Chapter #2

SURVIVING STRANGULATION: A CRITICAL LITERATURE REVIEW OF THE CONSEQUENCES FROM A PSYCHOLOGICAL PERSPECTIVE

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ABSTRACT
This critical review examines the literature on strangulation in the context of intimate partner violence, discussing in particular the neuropsychological and psychological consequences that have been associated with strangulation. Neuropsychological outcomes of strangulation have been predominantly derived from medical or forensic data and detail loss of consciousness, headaches, dizziness and memory loss as common consequences. Yet to be explored is the compounding effect of multiple instances of strangulation may have neuropsychologically, despite this being thought as a common experience to victim-survivors who have disclosed being strangled. PTSD and depression have been noted by researchers as a likely consequence of strangulation, however, the psychological consequences beyond diagnostic criteria are an area for further exploration. While informative, existing research has not yet examined how these consequences impact victim-survivors of strangulation within intimate partner violence. Having a more nuanced understanding of how strangulation impacts victim-survivors is imperative to tailoring support services to best meet their needs and this critical review concludes by highlighting key areas for future research.

Keywords: strangulation, intimate partner violence.

1. INTRODUCTION

Strangulation is an extreme form of violence that causes serious injury and, sometimes, death. Strangulation, as conceptualised by Pritchard, Reckdenwald, & Nordham (2017), "is the external compression of a person's neck and/or upper torso in a manner that inhibits that person's airway or the flow of blood into or out of the head" (p. 410). Not all incidents of strangulation are fatal, with the focus of this chapter being on instances of non-fatal strangulation specifically within intimate partner violence (IPV).

Strangulation in the context of IPV is thought to occur within a pattern of escalating violence, as opposed to an isolated incident (Brady, Fansher, & Zedaker , 2022; Shields, Corey, Weakley-Jones, & Stewart , 2010; Strack, McClane, & Hawley, 2001; Wilbur et al., 2001). This stance is supported by studies using police data commonly identifying a history of IPV occurring before the reported strangulation (Shields et al., 2010) and descriptive statistics suggesting the average duration of relationships prior to strangulation occurring being approximately 3 - 4 years (Strack et al., 2001; Wilbur et al., 2001). Locating strangulation within IPV as part of an escalating pattern of violence is consistent with IPV in general, in which typically the frequency and severity of violence increases as the relationship continues (Brady et al., 2022).

Before the seminal study of 300 cases of strangulation in San Diego conducted by Strack, McClane and Hawley (Strack et al., 2001; McClane, Strack, & Hawley, 2001; Hawley, McClane, & Strack, 2001), there was little academic attention in this area, with existing research predominantly including strangulation within more general studies of traumatic brain injury (Monahan et al., 2022; Patch, Anderson, & Campbell, 2018; Pritchard, Reckdenwald, Nordham, & Holton, 2018). Pritchard et al. (2017) argue that as a result, knowledge embedded within specialist family violence services about the impacts of strangulation on victim-survivors has so far outpaced academic research on this topic. Pritchard et al. (2017), among others, have called for the need for further research on this topic, particularly in light of the unique interaction of physical, neuropsychological and psychological harm produced through traumatic experiences that strangulation can cause.

This chapter provides a critical review of the existing literature on strangulation within the context of IPV, examining from a psychological perspective the impact strangulation may have on a victim survivor. Due to the nature of the topic having both medical and forensic repercussions, transdisciplinary literature was sought using various databases including; Google Scholar, PubMed, PsychINFO, ScienceDirect, Proquest and Connected Papers. Keywords to describe strangulation within IPV – "strangulation", "non-fatal strangulation", "choking", "throttling", "domestic violence", "family violence" and "intimate partner violence" – were used in the search. Consistent with systematic reviews on this topic (Bichard, Byrne, Saville, & Coetzer , 2022; Monahan et al., 2022; Pritchard et al., 2017), 30 studies were identified and the resulting literature was read, summarised using an Excel table. Literature was then manually annotated in NVivo to synthesize key findings and patterns, which reflect the key sections of this chapter. Literature which examined strangulation in the context of IPV was included, however as a critical literature review, wider literature was included and explicitly discussed as a result of gaps in current research.

This critical review of literature aims to present a balanced view of what is currently understood to be the consequences of strangulation within IPV, extending beyond current literature by considering how the neuropsychological and psychological consequences may impact individual victim survivors within their contexts. The next section offers further background details for the chapter such as descriptive statistics, followed by an exploration of the mechanisims of strangulation and why this is distinct from other IPV-related injuries. This is followed by an exploration of previous studies exploring the neuropsychological consequences of strangulation. Following is a focus on research into the psychological consequences of strangulation, highlighting, in particular, the need for research that extends beyond diagnostic criteria. The chapter is complete with consideration of future research directions and concludes that while existing research evidences the harm that can be caused by strangulation, there is a gap in understanding how this may potentially impact victim-survivors.

2. BACKGROUND

Intimate partner violence, as defined by the World Health Organization (WHO; 2005), is physical and non-physical acts of violence used by a current or former intimate partner, irrespective of relationship duration or marital status. Operationalising this definition, the WHO (2021) undertook the immense task of estimating the prevalence of IPV experienced by women globally. Systematic analysis of prevalence data across 161 countries over 18 years suggest the global lifetime prevalence of ever-partnered women experiencing physical or sexual IPV is 27%. However, "the iceberg-like nature of family violence"

(Gabbe et al., 2018, p. 3) means the vast amount of violence remains unreported or unseen, making prevalence estimates remarkably difficult.

Similar challenges are faced when attempting to estimate the prevalence of strangulation within IPV. Wilbur et al. (2001) found that 42 of the 62 victim-survivors surveyed in a family violence shelter reported having experienced strangulation. Further attempts at estimating the prevalence of strangulation have since occurred using vastly different sample sizes, populations and methods – therefore producing varying results (McQuown et al., 2016; Messing, Patch, Wilson, Kelen, & Campbell, 2018; White, Martin, Schofield, & Majeed-Ariss, 2021). Sorenson, Joshi, and Sivitz's (2014) systematic review of the epidemiology of strangulation attempts to make sense of these varying results, estimating the lifetime prevalence as between 3% - 9.7%. However, Sorenson and colleagues highlight (2014) that these results are derived from 11 studies representing 9 countries that are predominantly located in North America or Europe, thus lacking low to middle-income regions of the world that historically report higher rates of IPV as a whole. Furthermore, this estimate of prevalence also faces the same challenges of prevalence estimates as wider family violence, suggesting that the reported numbers are conservative at best.

Recent studies using police data provide demographic information on strangulation within IPV. Wilson, Spike, Karystianis, and Butler (2021) analysed 6,955 Australian-based police records of IPV-related strangulation finding 91.7% of reports noting the perpetrator as male and the victim-survivor as the female, female perpetrator and male victim-survivor in 4.7% of reports, male same-sex couples in 2.5% and female same-sex in 1.1% of cases. Analysing American-based police reports of IPV-related strangulation Messing, Thomas, Ward-Lasher, and Brewer (2021) report similar demographic distribution across different-sex couples, female same-sex and male same-sex couples. However Messing et al. (2021) do not distinguish between male and female perpetrators in the different sex statistics – an area for future research. These findings echo earlier work by Strack et al. (2001) who found 99% of victims were female, with one case of female-to-male and one case of female-to-female recorded out of 300. These findings suggest that strangulation occurs predominantly in heterosexual relationships, where women are predominantly the victims and men are the perpetrators.

Other researchers have reported on the diverse range of precipitating events to strangulation, including; emotionally charged arguments, underlying relationship stressors, jealousy, accusations of infidelity, the victim-survivor attempting to end the relationship, substance and alcohol misuse, and the victim-survivor's perceived non-compliance (Bendlin & Sheridan, 2019; Brady et al., 2022; Nemeth, Bonomi, Lee, & Ludwin, 2012; Reckdenwald, Fernandez & Mandes, 2019; Thomas, Joshi, & Sorenson, 2014; Wilbur et al., 2001; Wilson et al., 2021). Notably, as described by Thomas et al. (2014), 'mundane demands', such as dinner not being ready or buying the wrong brand of cigarettes, were also described as catalysts for the perpetrator to strangle the research participants. It is unsettling to see seemingly mundane demands described as catalysts for the perpetrators to inflict such serious violence, particularly given the significant impact strangulation can have on a victim survivor. While these studies begin to describe the occurrence of strangulation within IPV, the larger part of the academic focus has been on the consequences strangulation may have.

3. THE CONSEQUENCES OF STRANGULATION

Table 1.
Reported impairments and injuries following strangulation.

Physical			
abrasions (Joshi et al. 2018; Strack et al. 2001)	contusions (Strack et al. 2001)	coughing up blood (Wilkes 2023)	bradykinesia (Miao et al. 2009)
nausea (De Boos 2019; Ralston et al. 2019; Strack et al. 2001; Wilkes 2023)	dysarthria (Joshi et al. 2018; Malek et al. 2000; Miao et al. 2009; Pritchard et al. 2018; Ralston et al. 2019; Shields et al., 2010)	hyperreflexia (Milligan & Anderson 1980)	Horner's syndrome (Milligan & Anderson 1980)
pain (Funk & Schuppel 2003; Joshi et al. 2012; Ralston et al. 2019; Smith et al. 2001; Strack et al. 2001; Thomas et al. 2014; Wilbur et al. 2001; Wilkes 2023; Zilkens et al. 2016)	dysphagia (De Boos 2019; Funk & Schuppel 2003; Joshi et al. 2012; Malek et al. 2000; McQuown et al. 2016; Milligan & Anderson 1980; Pritchard et al. 2018; Shields et al. 2010; Strack et al. 2001; Wilbur et al. 2001; Zilkens et al. 2016)	resting tremor (Miao et al. 2009)	Parkinsonism (Miao et al. 2009)
throat pain (Ralston et al. 2019)	dysphonia (De Boos 2019; Jordan et al. 2020; Joshi et al. 2018; McQuown et al. 2016; Pritchard et al. 2018; Strack et al. 2001; Wilbur et al. 2001; Zilkens et al. 2016)	rigidity of extremities (Miao et al. 2009)	tracheal perforation (De Boos 2019)
vomiting (Joshi et al. 2018; Ralston et al. 2019; Strack et al. 2001; Wilkes 2023)	dyspnoea (Funk & Schuppel 2003; Joshi et al. 2018; McQuown et al. 2016; Plattner et al. 2015; Pritchard et al. 2018; Ralston et al. 2019; Shields et al., 2010; Strack et al. 2001; Wilbur et al. 2001; Wilkes 2023)	ptosis (Funk & Schuppel 2003; Milligan & Anderson 1980; Smith et al. 2001; Wilbur et al. 2001)	miscarriage /premature birth (Douglas & Fitzgerald 2020; Messing et al. 2018; Shields et al. 2010; Strack et al. 2001; Wilbur et al. 2001)
loss of bowel/bladder function (Jordan et al. 2020; Joshi et al. 2012; McQuown et al. 2016; Plattner et al. 2015; Ralston et al. 2019; Shields et al. 2010; Strack et al. 2001; Wilbur et al. 2001; Zilkens et al. 2016)	petechiae (Plattner et al. 2015; Pritchard et al. 2018; Shields et al. 2010; Strack et al. 2001; Zilkens et al. 2016)	paresis / unilateral weakness (Joshi et al. 2012; Malek et al. 2000; Milligan & Anderson 1980; Smith et al. 2001; Wilbur et al. 2001)	carotid artery dissection (Clarot et al. 2005; Milligan & Anderson 1980; Shields et al. 2010)
neck swelling (Joshi et al. 2018)	hemiplegia (Le Blanc Louvry et al. 2013; Milligan & Anderson 1980)	facial paralysis / droop (Le Blanc Louvry et al. 2013; Smith et al. 2001; Wilbur et al. 2001)	paralysis (Malek et al. 2000; Smith et al. 2001; Wilbur et al. 2001)
Neuropsychological			
sleepiness (Ralston et al. 2019)	loss of sensation / sensory deficit (Milligan & Anderson 1980; Smith et al. 2001; Wilbur et al. 2001)	subconjunctival haemorrhage (Strack et al. 2001; Vella et al. 2017; Zilkens et al. 2016)	seizures (Le Blanc Louvry et al. 2013)
dizziness/light headedness (Campbell et al. 2018; Douglas & Fitzgerald 2020; Funk & Schuppel 2003; Joshi et al. 2018; Ralston et al. 2019; Shields et al., 2010; Smith et al. 2001; Strack et al. 2001; Vella et al. 2017; Wilbur et al. 2001; Wilkes 2023; Zilkens et al. 2016)	dysesthesia (Le Blanc Louvry et al. 2013)	vision problems (Campbell et al. 2018; Jordan et al. 2020; Joshi et al. 2014; Le Blanc Louvry et al. 2013; Ralston et al. 2019; Smith et al. 2001; Strack et al. 2001; Wilbur et al. 2001; Zilkens et al. 2016)	stroke (Joshi et al. 2018; Malek et al. 2000; Milligan & Anderson 1980; Shields et al., 2010)
headaches (Campbell et al. 2018; Clarot et al. 2005; Funk & Schuppel 2003; Jordan et al. 2020; Joshi et al. 2014; Le Blanc Louvry et al. 2013; Milligan & Anderson 1980; Ralston et al. 2019; Smith et al. 2001; Strack et al. 2001; Wilkes 2023)	confusion (De Boos 2019, Milligan & Anderson 1980; Ralston et al. 2019; Wilkes 2023)	memory loss / amnesia (Campbell et al. 2018; De Boos 2019; Douglas & Fitzgerald 2020; Pritchard et al. 2018; Shields et al., 2010; Smith et al. 2001; Strack et al. 2001; Wilbur et al. 2001; Valera et al. 2022)	coma (Malek et al. 2000; Shields et al., 2010)
loss of hearing / tinnitus (Joshi et al. 2018; Joshi et al. 2014; Joshi et al. 2012; Ralston et al. 2019; Smith et al. 2001; Wilbur et al. 2001)	Broca-like aphasia (Le Blanc Louvry et al. 2013)	loss of consciouness / post-concussion syndrome (Campbell et al. 2018; De Boos 2019; Douglas & Fitzgerald 2020; Funk & Schuppel 2003; Jordan et al. 2020; Joshi et al. 2014; Joshi et al. 2018; McQuown et al. 2016; Messing et al. 2018; Shields et al. 2010; Plattner et al. 2015; Ralston et al. 2019; Strack et al. 2001; Thomas et al. 2014; Vella et al. 2017; Wilbur et al. 2001; Zilkens et al. 2016)	
Psychological			
shock (Thomas et al. 2014)	dissociation (Joshi et al. 2014)	hypervigilance (Joshi et al. 2014)	depression (Campbell et al. 2018; Joshi et al. 2014; Mittal et al. 2018; Smith et al. 2001; Valera et al. 2022; Wilbur et al. 2001)
mood disturbance (unspecified) (Joshi et al. 2018)	feelings of worthlessness & helplessness (Joshi et al. 2014)	traumatic immobility (Farr 2002)	PTSD (Campbell et al. 2018; Smith et al. 2001; Valera et al. 2022; Vella et al. 2017; Wilbur et al. 2001)
nightmares (Joshi et al. 2018; Joshi et al. 2012; Smith et al. 2001; Wilbur et al. 2001)	insomnia (Joshi et al. 2018; Joshi et al. 2014; Joshi et al. 2012; Smith et al. 2001; Wilbur et al. 2001)	panic attacks (Joshi et al. 2018)	suicidal ideation (Joshi et al. 2014; Joshi et al. 2012; Smith et al. 2001; Wilbur et al. 2001)
personality changes (Smith et al. 2001)	heightened & persistent fear (Joshi et al. 2012)	anxiety (Joshi et al. 2012; Smith et al. 2001; Wilbur et al. 2001)	

Strangulation can cause a wide array of consequences, with numerous signs, symptoms, injuries and impairments following strangulation have been documented by investigators. As illustrated in Table 1, there are many consequences reported by victim-survivors that can be categorised as physical, neuropsychological and psychological. Consequences within each category can range from mild (e.g., headaches) to severe (e.g., stroke). It is important to note here that large variations in the severity of symptoms following strangulation is thought to be the result of the method, location, force and duration of the strangulation event (Funk & Schuppel, 2003). The frequency of consequences being reported in the literature is also of note. In regards to physical outcomes of strangulation within IPV, Table 1 demonstrates difficulties with speech, breathing and swallowing (dysarthria, dysphagia, dysphonia and dyspnoea) are cited most frequently by researchers. Neuropsychologically, commonly recorded consequences include dizziness, headaches, memory loss and loss of consciousness. With regard to psychological outcomes, researchers have most frequently reported on depression, post-traumatic stress disorder (PTSD) and suicidal ideation. As our current interest is in understanding strangulation from a psychological standpoint, the neuropsychological and psychological consequences will be further discussed.

3.1. The Pathophysiology of Strangulation

The pathophysiological processes of strangulation – that is, how strangulation causes harm - provide the basis for understanding the neuropsychological consequences of strangulation. Anatomically, the neck is structurally vulnerable to injuries due to the neck containing the vital pathways for blood and oxygen flow to the brain and body, its relatively small size and lack of skeletal protection (Strack et al., 2001). There are multiple ways that strangulation can cause significant injury and death, however, most medical and forensic attention has been on hypoxia and anoxia - where the brain is starved of oxygen (Schoenberg & Scott, 2011). Without oxygen cell death within the brain occurs in minutes and can result in transient symptoms and permanent damage as noted in Table 1, to brain death and death (Anderson & Arciniegas, 2010; Schoenberg & Scott, 2011).

The amount of pressure required to cause injury through strangulation has been compared to the amount of pressure required to open a can of soda or a male's handshake (De Boos, 2019; Strack et al., 2001). Moreover, as detailed by Smith, Clayton, and Robertson (2011), loss of consciousness can occur within 6.8 seconds of strangulation starting and can progress to death within one to six minutes. Even after the strangulation has stopped there is still the risk of brain damage or death with delayed death as a result of carotid artery dissection - tears in the carotid artery – which have been reported in case studies in the weeks following a reported strangulation (see Table 1). Strangulation can not only become a lethal act with relative ease, but due to the susceptibility of the neck area to injury and the vulnerability of the brain, even minimal force applied through strangulation can have significant non-lethal consequences for victim-survivors (Bichard et al., 2022; Clarot, Vaz, Papin, & Proust, 2005; McClane et al., 2001; Pritchard et al., 2017; Shields et al., 2010).

The pathophysiological process in which strangulation causes injury is primarily a result of the brain being deprived of oxygen or blood. This is distinct from traumatic brain injuries (TBI), which are a result of blunt force trauma (Schoenberg & Scott, 2011). However, the distinction between injuries as a result of strangulation and TBI has not always been observed in the literature. Some researchers include strangulation in their definitions of TBI or more 'brain injuries' (Banks, 2007; Campbell et al., 2018; Esopenko et al., 2019; Hunnicutt, Lundgren, Murray, & Olson, 2017; Kwako et al., 2011; Prasad Adhikari et al., 2023), while others do not clearly distinguish between the two (Iverson, Dardis, & Pogoda, 2017; Maldonado-Rodriguez et al., 2021). This may be due to some defining TBI

as any injury to the head which results in loss of consciousness (e.g., Hunnicutt et al., 2017), or in a similar vein including strangulation in their data due to having injuries comparable to TBI (Haag et al., 2019). A key issue with this inconsistency in distinction is that the rates of those who are impacted as a result of blunt force trauma or strangulation become indistinguishable. For example, while Raskin and colleagues (2023) compared the cognitive performance of participants in their study who had experienced strangulation and those who had not, only one of the participants had experienced strangulation and no head trauma. Thus, echoing Pritchard et al.'s (2017) argument, to produce useful data regarding brain injury in IPV because of the pathophysiological differences, standardized, transdisciplinary definitions of strangulation and TBI would be beneficial. This inconsistency in definitions across existing literature remains problematic to understanding the relationship between strangulation and neuropsychological consequences. Arguably, however, this flaw may reflect how victim-survivors of IPV rarely experience physical violence limited to just blunt force trauma or strangulation (Ralston, Rable, Larson, Handmaker, & Lifshitz, 2019; Shields et al., 2010; Wilbur et al., 2001).

Due to the pathophysiological differences, recent research appears to be moving towards separating strangulation from TBI. For example, Valera and colleagues have reanalysed data collected from a previous study which included strangulation in its definition of TBI, to examine the effects of strangulation independent of (Valera, Daugherty, Scott, & Berenbaum, 2022; Valera & Berenbaum, 2003). In a similar vein, Daugherty, Verdejo-Román, Pérez-García, & Hidalgo-Ruzzante.'s (2022) examined different structural changes observed in the brain from trauma, TBI and strangulation.

3.2. Neuropsychological Consequences of Strangulation

Key areas of neuropsychological impairment as a result of hypoxic or anoxic injuries are thought to include executive function – especially attention and processing speed - and memory impairment (Anderson & Arciniegas, 2010; Monahan, Purushotham, & Biegon , 2019). This is thought to be a result of different brain regions varying in susceptibility to damage from hypoxic and anoxic injury, as demonstrated in post-mortem studies (Monahan et al., 2019). In particular, Anderson and Arciniegas (2010) highlight the hippocampus - a key brain structure involved with memory formation, learning, spatial navigation and regulation of emotions - appears to show greater vulnerability to short periods of hypoxia compared to other regions of the brain. Anderson and Arciniegas (2010) provide an in-depth account of the neurocognitive consequences of what they term hypoxic-ischemic brain injury. However, the article's reviewed by Anderson and Arciniegas' (2010) focus primarily on hypoxic-ischemic brain injury following cardiac arrest, respiratory failure or carbon monoxide poisoning – with no mention of strangulation in their article. This is of particular relevance because the cause of hypoxic-ischemic injury plays an important role in the pathophysiology and by extension the cognitive impacts. Therefore, while Anderson and Arciniegas' (2010) research may inform hypothesises on the brain regions impacted by strangulation, further research is required to explore strangulation-specific hypoxic-ischemic brain injury.

In an attempt to examine potential causal mechanisms for structural brain alterations in victim-survivors of IPV in an exploratory study, Daugherty and colleagues (2022) used structural magnetic resonance imaging and a variety of psychometric measures. A relationship between observed structural changes in the horizontal ramus of the anterior segment of the lateral sulcus and participants who had experienced strangulation (Daugherty et al., 2022). As Daugherty et al. (2022) recognise, this is not indicative of causation.

However, their studies offer support for the notion that IPV may lead to structural brain alterations.

Focusing specifically on strangulation, Bichard et al. (2022) found that 23 of the 30 studies included in their systematic review on the neuropsychological consequences suggested participants had potentially serious neuropsychological outcomes. Bichard et al. (2022) also commented on the lack of data on the long-term impact of strangulation, with existing research inconsistent in the timeframes of consequences examined, with the bulk of quantitative data reporting on initial outcomes of strangulation and qualitative studies overly reliant on participants memory and therefore prone to both recall bias.

Supporting the idea that strangulation may have neuropsychological consequences, Valera et al. (2022) found participants who had experienced what researchers termed 'alterations in consciousness' following strangulation, performed more poorly compared to the control sample on long-term and working memory, as measured by The California Verbal Learning Test (Delis, Kramer, Kaplan, & Ober, 1987) and Digit span, of the Wechsler Adult Intelligence Scale–Revised (Wechsler, 1981). Other measures of neuropsychological functioning, including learning, visuomotor speed, cognitive flexibility and nonverbal cognitive fluency, were included but no statistically significant differences between groups were observed. To support the methodological rigour of this study, Valera et al. (2022) attempted to control for what they termed "complex histories" victim-survivors may have through employing strict inclusion criteria, such as excluding participants who had recent histories of substance dependence. However, attempting to control for confounds and using retrospective data from a previous study, resulted in a small sample size of participants (52), meaning the study delivered only preliminary evidence of a relationship between strangulation and memory impairment. Despite this, findings are supported by other studies on the relationship between strangulation and memory loss (see Table 1). Valera et al. (2022) hypothesize larger sample sizes in replication studies may find further common neuropsychological impairments in victim-survivors of strangulation.

One approach to understanding the potential neuropsychological impact of strangulation that is prominent within the medical and forensic literature is through single cases. Such cases offer in-depth details regarding victim-survivor presentation, initial and progression of symptoms that have been useful in extending knowledge of the potential consequences of strangulation (Clarot et al., 2005; Funk & Schuppel, 2003; Jordan, Murphy,, Romine, & Varela-Gonzalez, 2020; Le Blanc-Louvry, Papin, Vaz, & Proust, 2013; Malek et al., 2000; Miao et al., 2009; Milligan & Anderson, 1980). For example, Le Blanc-Louvry et al. (2013) provide detail of a victim survivor of strangulation who on presentation to medical services experienced dysesthesia, headache and facial paralysis. These initial symptoms later developed into ongoing hemiplegia, aphasia, apraxia, lateral homonymous hemianopsia, and epileptic seizures. Case studies like this are useful in providing idiosyncratic conceptualisations of the outcomes of strangulation within IPV and are reflective of the heterogeneous nature of the consequences of strangulation.

Alternatively, other researchers have documented the accounts of victim-survivors of IPV and strangulation which detail impairment experienced as a result (Douglas & Fitzgerald, 2021, 2022; Farr, 2002; Joshi, Thomas, & Sorenson, 2012; Vella, Miller, Lambert, & Morgan, 2017). These primarily qualitative studies offer unique first-person descriptions of neuropsychological changes they have experienced following being a victim of strangulation. Vella and colleagues (2017) summarise one participant's experience:

Jennifer was strangled to unconsciousness and when she was conscious, she could not concentrate, felt dizzy, and had no appetite. Jennifer suffered severe trauma and had subconjunctival haemorrhages in both eyes (eyes filled up with blood). Memory loss was also severe as she had to re-learn how to read. (p. 180).

Such accounts are useful in contextualising experiences of the neuropsychological consequences and how those conditions listed in Table 1 can manifest for different individuals. As highlighted by Sorenson and colleagues (2014), a challenge unique to data generated through self-reports from victim-survivors of strangulation is that typical questions around the accuracy of recall are further compounded by the potential of impaired memory as a result of the strangulation. Similarly, Douglas and Fitzgerald (2022) and Joshi et al. (2012) observe that victim-survivors may also not connect the injuries and symptoms they are experiencing to strangulation specifically as a result of the multiple forms of violence experienced. As highlighted in Patch et al.'s (2018) systematic review, another challenge facing experiential accounts is that a causational relationship cannot be established.

Another method used to generate knowledge of the neuropsychological consequences of strangulation has been using either existing medical or forensic data (Hawley et al., 2001; McClane et al., 2001; Mittal et al., 2018; Plattner, Bolliger, & Zollinger, 2005; Pritchard et al., 2018; Ralston et al., 2019; Shields et al., 2010; Strack et al., 2001; Wilkes, 2023; Zilkens et al., 2016). This research has been useful in identifying commonalities of presenting symptoms of strangulation victim-survivors as detailed in Table 1, such as loss of consciousness, headaches, dizziness/light-headedness and memory loss. Reliance on medical and forensic data has been critiqued, however, because not all victim-survivors access medical or forensic services following strangulation and forensic or medical identification of symptoms – such as slurred speech - being misidentified as being due to distress or substance use (Monahan et al., 2022; Pritchard et al., 2018; Vella et al., 2017; Wilson et al., 2021). As a result of the range of methods used to document the neuropsychological impacts of strangulation, it is difficult to conclude what neuropsychological changes are most likely to be associated with strangulation.

Adding further complication, strangulation can be experienced by victim-survivors multiple times and in multiple instances (Joshi et al., 2012; Messing, Campbell, AbiNader, M. & Bolyard , 2022; Nemeth, Mengo, Kulow, Brown, & Ramirez, 2019; Vella et al., 2017; White et al., 2021; Wilbur et al., 2001). Qualitative interviews provide striking descriptions of these histories, such as one of Joshi et al.'s (2012) participants recalling that if the perpetrator "could not black me out, he'd let me go for a little bit, then turn around and do the same shit all over again" (p.804). In what Messing et al. (2018) name a 'dosage effect', it is hypothesised that there may be a relationship between the number of strangulation events experienced by a victim survivor and reported neuropsychological symptoms; finding that victim-survivors who had experienced multiple strangulations were more likely to have experienced a loss of consciousness. At a neurological level, Monahan et al. (2019) outline how multiple strangulation events may result in compounding damage, hypothesizing that epigenetic (non-genetic influences on gene expression) changes may occur as a result of damage to DNA causing irregular protein production. Monahan and colleagues hypothesize that the brain attempts to repair functional neuronal circuitry through inflammatory mechanisms. If repetitive injury occurs, chronic inflammation hinders cellular repair – especially if the brain does not have sufficient time to repair. This may prevent the brain's neuroplastic processes and lead to further structural damage and decreased brain function. This is an area that requires further investigation.

Although focused on medical causes of cognitive impairment than strangulation, Anderson and Arciniegas (2010) argue that the consequences of hypoxic-ischemic brain injury can result in significant functional disability or reduction in quality of life for those affected. What is lacking in the literature on strangulation is how these "….sometimes persistent, and occasionally permanent, disorders with complex medical, social, and legal considerations… " (Anderson & Arciniegas, 2010, p. 59) affect the victim-survivors and how people address the challenges they face. For example, there needs to be further academic inquiry on how neuropsychological consequences of strangulation – such as loss of consciousness, headaches and memory loss - impact victim-survivors with regard to their safety, risk, and ability to function. Furthermore, understanding how neuropsychological impacts might interact with the psychological impacts of strangulation offers an important area for future research.

3.3. Reported Psychological Consequences of Strangulation

Research on psychological injury and impairment from strangulation within IPV is in its relative infancy. Both Smith, Mills, and Taliaferro's (2001) and Wilbur et al.'s (2001) formative studies detail participants reporting experiencing personality changes, depression, nightmares, insomnia, suicidal ideation, anxiety and PTSD following experiencing strangulation. Smith et al. (2001) also note that 50% of participants reported developing one or more symptoms related to their psychological health within two weeks following experiencing strangulation. Sharing similar results to these, Joshi et al. (2012) highlighted the exacerbation of existing mental health concerns post strangulation - particularly depression, anxiety, and suicidal ideation. This is of notable concern as IPV victim-survivors tend to report higher levels of mental distress than general populations (Esopenko et al., 2019; Krug, Mercy, Dahlberg, Zwi, & The World Health Organisation, 2002). These studies are useful in connecting the issues of strangulation and psychological consequences. However, Joshi et al.'s (2012), Smith et al.'s (2001) and Wilbur et al.'s (2001) reliance on data generated through self-reports means diagnostic claims about specific types of psychological disorders are limited and alternative explanations for their experiences of mental distress have not been explored. Such contextual information is often what is collected in psychological research. Therefore, the findings of these studies do offer some indication of the occurrence of mental distress being perceived by victim-survivors as resulting from their experiences of strangulation.

Valera et al. (2022) and Mittal et al. (2018) employed psychometric measures to examine specific psychological disorders as a consequence of strangulation. Mittal et al. (2018) proposed that there could be a multitude of ways that experiencing strangulation could act as a risk factor for depression, such as ongoing feelings of helplessness and anticipatory anxiety. Performing a secondary analysis of data derived from an HIV-IPV prevention intervention clinical trial and using The Center for Epidemiologic Studies Depression Scale (Radloff, 1977), Mittal et al. (2018) did find high numbers of both strangulation and depressive symptoms in the sample of victim-survivors. The bivariate analysis performed by Mittal et al. (2018) found experiencing strangulation correlated with the participant's likelihood of depressive symptoms by 2.4 times. The multivariate logistic regression conducted by Mittal et al. (2018) with sociodemographic variables (age, race, education and income) and mitigating factors (social support and self-esteem) found social support as a significant protective factor for depression. While Mittal et al. (2018) acknowledge the small sample size may have impacted the ability to detect significance in this study, they have established a relationship between strangulation and subsequently increased likelihood of depression, whilst highlighting the importance of social support as a protective factor.

Also conducting a secondary analysis, Valera and colleagues (2022) examined the relationship between participants who had experienced 'alterations in consciousness' following strangulation and psychological functioning. Psychological functioning was defined in this study as anhedonic depression, anxious arousal, general distress, PTSD symptoms and worry, measured by The Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990), The Mood and Anxiety Symptom Questionnaire— Short Form (Casillas & Clark, 2000) and The Clinician-Administered Posttraumatic Stress Disorder Scale for Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition) (DSM-IV) - One Week Symptom Status Version (Weathers, Ruscio, & Keanne, 1999). Valera et al. (2022) reported higher levels of anhedonic depression and PTSD symptoms in participants that had experienced alterations in consciousness following strangulation in comparison to the control sample. Valera et al. (2022) hypothesize that the small sample size may have resulted in no relationship being established between strangulation and anxiety, general distress, or worry. As highlighted in Table 1, only a handful of other researchers have identified anxiety as a reported consequence following strangulation, while general distress and worry have not been identified at all. This could suggest that anxiety, general distress, and worry may not be a common outcome of strangulation within IPV, however, it would be beneficial to conduct more research in this space.

Vella et al.'s (2017) qualitative interviews with victim-survivors of strangulation in a community-based family justice centre found that participants described experiencing symptoms, such as flashbacks, hypervigilance and avoidance, which were consistent with the Diagnostic and Statistical Manual of Mental Disorders (Fifth Edition) (DSM-5 American Psychiatric Association, 2013) diagnostic criteria for PTSD. It is important to note that the purpose of the interviews conducted by Vella and colleagues (2017) was not diagnostic in nature and participant histories of IPV were not accounted for as potential explanations for symptoms experienced. Despite these limitations, qualitative studies, such as Vella et al.'s (2017) extend our understanding of the possible psychological impacts of strangulation beyond diagnostic criteria. For example, a participant in Thomas et al. (2014) is quoted speaking to the emotional pain of such experiences ''On top of all of it, it is painful to watch the man who so-called loves you try to kill you.'' (p.38). Little additional evidence exists in the literature regarding the emotional impacts of strangulation from a current or former intimate partner (Carlson, 2014).

What Vella et al. (2017) argue is most salient across their interviews with 13 victim-survivors was the result that victim-survivors of strangulation experienced ongoing, persistent fear that caused them to be vigilant in everyday life or altered their cognitions, including how they perceived themselves, others, and the world. Although not the focus of their study, Joshi et al.'s (2012) identified persistent fear as a psychological consequence of strangulation for the 17 victim survivor interviewees. Another reported consequence of strangulation is the disempowerment of victim-survivors. Messing et al. (2018) found that victim-survivors of strangulation were more likely to feel powerless than other victim-survivors of IPV. Similarly, following strangulation the majority of Thomas et al. (2014) participants reported feeling an intense sense of vulnerability and powerlessness and altered their behaviour as a survival strategy, for example, by increasing their compliant and submissive actions, self-isolating, and not leaving the house. Thomas and colleagues' (2014) observation that participants employed these strategies signals further psychological consequences for the victim-survivors. Collectively, the research outlined here suggests that the psychological impacts of strangulation extend beyond specific disorders, with further research needed to explore this topic.

4. FUTURE RESEARCH DIRECTIONS

Researchers who have taken a systematic approach to reviewing the literature on strangulation within IPV have critiqued existing research on the overall reliance on self-reports, convenience sampling and small sample sizes (Bichard et al., 2022; Monahan et al., 2022; Pritchard et al., 2017; Sorenson et al., 2014). It can be argued, however, that the subject matter at hand does not lend itself to traditional research methods that mitigate these criticisms. Unlike other subjects, the variables of interest regarding strangulation and IPV cannot be stripped back and manipulated to produce clear causal results. Instead, strangulation is a relational, sensitive and complex topic. Therefore, investigating the impact of strangulation on victim-survivors requires researchers to work within considerable practical restraints when designing such studies. For example, whilst convenience sampling is not the preferred method in other realms of research, participant safety concerns are paramount and convenience sampling from specialist family violence services gives researchers access to participants within a safe space. Further, when conducting research with victim-survivors, researchers ask participants to disclose highly sensitive and personal information about traumatic experiences (Sullivan & Cain, 2004). It can be argued that the resulting small, convenience samples are the most ethically appropriate in terms of minimising the risk of re-traumatisation. Sharing Patch et al.'s (2018) sentiments, although existing literature on strangulation within IPV has flaws, one can be optimistic in that existing research provides a foundation to further knowledge development and efforts to support victim-survivors. As this is a much-needed area to be researched, creative methods need to be employed to meet the needs of a complex topic.

Beyond critiques of methods employed by researchers, some scholars have identified a general lack of research addressing the psychological complexities of victim survivors' lived experiences of strangulation and its detrimental impacts (Daugherty et al., 2022; Vella et al., 2017). Patch et al. (2018) also note that little research into victim survivor understandings of the impacts strangulation may pose on their health, particularly long-term. However, when drawing from wider brain injury-focused literature, it is thought even mild brain injuries can impact employment, financial stress, parenting, relationships, housing, mental health, physical health, and day-to-day living (Gabbe et al., 2018; Haag, Toccalino, Estrella, Moore, & Colantonio, 2022). As well as initial injury from the act of IPV itself, the detrimental impacts of IPV on victim's well-being is a well-documented phenomenon internationally; including higher rates of self-reported poor health, depressive symptom, substance misuse and exacerbation of existing medical problems (Campbell et al., 2002; Coker et al., 2002; Ellsberg et al., 2008; World Health Organization, 2005).

It can be argued, therefore, that existing literature offers a somewhat one-dimensional view of the impact strangulation may have on victim-survivors, offering lists of injuries, symptoms and impairments (see Table 1). Given the multitude of consequences strangulation can have, the wider context of the victim survivor's lives need to be considered to understand the true impact of strangulation beyond what is currently known. Using the lists of injuries, symptoms and impairments outlined in Table 1 can be used as a base to then explore how strangulation impacts victim-survivors in their day-to-day lives, relationships and functioning. Generating a more holistic understanding of how strangulation impacts victim-survivors and those around them can then inform service supports to better address and meet victim survivor's needs.

5. CONCLUSION

Strangulation is a severe form of IPV. Growing evidence from analyses of medical and forensic data, convenience surveys and case-studies suggest that strangulation is highly traumatic and likely results in serious physical, neuropsychological and psychological consequences for surviving victims. Accumulated evidence also suggests the consequences of strangulation can vary from mild (e.g., headaches) to serve (e.g., stroke).

Common neuropsychological consequences include loss of consciousness, headaches, dizziness/light-headedness and memory loss. However, just how the brain is impacted by strangulation-specific hypoxia or anoxia is yet to move beyond hypothesis. It is also hypothesized that the multiple strangulations may have a compounding effect on the neuropsychological harm, however, this remains important for further investigation.

In regards to psychological consequences, PTSD and depression are forms of mental distress most strongly evidenced as outcomes of strangulation, followed by insomnia, anxiety and suicidal ideation. Qualitative investigations have begun to consider what the psychological consequences of strangulation may be beyond diagnoseable disorders. For example, are there particular psychological consequences from an intimate partner enacting such extreme life-threating violence on you, in heightening feelings of powerlessness, vulnerability and fear? The psychological outcomes unique to having an intimate partner inflict such a traumatic level of violence on a victim survivor are yet to be explored.

Existing literature on the consequences of strangulation within the context of IPV has been critiqued on orthodox methodological grounds. In response, it can be conceded that previous research has been limited methodologically, but that given the complexities of researching strangulation in this context, methodological compromises are necessary. In terms of further criticisms, while existing literature has detailed the harms associated with strangulation, the consequences of strangulation are often reduced to a one-dimensional list of signs, symptoms and impairments, devoid of the impacts of these items on survivor victims. When considering wider literature on mental health and brain injury, the ripple effect on an individual's well-being and functioning is well established. Therefore, this critical review concludes that there is a need for more holistically orientated future research to explore how the potential life and dynamic consequences of strangulation impact and are experienced by victim-survivors.

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KEY TERMS & DEFINITIONS

Existing literature predominately makes a distinction between 'strangulation' and 'non-fatal strangulation' on the basis of whether death has occurred as a result. When discussing this chapter with a specialist family violence service practitioner, she queried this distinction suggesting that this waters down the impact of non-fatal strangulation. Upon reflection, the authors of this chapter have decided to use strangulation as a blanket term to encompass both fatal and non-fatal strangulation.

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