local community mental health clinic in Las Vegas, NV. Participants were provided with another consent form along

with the following questionnaires to complete at the start of the follow-up testing session: demographic questionnaire, including exclusionary criteria; Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) to assess depressive symptoms and severity; and PTSD Checklist for DSM-5 (PCL-5) with Life Events Checklist for DSM-5 (LEC-5) and extended Criterion A assessment (Weathers et al., 2013) to assess posttraumatic stress symptoms and severity. The following demographic information was collected during the follow-up testing session: age, race, ethnicity, sexual orientation, educational level, socioeconomic status, marital status, and employment status.

This researcher then asked participants about their exposure to IPV over the past year and past 5 years using the CTS-2 (Straus, Hamby, & Warren, 2003). The question, "How often did this happen in the past year?" on the CTS-2 was altered to "How often did this happen in the past 5 years?" in order to assess participant's exposure to IPV over the past 5 years.

This researcher then asked each participant a series of questions about head trauma in order to assess for possible history of mTBI. Questions were taken directly from Valera and Berenbaum (2003), who assessed for mTBI in adult female victims of IPV. Valera and Berenbaum used the Mild Traumatic Brain Injury Committee of the American Congress of Rehabilitation Medicine's definition for brain injuries and based their semi-structured interview questions off of this definition. This researcher asked the following questions to assess for mTBI in study participants, which was taken directly from Valera and Berenbaum (2003, p. 798): "(Have you) ever experienced a period of dizziness, felt stunned or disoriented, seen stars or spots, had a loss of consciousness

(LOC) or blacked out, or had memory loss surrounding a particular incident (posttraumatic amnesia, PTA)?" For participants who answered yes to any of these alterations in consciousness (AIC), this researcher asked follow-up questions to assess the causes. Specifically, participants were asked if any of their AIC occurred following something their partner did to them and if so, what their partner did (e.g., head hitting an object, being violently shaken, being choked)? Participants were also asked about the duration of their LOC and/or PTA if applicable. According to the ACRM Committee on Mild Traumatic Brain Injury (1993), a LOC 30 mins or less or PTA 24 hrs or less falls within the category of a mTBI. Any LOC greater than 30 mins or PTA greater than 24 hrs is considered to be a moderate to severe TBI. Participants were asked about the frequency and duration of IPV related mTBI. Specifically, participants were asked when the first and last incident of AIC occurred as well as the total number of AIC due to something their partner did. Participants were also asked if their partner ever choked them and if they ever had an AIC as a result of the choking. This information was collected to determine if a participant sustained a hypoxic or anoxic insult to their brain. Participants who reported sustaining an AIC due to a partner choking them are considered to have sustained a hypoxic or anoxic insult to the brain (Valera & Berenbaum, 2003).

Participants were then asked to complete the core battery and supplementary subtests of the TOMAL-2 (Reynolds & Voress, 2007). The two supplemental subtests on delayed recall were excluded. This researcher administered all core and supplementary subtests in a private office, free from distractions. Upon completion of the TOMAL-2, participants received a written description of the purpose of this study with a list of local

domestic violence and mental health resources and received a $50.00 Visa card as compensation for time and travel.

Using the one-way, between-subjects ANOVA table to estimate sample size in Jaccard and Becker (2002), with 2 degrees of freedom, an alpha level of .05, power level equal to .90, and eta^2 equal to .10, the sample size per group recommendation is 39. Therefore, this researcher planned to recruit at least 39 adult females with a history of current or past exposure to IPV and at least 39 adult females with no history of IPV exposure. Due to time limitations, this researcher was only able to recruit a total of 23 participants, seven with no history of IPV in the past 5 years and 16 with a history of IPV in the past 5 years.

Instrumentation and Operationalization of Constructs

The Beck Depression Inventory – II (BDI-II), developed by A. T. Beck, R. A., Steer, and G. K. Brown (1996), is a revised version of the Beck Depression Inventory (BDI), which has been used for decades to measure depressive symptoms and severity and has an established construct validity. The BDI-II has a high internal consistency ($\alpha = 0.92$ for outpatient sample and 0.93 for college sample). The BDI –II was compared to the BDI-1A on two outpatient subsamples ($N = 191$) and found to be comparable to the BDI-1A at the $p < .001$ level ($r = .93$; Beck, Steer, & Brown, 2015).

The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5), developed by F. W. Weathers, B. T. Litz, T. M. Keane, P. A. Palmieri, B. P. Marx, and P. P. Schnurr (2013), is a self-report measure that patients can complete to help clinicians assess and track the progress of PTSD symptoms. The PCL-5 is a revision of the PCL for the DSM-

IV, which is a widely used measure with strong reliability and validity (r = .93; α = .94), based on psychometrics for the PCL-S for DSM-IV version (Norris & Hamblen, 2003). The PCL-5 is reportedly most comparable to the PCL-S for DSM-IV (U.S. Dept. of VA, 2016). Blevins, Weathers, Davis, Witte, and Domino (2015) evaluated the PCL-5 on two different groups of trauma-exposed college students. They found a similarly strong internal consistency (α = .94) and reliability (r = .82).

The Conflict Tactics Scales – 2 (CTS-2), developed by M. A. Straus, S. L. Hamby, and W. L. Warren (2003), is one of the most widely used tools for measuring IPV. The internal consistency values for each of the subscales measured by Straus et al. (2003) range from α = .79 to .95 based on a sample of college students. Three additional populations, measured by independent researchers, were included in the CTS-2 psychometrics. Internal consistency values were measured on incarcerated female substance abusers (Lucente, Fals-Stewart, Richards, & Goscha, 2001) and mothers at a high-risk for postpartum depression in Hawaii (Duggan et al., 1999) and San Diego (Newton, Connelly, & Landsverk, 2001). Internal consistency results for the population of incarcerated female substance abusers fell between .74 and .94 with one extreme score of .34 on perpetration of sexual coercion subscale. The two populations of mothers at a high-risk for postpartum depression yielded alpha ranges above .70 with two exceptions in the subsample of perpetrators in San Diego. On questions related to severe physical assault and severe physical aggression, Cronbach's alpha was .57 and .63, respectively. The physical assault subscale on the CTS-2 was compared to the Personal and

Relationships Profile Scales (Straus & Mouradian, 1999) and found to be significantly correlated at the $p < .05$ level on the majority of focus areas across gender.

Tests of Memory and Learning, 2nd edition (TOML-2), developed by C. T. Reynolds and J. K. Voress (2007), is a standardized battery of tests that assesses memory functioning. The TOML-2 measures verbal memory, nonverbal memory, and calculates a composite memory index. Additional indexes can be calculated, including verbal delayed recall index, learning index, attention and concentration index, sequential memory index, free recall index, and an associative recall index. The core battery includes the following eight subtests: memory for stories, facial memory, word selective reminding, visual selective reminding, object recall, abstract visual memory, digits forward, and visual sequential memory. The TOML-2 includes the following six supplementary subtests: paired recall, memory for location, manual imitation, letters forward, digits backward, and letters backward. The TOML-2 also includes two verbal delayed recall tasks and cued recall procedures. The TOML-2 can be administered to children and adults, with the recommended age range of 5 to 59 years. The TOML-2 manual suggests that the core battery can be completed within 30 mins and 60 mins if administering supplementary subtests. Reliability values are .85 or higher on all subtests. Test-retest reliability values exceeded .70.

Data Analysis Plan

The following research question and hypotheses were analyzed using SPSS version 24.

RQ1: Is memory impairment associated with prolonged or severe intimate partner violence in adult female victims?

H_{0CMI}: Adult female victims of IPV will perform as well as or better than control subjects on tests of verbal and nonverbal memory as measured by the Tests of Memory and Learning, 2nd edition (TOML-2), Composite Memory Index (CMI).

H_{1CMI}: Adult female victims of IPV will perform worse than control subjects on tests of verbal and nonverbal memory as measured by the TOML-2, CMI.

H_{0LI}: Adult female victims of IPV will perform as well as or better than control subjects on tests of learning as measured by the TOML-2, Learning Index (LI).

H_{1LI}: Adult female victims of IPV will perform worse than control subjects on tests of learning as measured by the TOML-2, LI.

H_{0ACI}: Adult female victims of IPV will perform as well as or better than control subjects on tests of attention and concentration as measured by the TOML-2, Attention and Concentration Index (ACI).

H_{1ACI}: Adult female victims of IPV will perform worse than control subjects on tests of attention and concentration as measured by the TOML-2, ACI.

Descriptive analyses were run to review the data and identify any outliers that may skew statistical results. Multivariate Analysis of Variance (MANOVA) was used to analyze the relationship between IPV and memory performance in adult female victims. The following variables were included as covariates: depression, PTSD, and mTBI. Depression was included as a numerical score, PTSD was included as a numerical score, and mTBI was included as a nominal value of 0 or 1 where 0 is equal to no history of mTBI and 1 is equivalent to the presence of 1 or more mTBIs. The frequency of mTBIs was also measured and included as a numerical score. The literature indicates that

depression, PTSD, and presence of mTBIs negatively impact memory function independently of each other. Victims of IPV often suffer from depression and PTSD symptoms while some also sustain multiple mTBIs. The documented relationship between IPV and depression, PTSD, and mTBIs demands that the latter three variables be included as covariates in the analysis of the relationship between this study's independent and dependent variables.

Threats to Validity

The population being studied is a vulnerable population. Participants currently involved in a violent relationship and participants with a history of violence in a relationship may feel shame and guilt, which may cause some participants to minimize their symptoms and violent / abusive acts from their partner. Other participants may have an irrational fear or paranoia that the information collected for this research study will some how be disclosed to their abusive partner or ex-partner. This researcher reviewed the procedures for ensuring confidentiality in the data collection process with participants. Data was collected in a professional setting, in an office that has been decorated to evoke warmth and safety. This researcher also acknowledged participants fears prior to reviewing instructions for questionnaires and tests, including accuracy of information reported.

Data was collected on four independent variables (IPV, depressive symptoms, PTSD symptoms, presence and frequency of mTBIs) and one dependent variable (memory performance). The questionnaires administered and provided to the participants for IPV, depression, and PTSD symptoms are published tools with good reliability and

validity. The standardized battery of tests used to collect memory performance is a widely used tool for memory with proven validity and reliability. This researcher collected data on the presence of mTBI using a semi-structured interview taken from Valera and Berenbaum (2003), who formulated their interview based on the American Congress of Rehabilitation Medicine's definition of mTBI.

Ethical Procedures

This study was approved by Walden University's Institutional Review Board (01-13-17-0032857). All participants were advised of their right to end participation in this study at any time prior to the start of collecting data. Participants were debriefed at the end of the data collection period on the true focus of this study and the social implications. They were provided a list of local resources for IPV support and treatment. Participants with a history of current or past violence by an intimate relationship may exhibit significant depressive and/or posttraumatic stress symptoms during the data collection process. For participants who arrived at the data collection site in an elevated emotional state or developed aversive emotional symptoms during the data collection process, this researcher stopped the study and provided crisis-focused psychotherapy. The participants who needed to stop the study reported a willingness to continue with the study following brief, trauma-focused psychotherapeutic treatment.

All data collected was anonymous. Participants were assigned a unique numerical code upon acceptance into this study and no personal identifying information was collected. Data was stored on a personal laptop that is linked to a wireless backup data storage device, which is password protected. This researcher had sole access to the laptop

computer and backup storage device being used for data storage and analysis. Data was also stored on a flashdrive for additional backup that contains only the data being collected for this study. This researcher also has sole access to this flashdrive. Data will be kept by this researcher indefinitely in the event another researcher requests access to the raw data in the future. Prescreening data collected through surveymonkey.com was stored through SurveyMonkey, which uses encrypted technology. Data collected through surveymonkey.com was permanently erased 90 days following deletion of survey questions and responses per the website's privacy policy.

Participants who qualified for this study were asked to arrive at a local community mental health clinic in Las Vegas, NV to collect the data described earlier in this chapter. This researcher worked at this clinic as an outpatient clinician and rapid response hospital assessor during the data collection period. The clinical director authorized use of the clinic after hours for collection of data related to this study.

Summary

A between-subjects design was used to better understand the relationship between IPV and memory performance. A multivariate analysis of variance was used to analyze how duration and severity of partner abuse correlates with memory performance. The severity of depressive and PTSD symptoms, as well as the presence or absence and frequency of mTBIs were incorporated into this analysis as covariates. The data collected from female participants between the ages of 18 and 59 years with a history of exposure to violence by a partner over the past 5 years was compared to a non-victimized group. Chapter 4 describes in detail the results of the data collected.

Chapter 4: Results

Introduction

The purpose of this quantitative study is to add to our knowledge of the effect IPV has on memory in adult female victims. We know that there is an indirect relationship between these two variables due to the psychological effects of PTSD and depression, but we do not know if there is a direct relationship. Under the assumption that recent incidents of IPV (mild or severe) will likely cause significant distress leading to difficulties in concentration and memory, this author set out to investigate the impact of prolonged IPV on memory. Prolonged IPV is defined as experiencing at least one incident of IPV per year for more than 1 year (WHO, 2013). Additionally, this author wanted to know how the severity of IPV impacts memory. Mild IPV is defined as incurring or inflicting harm on a partner in the form of insulting, swearing, yelling, stomping out of a room during an argument, being spiteful, throwing an object that could hurt, twisting partner's arm or hair, pushing or shoving, grabbing, slapping, sustaining a sprain, bruise or small cut from a fight with partner, coercing partner to have sex without a condom, or insisting on having sex without using physical force (Straus et al., 2003). For the purposes of this study, conflict resolution tactics such as yelling, insulting, swearing, and stomping out of a room during an argument were ignored when determining which category the participant fell into due to their frequency among all participants and limited sample size. Severe IPV is defined as incurring or inflicting harm on a partner from kicking, biting, attempting to hit with an object, beating up, choking, burning, forced sex, or threatening with or use of a knife or gun (McKinney et al., 2010).

For the purposes of this study, severity was defined based only on subjects' report of incurring any harm by their partner and any reports of inflicting harm on their partner was not included during the designations of IPV severity.

Three indices from the TOML-2 were used to measure the effect IPV has on memory in adult female victims. This author hypothesized that adult female victims of IPV will perform worse than non-victimized subjects on tests of verbal and nonverbal memory (CMI), learning (LI), and attention and concentration (ACI). This chapter contains a description of the data collection procedures and results.

Data Collection

Subjects were recruited from the city of Las Vegas, NV through the distribution of brochures at public libraries, supermarkets, pharmacies, urgent care clinics, a mental health clinic, and at a local domestic violence organization. The locations of public libraries, supermarkets, pharmacies, and urgent care clinics were identified from a Google map search. The city of Las Vegas was divided into four quadrants and up to four sites were randomly selected from each of the four quadrants. The domestic violence organization used to recruit subjects for this study was chosen based on its reputation for specialized services as well as its referral sources. The community mental health clinic used in this study was chosen as a recruitment site because of its high volume of clientele, in addition to being used as a convenience sample. Despite efforts, no brochures were distributed at local OB/GYN practices due to the lack of interest by practice owners. Brochures were also left in the teacher's lounge of a local high school. Recruitment criteria were amended to include individuals with a history of minimal daily or weekly

marijuana use due to the recent legalization of this substance in Las Vegas, its popularity among residents, and low recruitment. Recruitment criteria were also amended to include individuals diagnosed with bipolar disorder, ADHD, or a learning disorder.

Recruitment began in February 2017 and ended in December 2017. Approximately 1060 brochures were distributed. Fifty-four (5%) individuals responded to the prescreener website located on the brochure. Of the 54 individuals who responded to this researcher's advertisement, 33 qualified and 19 (58%) completed the study. An additional four participants completed the study that were referred by other participants. Participants did not appear reluctant to disclose details of their intimate relationships and nature of the abuse they have endured. However, some participants appeared anxious at the start of the session, which lessened once testing began and rapport was established. The results below include the data collected from the 23 participants who responded to this researcher's advertisement and met study criteria.

Results

Demographics

Study participants ranged in age from 19 to 45 years (M = 30 years). Racial and ethnic demographics were fairly representative of the population of Las Vegas, NV based on 2012 census data (City of Las Vegas Redevelopment Agency, 2014): 39% identified as Caucasian, 22% identified as African-American, 4% identified as Asian, 26% identified as Hispanic, and 35% identified as more than one race. The educational background of subjects (see Table 1) is also fairly representative of the 2012 census with

Table 1

Educational Level of Study Participants

Educational Level	Frequency	Percent
No H.S. diploma	2	8.5
H.S. diploma	8	35
Some college	6	26
Associates Degree / Technical Certificate	5	22
Graduate Degree	2	8.5

the exception of those who reported completing an associates or technical degree. The 2012 census noted that only 9% of residents had completed an associates or professional certificate. The majority of participants (61%, $n = 14$) were employed, 35% ($n = 8$) were unemployed, and one participant was a student. The socioeconomic status and marital status of subjects are not representative of the residents of Las Vegas. The majority of study participants (61%) reported a median household income of $30,000 or less (see Figure 1) and only 39% of Las Vegas residents reported making less than $35,000 per year in 2012. The majority (56%) of study participants were single and only 32% of residents identified as single in 2012 (City of Las Vegas Redevelopment Agency, 2014).

Descriptive Analysis

Of the 23 participants, 16 reported a history of IPV within the past 5 years and seven reported no history of IPV within the past 5 years. Almost two-thirds of the

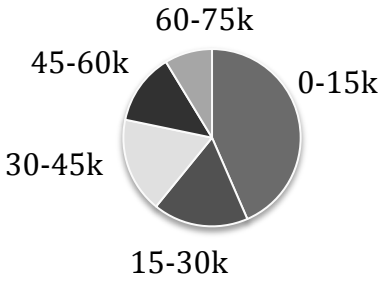

Figure 1. SES percentiles of study participants. 0-15k (.44), 15-30k (.17), 30-45k (.17), 45-60k (.13), 60-75k (.09).

participants with a history of IPV in the past 5 years reported sustaining severe physical or sexual abuse (see Table 2). Two of the seven individuals who reported no history of IPV in the past 5 years reported a history of severe IPV more than 5 years ago and two of the six participants who reported a history of severe psychological abuse or minor physical/sexual abuse in the past 5 years reported sustaining severe IPV more than 5 years ago. In total, 10 of the 23 (43%) participants reported experiencing either minor or severe IPV more than 5 years ago.

Over half (61%, $n = 14$) of the women who participated in this study reported sustaining at least one mTBI in their lifetime. Of those 14 women, seven reported that their mTBI was due to one or more incidents of IPV. Figure 2 shows the number of mTBIs sustained by each of the 14 women and the associated number of IPV related mTBIs. Two women who reported experiencing severe IPV within the past 5 years, reported sustaining more than 40 mTBIs (depicted as $n = 40$ in Figure 2) due to their

Table 2

Reported History of IPV of Participants over the Past Five Years

IPV Category[a]	Frequency	Percent
No History of IPV[b]	7	30
History of severe psychological abuse or minor physical/sexual abuse	6	26
History of severe physical/sexual abuse	10	44

[a:] Categories include the presence of IPV within the past 5 years only.
[b:] Subjects who reported a pattern of yelling, name calling, or stomping out of the room during an argument by their partner was also included in this category. Note that Straus' CTS-2 identifies these patterns of conflict resolution as mild psychological aggression, with name calling categorized as a severe pattern of psychological aggression.

partner's abuse. One woman reported sustaining approximately 18 mTBIs due to incidents of partner violence, and four women reported sustaining five or less mTBIs caused by their partner's abuse. Of the 16 women who reported experiencing mild or severe IPV within the last 5 years, six reported sustaining head trauma due to their partner's abuse that caused mTBI symptoms. Of the 10 women who reported experiencing severe IPV in the past 5 years, five (50%) reported sustaining head trauma due to their partner's abuse that caused mTBI symptoms.

Analysis of Covariates and Memory and IPV

Depressive symptoms were measured with the BDI-II and posttraumatic stress symptoms were measured with the PCL-5. Larger BDI-II and PCL-5 scores equate to greater symptom severity. Group 0 (No IPV) had the lowest depression scores, BDI-II ($M = 10.14$, $n = 7$, $\sigma = 8.26$) and PTSD measures, PCL-5 ($M = 22.14$, $n = 7$, $\sigma = 18.90$).

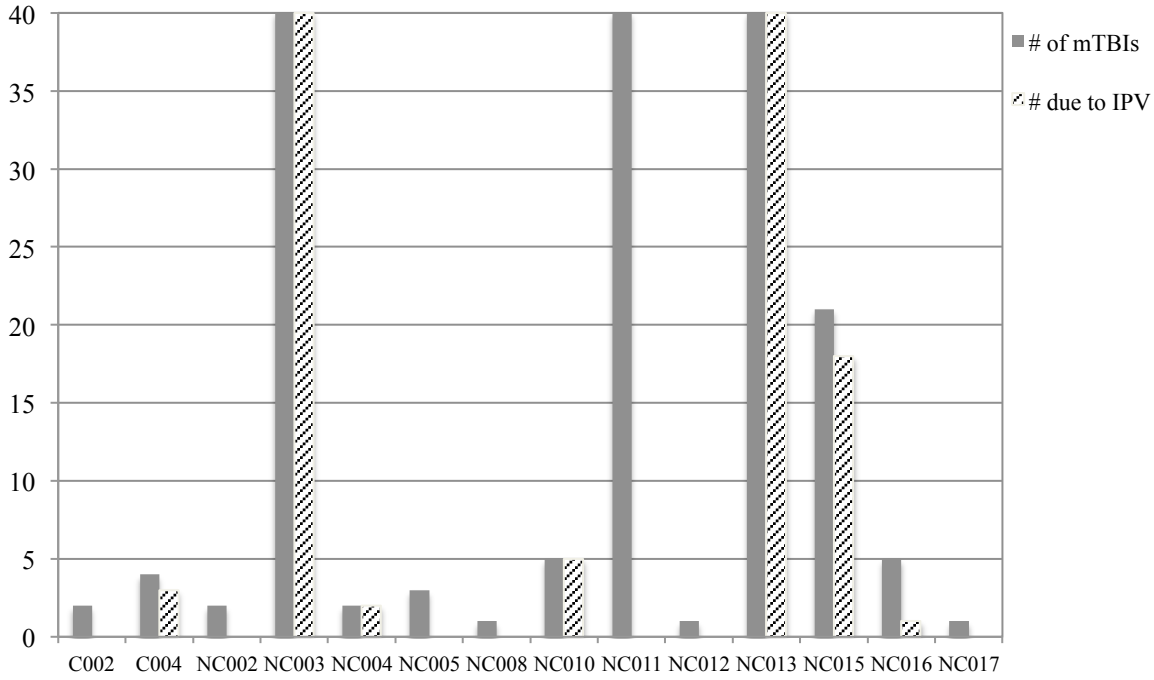

Figure 2. Frequency of lifetime and IPV related mTBIs sustained by participants. Participants NC003, NC011, and NC013 reported sustaining head trauma 40 or more times leading to a mTBI.

In group 1 (Hx of severe psychological or minor physical/sexual abuse), depression scores were slightly greater, BDI-II ($M = 18.17$, $n = 6$, $\sigma = 13.53$) as were their PTSD scores, PCL-5 ($M = 27.33$, $n = 6$, $\sigma = 15.46$). Group 2 (Hx of severe physical/sexual abuse) had the highest depression scores, BDI-II ($M = 24.40$, $n = 10$, $\sigma = 9.89$) and PTSD scores, PCL-5 ($M = 36.80$, $n = 10$, $\sigma = 21.99$).

A correlational analysis between the BDI-II and PCL-5 against each of the measures used to assess memory (e.g., CMI, LI, ACI) was performed to justify the use of these measures as covariates. The results indicated that there were no statistically significant relationships found between either the BDI-II (depression) and each of the

Table 3

Correlational Analysis between Depression and PTSD and Memory

Correlation	Pearson's coefficient	Significance Value
BDI * CMI	$r = .171$	$p = .44$
BDI * LI	$r = .062$	$p = .78$
BDI * ACI	$r = .208$	$p = .34$
PCL5 * CMI	$r = .288$	$p = .18$
PCL5 * LI	$r = .280$	$p = .20$
PCL5 * ACI	$r = .191$	$p = .38$

$n = 23$ for all correlational analyses in Table 3

three memory indices or the PCL-5 (PTSD) and each of the three memory indices (see Table 3). However, the sample size was limited and likely contributed to the lack of significance. While this analysis revealed no statistically significant relationships between depression and memory and between PTSD and memory, the analysis did indicate that there was a small effect between depression and memory and a moderate effect between PTSD and memory. Past research with larger sample sizes have shown statistically significant relationships between these variables, which was covered in Chapter 2. Therefore, inclusion of these variables as covariates is still supported.

The history of mTBIs was also used as a covariate in this research. Results from each of the memory indices was compared between participants reporting a history of mTBI and participants reporting no history of mTBI using a MANOVA. No significant difference was found between these groups for each of the memory indices (MANOVA CMI, $F(1, 21) = .01$, $p > .05$; LI $F(1, 21) = .01$, $p > .05$; ACI $F(1, 21) = .27$, $p > .05$). A correlational analysis of the frequency of mTBIs with each of the memory indices also

yielded no statistically significant relationships (CMI r = -.03, p > .05; LI r = .13, p > .05; ACI r = -.14, p > .05). As indicated in previous findings covered in Chapter 2, a history of mTBI can lead to acute problems in concentration and memory. Historical information on head trauma was gathered by subjects' reports, which is not a reliable measure for this variable. Additionally, the sample size for this study is low, both of which likely contributed to the lack of statistical findings. Therefore, inclusion of this variable as a covariate is still supported based on previous literature.

Analysis of IPV and Memory

A multivariate analysis was completed on the independent variable (IPV) and dependent variables (CMI, LI, ACI) with the covariate measures for depression (BDI-II), PTSD (PCL-5), and frequency of mTBIs (NumberMTBI). A total of seven participants were placed in the non-IPV group, where they reported no history of IPV within the past 5 years. A total of 16 participants were placed in the IPV group, which included individuals who reported a history of either mild or severe IPV over the past 5 years. *Box's Test of Equality of Covariance* found both groups to have equal variances (F (6, 847) = 1.57, p > .05) and *Levene's Test of Equality of Error Variances* found all three dependent variables to have equal variances (CMI: F (1, 21) = 1.44, p > .05; LI: F (1, 21) = .28, p > .05; ACI: F (1, 21) = 2.83, p > .05).

Participants in the IPV group tended to perform slightly worse on tests of verbal and nonverbal memory (CMI) and worse on tests of learning (LI) compared to participants in the non-IPV group. In contrast, participants in the IPV group performed

slightly better on tests of attention and concentration (ACI) compared to participants in the non-IPV group.

In a comparison of the means between groups for each dependent variable, the mean CMI from the IPV group ($M = 95.81$) was lower than the mean CMI from the non-IPV group ($M = 97.00$); however, the measures were very similar (MANOVA, $F\ (1, 18) = .03$, $p > .05$). While the mean LI from the IPV group ($M = 98.19$) was lower than the mean LI from the non-IPV group ($M = 103.71$) and, on average, IPV participants scored 6 points lower than participants from the non-IPV group, the difference in means was not statistically significant (MANOVA $F\ (1, 18) = .40$, $p > .05$). When comparing the mean attention and concentration (ACI) score between IPV participants ($M = 97.88$) and non-IPV participants ($M = 96.00$), results indicated that the means were similar (MANOVA, $F\ (1, 18) = .03$, $p > .05$).

Severity. Participants reporting a history of severe IPV within the past 5 years tended to perform worse on tests of verbal and non-verbal memory (CMI) as well as on tests of learning compared to participants reporting a history of mild IPV within the past 5 years and participants reporting no history of IPV within the past 5 years. Attention and concentration (ACI) results varied across severity.

On a measure of verbal and non-verbal memory (CMI), participants reporting a history of severe IPV in the past 5 years ($n = 10$) had the lowest score, performing on average, 5 points lower ($M = 94.40$) than participants in the non-IPV group ($n = 7$, $M = 97.00$). Participants reporting a history of mild IPV in the past 5 years had the highest CMI score ($n = 6$, $M = 98.17$) and tended to perform 1.34 points higher than non-

IPV participants. This comparison was not statistically significant (MANOVA, F (2, 17) = .22, p > .05).

A more direct negative or inverse relationship was found between the performance on tests of learning (LI) and severity of IPV (see Figure 3). On average, participants with a history of mild IPV over the past 5 years scored 3.82 points lower than participants with no history of IPV in the past 5 years on tests that measured learning. Participants with a history of severe IPV over the past 5 years scored 8.14 points lower compared to non-IPV participants on tests of learning. Figure 4 shows the mean ACI scores for participants within each severity group as well as each individual score per severity group. No correlation was found among groups on this index. *Box's Test of Equality of Covariance* held true for equality between groups (F (12, 1273) = 1.62, p > .05). *Levene's Test of Equality of Error Variances* also held true for equality between the three dependent variables.

Duration. In general, participants reporting a history of prolonged IPV (i.e., history of either mild or severe IPV at least once a year for more than 1 year over the past 5 years; n = 10) tended to perform worse on tests of verbal and non-verbal memory (CMI) and worse on tests of learning (LI) compared to non-IPV participants (n = 7). An analysis of variance was performed based on duration of IPV. Participants with a history of prolonged IPV scored, on average, 9.52 points lower (M = 93.40) on tests of verbal and nonverbal memory (CMI) compared to non-IPV participants (M = 97.00) (MANOVA F (1, 12) = .64, p > .05). Prolonged IPV participants scored 11.65 points

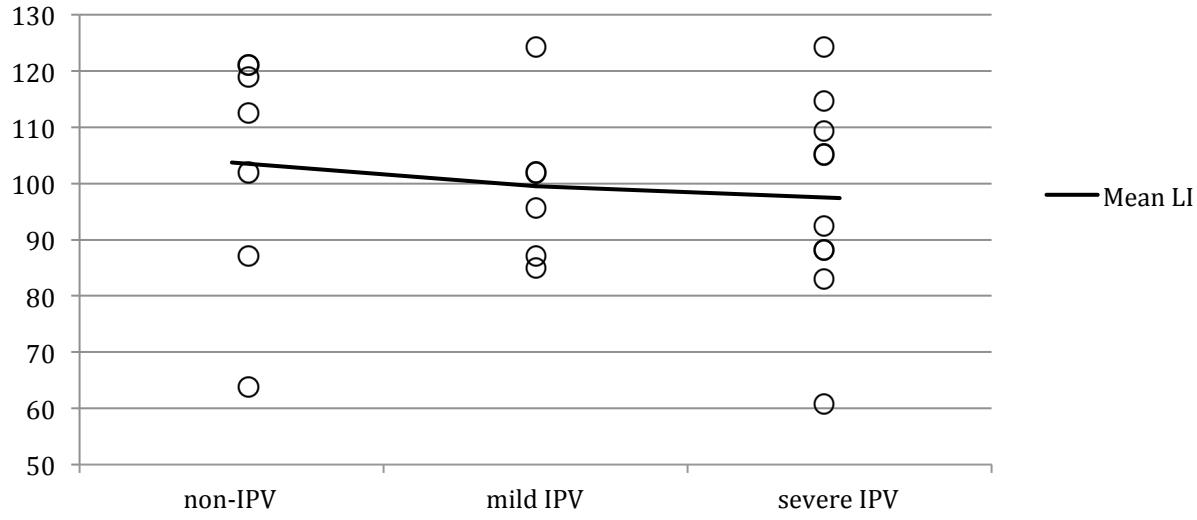

Figure 3. Individual Learning Index (LI) scores with Mean LI score per severity group. Mean LI: non-IPV (*M*=103.71), mild IPV (*M*=99.50), severe IPV (*M*=97.40).

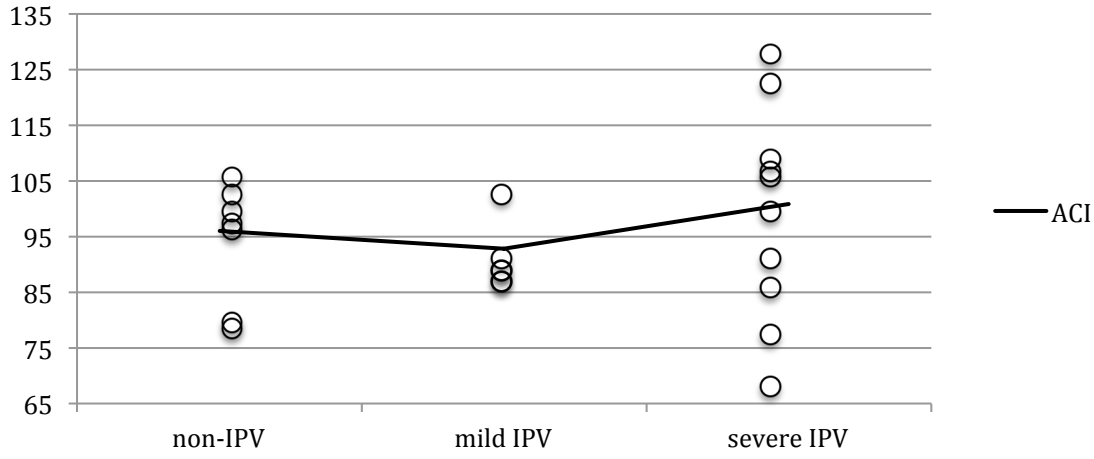

Figure 4. Individual Attention and Concentration Index (ACI) scores with Mean ACI scores per severity group. Mean ACI: non-IPV (*M*=96.00), mild IPV (*M*=92.83), severe IPV (*M*=100.90).

lower (*M* = 96.70), on average, on tests of learning (LI) compared to non-IPV participants (*M* = 103.71) (MANOVA *F* (1, 12) = .89, *p* >.05) and the measures between these two groups were very similar on tests of attention and concentration (ACI)

(MANOVA F (1, 12) = .03, p > .05). The difference in means between prolonged IPV and non-IPV participants for all dependent variables was not statistically significant and the *Box's Test of Equality of Covariance* indicated that the variance between prolonged IPV participants and non-IPV participants is not equal (F (6, 1117) = 2.86, p < .05). However, *Levene's Test of Equality of Error Variance* indicated the variance between all three dependent variables is equal: CMI: (F (1, 15) = .24, p > .05); LI: (F (1, 15) = .10, p > .05); ACI: (F (1, 15) = 3.35, p > .05).

Analysis of the interaction of duration and severity on memory. There appears to be no interaction effects between duration and severity on memory in IPV victims. When analyzing the interaction effects of duration of IPV with severity of IPV on memory, participants with a history of prolonged IPV and mild (n = 1, M = 93.00) or severe IPV (n = 9, M = 93.44), had the lowest scores on tests of verbal and nonverbal memory (MANOVA CMI, F (1, 15) = .15, p > .05) compared to participants with no history of IPV in the past 5 years (n = 7, M = 97.00) as well as participants with a history of mild IPV (n = 5, M = 99.20) and severe IPV(n = 1, M = 103.00) in the past 5 years but not of a prolonged duration.

Participants with a history of prolonged IPV and mild (n = 1, M = 102.00) or severe IPV (n = 9, M = 96.11) also had the lowest scores on tests of learning (MANOVA LI, F (1, 15) = 1.01, p > .05) compared to non-IPV participants (n = 7, M = 103.71) and non-prolonged IPV participants with a history of mild IPV (n = 5, M = 99.00) and severe IPV (n = 1, M= 109.00) when comparing total average means (prolonged IPV: n = 10, M = 96.70; non-prolonged IPV: n = 6, M = 100.67).

Results on tests of attention and concentration (ACI) revealed a similar non-trend as in previous analyses (non-IPV: $n = 7$, $M = 96.00$, prolonged IPV (mild & severe): $n = 10$, $M = 101.40$, non-prolonged IPV (mild & severe): $n = 6$, $M = 92.00$) (MANOVA $F\ (1, 15) = .49$, $p > .05$). *Box's Test of Equality of Covariance* revealed unequal variances between groups ($F\ (12, 856) = 2.42$, $p < .05$). *Levene's Test of Equality of Error Variance* revealed equal variances between the dependent variables. No statistically significant relationship was found from the interaction between the duration and severity of IPV.

It is assumed that the variance between groups and variance between dependent variables are equal when performing an ANOVA. When variances are not equal, the differences observed between groups or dependent variables are likely due to chance. Equal variances between each of the three dependent variables were found during all analyses. Equal variances between groups were found during all analyses with the exception of the following analyses: comparison between non-IPV participants to prolonged IPV participants and a comparison of the interaction of IPV severity and duration between groups. This was likely due to the limited sample size of these analyses.

When PTSD symptoms were factored into the comparison of memory scores (CMI, LI, ACI) between IPV participants and non-IPV participants, the difference between LI scores yielded a significance value of $p = .16$ with a small to moderate effect size ($d = .33$). Additionally, when PTSD symptoms were factored into the comparisons of memory scores (CMI, LI, ACI) between IPV severity groups (non-IPV, mild IPV, severe IPV), the difference between LI scores yielded a significance value of $p = .18$ with the

greatest effect observed between non-IPV participants and participants reporting a history of severe IPV in the past 5 years (d = .37).

Summary

A generalized MANOVA between non-IPV participants and IPV participants found a small reduction in memory performance as measured by the CMI and LI when IPV was present in the past 5 years. Performance on the ACI was similar between these two groups. When participants' performance on memory was analyzed based on the severity of their IPV (mild vs. severe), an inverse relationship was found between severity of IPV and LI scores, with a moderate effect (d = .37). When participants' performance on memory was analyzed based on the duration of IPV, participants with a history of prolonged IPV tended to perform worse on tests of verbal and nonverbal memory (CMI) and learning (LI) compared to non-IPV participants while no difference was observed on measures of attention (ACI) between these two groups. A similar effect was observed on learning (d = .39) between these two groups. Lastly, the interaction between the duration and severity of IPV yielded similar results, where there was a slight inverse relationship between duration and CMI and LI as well as severity and CMI and LI. Results between duration and severity groups varied on performance on the ACI. No statistically significant results were observed from any of the analyses. A more detailed discussion of these results with the limitations of this study and recommendations for future research is included in Chapter 5.

Chapter 5: Discussion

Introduction

The purpose of this quantitative study on IPV was conducted to gain a better understanding of how duration and severity of IPV affect short-term memory in adult female victims. A review of the literature from 2005 to 2015 yielded only five neuropsychological studies that examined the direct relationship between IPV and memory function and only two of these studies investigated this relationship in adult female victims (Minshew & D'Andrea, 2015; Twamley et al., 2009). With incidence rates (1 in 3) continuing to remain high among heterosexual women in the United States (CDC, 2014) and across the globe (WHO, 2013) and the frequency of concussions thought to be similar to that seen among professional athletes (Jackson et al., 2002), a look at the neuropsychological effects IPV has on its victims is overdue.

Due to the small sample size, there were no statistically significant results; however, a discussion of the results is still imperative for future research. Results from this study suggest that verbal and non-verbal short-term memory and learning is impacted in adult female victims of IPV in comparison to a non-victimized group while victims' attentional skills may be slightly stronger compared to non-victimized women. Results also suggest that the severity of IPV and PTSD symptoms may have an impact on victims' learning. The duration of violence may impact short-term memory and learning in victims, however variance criteria was not met for between group variability. As a result, the following discussion on findings will exclude this factor.

Interpretation of Findings

While not statistically significant, the greatest difference observed between participants reporting a history of IPV within the past 5 years and participants reporting no history of IPV in the past 5 years was on the learning index. The tests on this index measured participant's ability to encode, consolidate, and recall novel information over multiple trials presented in different formats (e.g., orally, visually, and both orally and visually). On average, IPV participants performed 6 points worse on this measure compared to participants reporting no history of IPV, and participants reporting a history of severe IPV performed on average, 8 points worse compared to participants reporting no history of IPV.

IPV may undermine the learning ability of victims, impact all cognitive functions that depend on it, and compromise professional and daily life. For the majority of us, most of our essential learning takes place during childhood (e.g., motor, verbal, spatial) unless we suffer a brain injury in adulthood. While most of our crystallized intelligence is shaped in childhood as well, our brains are constantly working and learning until we die. Remembering to take a different route home from work on Fridays in the Fall to avoid the local high school football traffic or remembering that your boss wants her reports bound with a blue front cover rather than a clear cover for example, requires the act of learning. If we are unable to encode and consolidate information into memory, our day to day experience will become quite challenging. It can lead to poor performance evaluations at work, missed doctors appointments and social engagements, and can even lead to problems in our relationships with family members, friends, and coworkers.

Adult female victims of IPV often return to their abusive partner. Some believe that their partner will change or that they can help their partner change. Some believe that they are at fault for the abuse, while others are forced to return out of fear of retribution, particularly when children are involved. It takes a victim, on average, seven attempts to leave her abusive partner for good (The National Domestic Violence Hotline, 2013). The results from this study suggest that there may also be a neurological component for why adult female victims return to their abusive partner; they have not *learned* that they are valuable and that he will abuse her again regardless of what she does or does not do.

The hippocampus is a major structure of the limbic system involved in learning and spatial memory. *In-vivo* studies have shown that a high concentration of corticosteroids, which are released during the stress response, suppress long-term potentiation (i.e., synaptic activity) in the dorsal hippocampus, thus causing a delay in learning (Maggio and Segal, 2007). Maggio and Segal (2012) found reduced synaptic activation in the hippocampus in animals that have been exposed to repetitive stress, even when corticosterone levels were normal. Furthermore, Wu et al. (2014) compared learning and memory in rats under chronic mild stress (CMS) conditions to a control group and found that the CMS group performed more poorly on an open-field exploration task, indicating an impairment in learning and memory.

Chronic stress has been shown to retard new nerve cell production in the hippocampus as well as contract nerve projections already present in the hippocampus. Nerve projections in the prefrontal cortex are also believed to be stunted under chronic

stress conditions, all of which impacts working memory and thus learning (Klingberg, 2013).

Although no dependent or covariate variable comparisons yielded statistically significant results, a broad group analysis (IPV vs. non-IPV) and an analysis of IPV severity (severe IPV vs. mild IPV vs. non-IPV) both resulted in a significance value approaching .10 when factoring in PTSD symptom severity in a comparison of means on the LI. When the severity of PTSD symptoms were incorporated into the analysis of variance between IPV participants and non-IPV participants on learning, a difference in mean LI scores was found to be at the $p = .16$ level and when IPV severity was also incorporated into this analysis, a difference in mean LI scores was found to be at the $p = .18$ level. This suggests that the severity of PTSD symptoms may play a role in learning effects observed in this population. Future studies (with sufficient power) should focus specifically on this issue.

PTSD has been shown to impact learning and memory in prior studies. Scott et al. (2015) performed a meta-analysis looking at the cognitive effects of PTSD. In a review of 60 studies, totaling over 4,000 participants, Scott and colleagues found the greatest difference in verbal learning ($d = -.62$) between participants with and without PTSD and also found a significant difference in verbal memory ($d = -.46$). Diener et al. (2010) found impairments in declarative memory in PTSD subjects, however Diener and colleagues proposed that PTSD subjects actually have an impairment in learning rather than memory consolidation. Stein et al. (2002) evaluated a number of cognitive functions in IPV victims with and without PTSD. They found that IPV victims performed worse on

measures of working memory, sustained attention, and processing speed regardless of PTSD status. They also found that IPV subjects with PTSD performed worse on executive functioning tasks compared to a control group. LaGarde, Doyon, and Brunet (2010) also found impairments in executive function, in addition to impairments in memory, in recently traumatized adults diagnosed with acute PTSD. Thomaes et al. (2013) found functional differences in the frontolimbic circuitry in study participants with complex PTSD, in addition to impairments in memory. The frontolimbic circuit and executive functioning are both important structural and functional aspects of learning (Klingberg, 2013).

Another interesting result found from this study was that attentional skills seem to be more heightened in victims of IPV when compared to non-victims. On average, participants who reported a history of IPV in the past 5 years scored 1.28 points higher on tests of attention and concentration compared to participants reporting no history of IPV in the past 5 years. When comparing attention and concentration between differing severities of IPV, participants who reported a history of severe IPV in the past 5 years performed better than those who reported a history of mild IPV as well as non-IPV participants. Although the increase was small, victims of IPV need to be more aware of their surroundings and are sensitive to danger signals (i.e., hypervigilance; Thomaes et al., 2013), thus victims experiencing a severe form of IPV would likely then have heightened attention.

Tests used in this study to measure attention and concentration, measured short-term attention or working memory rather than sustained attention. Previous studies report

a relationship between PTSD and increased attention to potentially threatening cues, while reporting a decrease in their sustained attention (Blanchette & Caparos, 2016; DePierro, D'Andrea, & Pole, 2013; Herz et al., 2016). DePierro et al. (2013) research confirmed the avoidant and intrusive symptoms as well as attentional biases often observed in victims of chronic IPV. In the Scott et al. (2015) meta-analysis, they also found a significant effect in attention/working memory (d = -.50) in participants with PTSD compared to participants without PTSD. Block and Liberzon (2016) reviewed the literature on this topic as well and found inconsistent findings, in part due to nonuniformity in the measures and specific types of attention investigated. They proposed three areas of focus for future research efforts and readers are referred to their article for specific recommendations.

Limitations of the Study

The small sample size limits the interpretability of results and results should only be used for areas of focus in future research. A multivariate analysis with covariates was used to analyze data. A violation of group variance occurred when comparing duration of IPV (i.e., prolonged IPV vs. non-IPV) and when comparing the interaction of severity and duration of IPV. When this assumption is violated, the Analysis of Variance model cannot yield meaningful results. Therefore, these results were not included in the interpretation of findings.

Self-report measures included the CTS-2 to assess duration and severity of IPV, the BDI-II to assess depressive symptoms, the PCL-5 to assess posttraumatic stress symptoms, and a semi-structured interview to assess for a history of mTBI. Self-report

measures are inherently less reliable than standardized measures. Participants completed the BDI-II and PCL-5 independently in a private waiting area at the start of the data collection session. When reviewing BDI-II and PCL-5 responses with participants, all responses appeared to be truthful and participants did not appear guarded when discussing some of their responses in more detail. Participants also did not appear reluctant to disclose information about the abuse they endured or head injuries they incurred, and appeared to be responding in a truthful manner on both of these measures as well. Therefore, the results from all of these measures are considered valid.

Participants were asked about their history of violence in intimate relationships over the past 12 months, 5 years, and lifetime history using the CTS-2. The reliability psychometrics from the CTS-2 do not account for this variation in testing (i.e., frequency and types of abuse sustained over the past 5 years). CTS-2 questions were read to participants to ensure accuracy of responses and to allow for follow-up questioning as necessary. The lack of reliability psychometrics on this measure for assessing IPV over the past 5 years, therefore, should not be a significant limitation.

The majority of the participants engaged quickly with this researcher and displayed little to no anxious symptoms related to the research. A few of the participants exhibited some anxious symptoms at the start of data collection, however quickly lessened once rapport was established and the testing structure was outlined. Due to the fatigue observed in the first participant following the administration of the delayed recall tasks, this author chose to eliminate these two subtests as they were not necessary for calculating the specified indices/dependent variables (i.e., CMI, LI, ACI).

Implications and Recommendations

Past research on IPV has focused on its implications on victims' psychological and emotional health, and treatment for both the abuser and victim. In a review of the literature from 2005 to 2015, only five studies were found that investigated the neuropsychological effects of IPV and only two of those studies focused on the cognitive effects in adult female victims (Minshew & D'Andrea, 2015; Twamley et al., 2009) while the other three studies focused on the impact on memory in children (Gustafsson et al., 2013; Johnson et al., 2005; Jouriles et al., 2008).

The results from this study contribute to our understanding of how IPV impacts victims' cognition and identifies a possible impact on learning in adult female victims. Future research in this area with larger samples may yield statistical significance, which could change our understanding on why victims repeatedly return to their abuser. Currently it is believed that one of the reasons victims of IPV return to their abuser is because they have low self-esteem and self-worth that was stripped away by their abuser (Wetzel & Ross, 1983). While this is still a valid factor, the impact the stress of the violence has on its victims' cognition may also be a factor in victims returning to their abuser.

Some mental health professionals and law enforcement officers dismiss victims' reports of abuse and assume that the victims are equally at fault because they returned to their abuser (Portwood & Heany, 2007). The results from this study suggest that one of the reasons why victims return to their abuser is because their brains have not *learned* that the kind, loving man they remember is also mean and violent and that they are not

the reason for the violence. While those who directly work with victims of IPV assume this to be true, this and future research focused in this area will provide healthcare and law enforcement professionals with data substantiating this assumption, which will also hopefully reduce the negative stigma associated with returning to an abuser.

While laws for violence against women have come a long way from the 19th century, when it was legal to beat your wife, current laws such as mandatory arrest laws are actually leading to the arrests of many victims as well as the abuser. Results from this and future similar studies may be able to help improve these laws. For example, requiring all U.S. states to enact aggressor laws, which force police officers and their departments to be better informed and better skilled to assess domestic violence situations. States that have enacted an aggressor law have seen a significant decrease in the incidence of victim arrests (Hirschel & Deveau, 2017). Additionally, mental healthcare providers will be better equipped to help victims remain safe while they *learn* to gain a new perspective on their relationship and thus start the healing process.

Further examination of how learning is effected in adult female victims of intimate partner violence is warranted given the preliminary results from this study. Given the effect size in comparison to other variables investigated in this study, research on how the severity of IPV and how PTSD in IPV victims impacts learning would also be helpful in identifying treatment needs for victims as well as aiding policymakers in modifying domestic violence laws to be more reflective of the harm inflicted.

Conclusion

One in three women in the United States and across the globe will be physically abused by their partner (CDC, 2014; WHO, 2013). In 2014, the director of the WHO, administrator of the United Nations Development Program, and the executive director of the United Nations Office on Drugs and Crime urged healthcare providers to improve their services provided to victims of IPV, increase their role in the prevention of IPV, and improve their research efforts on this issue (WHO, 2014). This global health and social issue is still silenced by poor laws and poor implementation of strong domestic violence laws, which is leading to the lack of arrests of abusers in states that do not require a victim's report, denial of protective orders, and arrest and subsequently psychological trauma of the victims.

Learning affects many aspects of our daily life, from remembering that project deadline to how we interact with others. When learning is impaired, it can cause someone to miss important appointments, become distracted when someone is talking to them, and even struggle completing a multi-step task, for example. The results from this study suggest that learning may be effected in adult female victims of IPV, which can help explain why many women report that they do not know why they see their abuser again (Hall, 2016). This and future research focused on the impact of learning and other cognitive functions, such as executive functioning, in victims of IPV will hopefully eliminate the stigma linked to victims, improve how law enforcement officers evaluate and respond to domestic violence calls, and help improve laws to better reflect the harm incurred by victims.

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Appendix

Literature Review Search Strategies

The following is a list of the exact queries used in the databases listed in Chapter 2 to complete a review of recent and past literature related to the topic under investigation. All of the following queries were searched in peer reviewed journals with full text limiter.

i. SU IPV OR SU intimate partner violence

   Published Date: 20050101 – 20091231

   Narrowed by SubjectMajor (top five categorical results): intimate partner violence, partner abuse, domestic violence, violence, battered females

   Narrowed by SubjectMajor (top five categorical results of initial SubjectMajor limiter): human females, perpetrators, victimization, risk factors, human sex differences

ii. SU IPV OR SU intimate partner violence

   Published Date: 20100101 – 20151231

   Narrowed by SubjectMajor (top five categorical results): intimate partner violence, domestic violence, victimization, partner abuse, risk factors

   Narrowed by SubjectMajor (top five categorical results of initial SubjectMajor limiter): posttraumatic stress disorder, child abuse, human sex differences, human females, physical abuse

iii. SU battered women

   Published Date: 20100101 – 20141231

Narrowed by SubjectMajor: battered women; spouse abuse; domestic violence; battered females; women's health; stress disorders, post-traumatic; intimate partner violence; violence; adaptation, psychological; mental health; health status; attitude of health personnel; posttraumatic stress disorder; depression; women's health services; stress, psychological

iv. SU intimate partner violence AND SU memory

v. SU domestic violence AND SU memory

vi. AB General Systems Theory [PsycARTICLES database only]

vii. SU General Systems Theory or SU biopsychosocial model [PsycARTICLES database only]

viii. SU hippocampus AND SU memory

Published Date: 20100101 – 20151231

Narrowed by SubjectMajor: stress, psychological; fear

ix. SU amygdala AND SU memory AND stress

x. SU chronic stress AND SU memory

xi. SU brain injury

Narrowed by SubjectMajor: treatment effectiveness evaluation, symptoms

xii. SU TBI AND SU IPV

xiii. SU traumatic brain injury AND SU IPV

xiv. SU TBI AND SU intimate partner violence

xv. SU traumatic brain injury AND SU intimate partner violence

xvi. SU traumatic brain injury AND SU domestic violence

xvii. SU traumatic brain injury AND SU battered women

xviii. SU TBI AND SU memory

xix. SU brain injury AND SU memory

Published Date: 20100101 - 20151231

Narrowed by SubjectMajor: magnetic resonance imaging; brain size; brain injury, chronic; autobiographical memory; anxiety; amnesia; visual perception; verbal learning; severity (disorders); psychometrics; neuroimaging; injuries; implicit memory; functional magnetic resonance imaging; cognitive processes; brain; verbal memory; retrospective memory; cognition disorders; brain injuries; brain damage; cognitive ability; episodic memory; cognitive impairment; neuropsychological assessment; memory disorders; learning; short term memory; prospective memory; memory; traumatic brain injury

xx. IPV AND PTSD AND Memory

xxi. SU PTSD AND SU memory

Published Date: 20050101-20151231

xxii. PTSD AND memory

Published Date: 20100101-20151231

Narrowed by SubjectMajor: short term memory; neuropsychology; episodic memory; memory, episodic; cognitive ability; survivors; memory disorders; cognitive processes; cognition disorders; amygdala; major depression; hippocampus; memory; posttraumatic stress disorder

xxiii. IPV AND depression AND memory

Published Date: 20100101-20151231

xxiv. domestic violence AND depression AND memory

xxv. depression AND memory

Published Date: 20100101-20151231

Narrow by Subject: episodic memory; functional magnetic resonance imaging; verbal learning; human females; short term memory; depression (emotion); memory; major depression

xxvi. chronic stress AND depression AND memory

Published Date: 20100101-20151231