

**Aggression following Acquired Brain Injury in a Forensic Hospital.**

**The assessment of triggers and management strategies.**

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## **Abstract**

Background: Aggression can often occur in people who have an Acquired Brain Injury (ABI), and the prevalence of ABI in forensic settings is high. This thesis aimed to explore aggression following ABI, how aggression is measured in various clinical settings, and then how aggression is defined, triggered and managed in a forensic hospital setting.

Method: A systematic review and meta-analysis was conducted, identifying and evaluating measures used to assess aggression in adults with ABI. One of these measures, the OAS-MNR was critically evaluated. A questionnaire was then developed based on the OAS-MNR to quantitatively assess triggers to aggression in patients with ABI in a forensic hospital from the staff's perspective. Qualitative data was then collected through interviews with staff to provide deeper exploration of these triggers.

Results: The OAS-MNR was the only identified measure which assesses antecedents to aggression in people with ABI. Using a questionnaire based on this measure, staff frequently reported internal and external triggers that can lead to aggressive incidents, including restrictions in the secure environment. Frustration was identified as the main trigger, which they explained could lead to aggression if the patient is unable to control or effectively communicate their frustration. Impairment as a result of the brain injury can make this more difficult.

Discussion: Incidents of aggression in a forensic ABI setting are frequent, complex and include multiple triggers to aggression. Incidents can be better managed by awareness of individual patients' triggers, and

distraction techniques. This can be helpful when training new staff or managing incidents.

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## **List of abbreviations**

ABI: Acquired Brain Injury

COSMIN: Consensus-based Standards for the Selection of Health  
Measurement Instruments

ICD-10: The International Classification of Diseases

NHS: National Health Service

NICE: National Institute for Health and Care Excellence

OAS-MNR: Overt Aggression Scale – Modified for Neurorehabilitation

OT: Occupational Therapist

PD: Personality Disorder

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-  
analyses

PROM: Patient Reported Outcome Measures

PTSD: Post Traumatic Stress Disorder

TBI: Traumatic Brain Injury

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## Chapter 1 - Introduction

### ***What is an Acquired Brain Injury (ABI) and why is this relevant in forensic settings?***

An Acquired Brain Injury (ABI) is any form of damage to the brain which was acquired after birth. An ABI can result from a Traumatic Brain Injury (TBI) such as trauma to the head from road traffic accidents, assaults, or falls. It can also occur from any other form of injury to the brain such as a stroke, hypoxia, tumour, or encephalitis (Headway, 2018; Turner-Stokes, Pick, Nair, Disler, & Wade, 2015). In the UK, prevalence of ABI remains high, with recent statistics documenting over 300,000 ABI-related hospital admissions in 2016-2017 (Headway, 2017). Traumatic injury **has been found to be** the leading cause of ABI (Alderman, Bentley, & Dawson, 1999; Lannoo, Brusselmans, Van Eynde, Van Laere, & Stevens, 2004).

Higher rates of ABI are reported in forensic settings in comparison to the general population (Farrer & Hedges, 2011), with prevalence rates as high as 82% (Schofield et al, 2009). Results of these studies vary due to differences in how we classify, and determine prevalence of ABI. For example, the majority of studies within prisons focus on TBI, making overall ABI statistics unclear. A recent meta-analysis including studies from Australia, Europe, and the USA demonstrated TBI prevalence rates in forensic settings (including prisons and psychiatric units) from 9.7 – 100%, averaging at 46% (Durand et al, 2017). Other meta-analyses have documented similarly high prevalence in prisons (Allely, 2016; Farrer & Hedges, 2011; O'Rourke, Linden, Lohan, & Bates-Gaston, 2016).

In the UK, rates of TBI up to 60% are reported in prisons through self-report surveys (Pitman, Haddlesey, Ramos, Oddy, & Fortescue, 2015; Williams et al, 2010). However, although prevalence of ABI in forensic settings is high, longitudinal research finds that only a minority of individuals had been arrested post TBI (11.8% after 5 years; Elbogen, Wolfe, Cueva, Sullivan, & Johnson, 2015). This demonstrates that only a minority of individuals with brain injury engage in offending behaviour.

### ***What difficulties do people experience following ABI?***

People can present with a range of cognitive, emotional, and behavioural difficulties after an ABI. Difficulties can include cognitive impairment (Carroll et al, 2014; Patel, Coshall, Rudd, & Wolfe, 2003; Skandsen et al, 2010), impaired executive function (Spikman, Boelen, Lamberts, Brouwer, & Fasotti, 2010), elevated impulsivity (McHugh & Wood, 2008; Rochat et al, 2010), and lowered inhibition (Rochat, Beni, Annoni, Vuadens, & Van der Linden, 2013). Social difficulties include social isolation (Hoofien, Gilboa, Vakil, & Donovanick, 2001; Morton & Wehman, 1995), impaired social functioning (Rosema, Crowe, & Anderson, 2012), and increased burden for family members of the person with ABI (Hoofien, Gilboa, Vakil, & Donovanick, 2001).

Rates of mental health problems in people with ABI are higher than in the general population, with higher incidence of depression, anxiety, psychosis, and Post Traumatic Stress Disorder (PTSD) (Hoofien, Gilboa, Vakil, & Donovanick, 2001; McAllister & Ferrell, 2002; McMillan, Williams, Bryant, 2003; Orlovska et al, 2014; Silver, Kramer, Greenwald, &

Weissman, 2009; Timonen et al, 2002). The increased risk likely relates to a combination of undiagnosed mental health problems prior to the injury, damage to certain regions of the brain (e.g., disruption to neurotransmitter systems), a psychological reaction to the trauma of sustaining the injury, or relating to functional deficits experienced by the individual (Orlovska et al, 2014).

In forensic settings, individuals with ABI show higher rates of neuropsychological and neurobehavioural disability than those without ABI, which are likely to impact on a person's ability to effectively engage in rehabilitation programmes (Pitman, Haddlesey, Ramos, Oddy, & Fortescue, 2015). Compared to people without TBI, individuals with TBI in prison have been found to have reduced scores on tests of memory, executive functioning, and information processing speed (Barnfield & Leathem, 1998; Corrigan, Bogner, & Holloman, 2012). Those who reported a higher number of, and more severe, brain injuries showed a greater degree of cognitive impairment (Pitman, Haddlesey, Ramos, Oddy, & Fortescue, 2015).

Higher rates of psychiatric disorder are reported in individuals with TBI compared to individuals without TBI in forensic settings (Ray, Sapp, & Kincaid, 2014; Slaughter, Fann, & Ehde, 2003; Williams, Cordan, Mewse, Tonks, & Burgess, 2010). This includes higher rates of psychosis compared to prisoners without TBI (Schofield et al, 2006), and higher rates of anxiety and depression (Diamond, Harzke, Magaletta, Cummins, & Frankowski, 2007; Pitman, Haddlesey, Ramos, Oddy, & Fortescue, 2015; Slaughter, Fann, & Ehde, 2003; Walker, Hiller, Staton, &

Leukefeld, 2003). In UK prisons, 65% of people with TBI report symptoms of anxiety, and 61% report low mood (The Disabilities Trust, 2016). This illustrates the significant number of people with mental health problems within forensic settings, in particular with among people who have sustained an ABI.

Sustaining a brain injury has been associated with earlier onset of offending, violent offending, and increased number of convictions (Williams et al, 2018). It is likely that cognitive and psychological difficulties will impact a person's rehabilitation from offending such as interfering with engagement with offending behaviour programmes. Individuals with brain injury are more likely to be repeat offenders suggesting certain difficulties with rehabilitation (Pitman, Haddlesey, Ramos, Oddy, & Fortescue, 2015; Ray, Sapp, & Kincaid, 2014; Williams et al, 2010). For example, recent UK statistics showed between 48-89% of prisoners with TBI in were repeat offenders (The Disabilities Trust, 2016) and were committing a significantly higher number of offences than non-TBI controls (Pitman, Haddlesey, Ramos, Oddy, & Fortescue, 2015). The majority of individuals sustained their brain injury at the same age, or prior to their first offence (up to 70.5%), with a significantly larger portion of individuals with TBI in custody for a violent offence (60.4%) compared to controls without TBI (38%; Pitman, Haddlesey, Ramos, Oddy, & Fortescue, 2015; The Disabilities Trust, 2016). This suggests a link between brain injury and offending, with violence and aggression an important factor.

### ***Aggression in individuals with ABI***

Aggression can manifest itself in a number of ways and is often separated into two categories that are motivated by different goals (Bandura, 1973; Woods, 2001; Bushman & Anderson, 2001). The two categories are typically referred to as "hostile aggression" which occurs impulsively and is driven by anger, and "instrumental aggression" which is a planned act as a means of achieving a goal (Bushman & Anderson, 2001). Aggression can have many antecedents, these can include frustration, or noxious stimuli such as attack from others, or other irritating or aversive stimuli (Buss, 1961). Individual differences can impact whether a person responds aggressively to a situational trigger, such as such as a person's sensitivity to frustrations and provocations (Lawrence, 2006; Mylonas, Lawrence, Zajenkowska, & Russa, 2017). Hostile or impulsive aggression is said to occur when aggressive responses to provocation are exaggerated, with high levels of arousal and negative emotion such as anger. Neurobiological explanations of aggression describe provocations may trigger aggression by a failure of behavioural control systems, such as frontal cortices, and over-responsive areas involved in affective responses such as the amygdala (Siever, 2008). The response to provocations can also be influenced by social and cultural norms, past experiences, cognitive impairment, and processing difficulties.

Changes in aggression are not experienced by most individuals following an ABI, although aggression can be seen more often in individuals with an ABI compared to those without in forensic settings (Shiroma et al, 2010; Slaughter, Fann, & Ehde, 2003). Rates of aggression are also

higher in the general population compared to those without brain injury (Fazel, Lichtenstein, Grann, & Langstrom, 2011), and in hospital and rehabilitation settings (Rao et al, 2009; Tateno, Jorge, & Robinson, 2003).

Prevalence rates of aggression vary due to differing definitions. For example, the **National Institute for Health and Care Excellence** (NICE) refers to both violence and aggression as “a range of behaviours or actions that can result in harm, hurt or injury to another person, regardless of whether the violence or aggression is physically or verbally expressed, physical harm is sustained or the intention is clear” (NICE, 2015, p6.). While most definitions of physical aggression focus on impact on others, some definitions also include physical aggression towards objects and the self (Yudofsky, Silver, Jackson, Endicott, & Williams, 1986). A review of definitions within the literature identified that all studies on aggression and violence in inpatient settings included physical violence within their definition, 59% of studies included verbal aggression, and only 36% included self-harm. The most common definition used was that of verbal aggression, physical aggression, and aggression towards objects and self (Bowers et al, 2011). Aggression can also be described with different dimensions. Eight categories of aggression have been provided by Buss (1961) with aggression being a combination of physical or verbal, active or passive, and direct or indirect.

**The literature on aggression varies in its definitions, with debates around what constitutes aggression rather than violence (O’Leary-Kelly, Griffin, &**



Glew, 1996). The literature often describes violence and aggression interchangeably, however violence is often considered a subtype of aggressive behaviour, specifically referring to physical acts which are more intense or heinous (Rippon, 2000) or those which involve the most negative outcomes (O'Leary-Kelly, Griffin, & Glew, 1996). Whilst violence refers to behaviours which intentionally inflict physical harm on others, aggression does not always intentionally inflict harm, but can instead serve a protective function to the person displaying the behaviour (Liu, 2004). Aggression can serve the purpose of reducing frustration (Berkowitz, 1989), asserting control or dominance (Ramirez & Andreu, 2006), or function as an attempt to communicate distress or needs when abilities are compromised (Duxbury, Pulford, Hadi, & Sykes, 2013). Aggression can also be subjective based on an individual's own definition of aggression, the context in which the behaviour occurs, and how a person interprets the behaviour (Farrell, 1997; O'Leary-Kelly, Griffin, & Glew, 1996). This thesis will focus on aggression rather than violence. For the purpose of this thesis, aggression will be defined as both verbal and physical acts that cause physical or psychological harm to others, self, or objects.

Frustration is often cited as a reason for aggression following ABI, (Beaulieu, 2007; Pryor, 2004) making frustration an important focus when understanding aggression. The frustration-aggression hypothesis (Dollard et al, 1939) stated that "the occurrence of aggression always presupposes the existence of frustration and, contrariwise, that the existence of frustration always leads to some form of aggression". Frustration was defined as interference from achieving a goal, when a

positive outcome was anticipated. Thus, frustration was considered as an event rather than an emotional experience. The frustration-aggression hypothesis was later clarified and re-formulated after criticisms that frustration does not always lead to aggression (Miller, 1941). This updated version describes how frustration leads to a number of responses, one of which is the instigation to aggression. The strongest response will occur first, if this response does not reduce the frustration, then the next strongest response will occur. If frustration continues, it becomes more likely that aggression will be the dominant response and will therefore occur (Miller, 1941). Aggression was considered to be overt acts which cause injury to the person it was directed at, although they acknowledged that indirect, or less overt acts could also occur, if the threat of punishment is present. A number of factors can affect the instigation to aggression, these include the strength of the anticipated satisfaction from achieving the goal, the degree of interference with the goal and satisfaction, and the number of frustrated responses. Each time a goal is blocked, aggressive inclinations can be left over, and when added together, can intensify the aggressive reaction (Dollard et al, 1939).

It was noted that the frustration-aggression hypothesis explains only emotionally driven hostile aggression rather than instrumental aggression, with aggression serving the purpose of reducing frustration (Berkowitz, 1989). Further to this, whilst the original hypothesis noted that frustration does not always lead to an aggressive response, the hypothesis focused primarily on perceived punishment as inhibiting an aggressive response, and other factors would also likely be involved. The

response would also be impacted by social rules which inhibit an aggressive response, prior learning or experience regarding aggression, whether alternative goals are available, and attributions made regarding unfair treatment or personal attack (Berkowitz, 1989). This led to a revised hypothesis (Berkowitz, 1989) in which frustrations give rise to aggressive inclinations because they are aversive, or unpleasant, and is it this negative affect resulting from the frustration which creates the instigation to aggression, not the frustration itself. Importantly, the frustration and subsequent negative affect causes the instigation to aggression, not necessarily an aggressive response, and a range of individual factors and social norms would impact whether this results in aggressive behaviour.

Aggression following ABI can be explained in a number of ways. One explanation is frontal lobe disinhibition which occurs when the mechanisms that inhibit or regulate emotional responses and behaviour are impaired, which may lead to a reduced ability to regulate or control frustrations when the frontal lobes are damaged (Miller, 1994). This may lead to patients having a lower threshold for aggression when frustration is experienced which explains why some patients are more likely to respond with aggression. Another explanation is episodic aggression post brain injury, which can be described as having an abrupt onset in response to minor frustrations, with a loss of control, followed by returning to their usual and pre-injury state (Miller, 1994; Wood & Thomas, 2013). A third explanation of aggression following ABI involves an exacerbation of pre-morbid personality traits where negative traits, such as aggression are exacerbated (Miller, 1994).

For people with an ABI, prevalence rates of aggression vary depending on time since the injury. For example, in the “acute” phase (e.g., immediately following the ABI) rates of aggression range between 20.6% – 41.1% (Cole et al, 2008; Rao et al, 2009; Roy, Vaishnavi, Han, & Rao, 2017; Tateno, Jorge, & Robinson, 2003). Comparatively, in the “chronic” phase (e.g., from six months post-injury), we observe a wider range (typically, 8.8% – 75 %; Baguley, Cooper, & Felmingham, 2006; Dyer, Bell, Mccann, & Rauch, 2006; James & Young, 2013; Johannson, Jamora, Ruff, & Pack, 2008). It may be that there are differences between these phases which account for the variance in aggression, such as individual differences in recovery in the chronic phase. However, when individual recovery times have been compared with records of aggression in a neurorehabilitation unit, two studies did not find any significant effects between patients’ length of time since the injury, duration of hospital admission, or patients’ gender, on frequency or severity of aggression (Alderman, Knight, & Henman, 2002; Alderman, 2007). It is possible that these differences in prevalence rates arise due to differences in study methodology.

The variation in aggression prevalence is affected by the definition and methods used to measure aggression, as well as the setting in which the sample was recruited. Lowest rates of aggression are reported at 8.8% in a Swedish general population prevalence study (Fazel, Lichtenstein, Grann, & Langstrom, 2011). This demonstrates that overall, aggression following brain injury occurs infrequently, however there may be subgroups of the population where aggression is more common. In

inpatient settings, we see rates between 33 – 41% (Dyer, Bell, Mccann, & Rauch, 2006; Rao et al, 2009; Roy, Vaishnavi, Han, & Rao, 2017; Tateno, Jorge, & Robinson, 2003). This indicates that rates of aggression are higher in patients who require inpatient treatment. Patients who require inpatient treatment are likely to have more complex needs and difficulties which may make aggression more likely. These values mostly consist of verbal aggression, with lower rates of physical aggression (towards others or objects) reported between 1.5 – 21% (Dyer, Bell, Mccann, & Rauch, 2006; Rao et al, 2009). The highest rates of up to 75% are reported when less severe forms of aggression, such as traits of anger, are included. For example, anger accounted for 38% of aggression in this study (Johansson, Jamora, Ruff, & Pack, 2008).

A number of factors are associated with increased propensity for aggression after ABI. For example, level of pre-injury aggression is one of the strongest predictors of aggressive behaviour post ABI (Cole et al, 2008; James, & Young, 2013; Kerr, Oram, Tinson, & Shum, 2011; Tateno, Jorge, & Robinson, 2003). In a study by Greve et al, (2001), 74% of patients who were aggressive post-injury had problems with aggression prior to their brain injury compared to only 26% of non-aggressive controls. It may be that sustaining a brain injury, and experiencing other symptoms exacerbates pre-existing aggressive traits.

### ***Impact of aggression in this population***

Higher rates of difficulties have been associated with aggression post-ABI, which suggest those who experience cognitive, psychological, and physical difficulties are more likely to also be aggressive post-ABI.

Patients with ABI who were classed as aggressive were more likely to have depression after the injury compared to non-aggressive controls (Baugley, Cooper, & Felmingham, 2006; Johannson, Jamora, Ruff, & Pack, 2008; Rao et al, 2009; Roy, Vaishnavi, Han, & Rao, 2017; Tateno, Jorge, & Robinson, 2003). Aggression has also been associated with having greater disability following ABI (Cole et al, 2008), and increased dependency on others for activities of daily living (Kerr, Oram, Tinson, & Shum, 2011; Rao et al, 2009). This is likely due to frustration of reduced independence. Aggression is also associated with greater impulsivity (Greve et al, 2001), poor verbal comprehension (James & Young, 2013), poorer social functioning (Rao et al, 2009; Roy, Vaishnavi, Han, & Rao, 2017; Tateno, Jorge, & Robinson, 2003), PTSD, anxiety, physical pain, and somatic complaints (Johannson, Jamora, Ruff, & Pack, 2008). Aggression, therefore, does not occur in isolation and may increase after ABI as a result of physical, and psychological symptoms.

The experience of aggression is one of the most disruptive symptoms following ABI (Alderman, 2003; Braine, 2011; Tateno, Jorge, & Robinson, 2003; Wortzel & Arciniegas, 2013). Aggression can be difficult for families or services to manage, can lead to criminal arrest, or result in admission to forensic services. Aggression, if not assessed or managed appropriately, can significantly interfere with rehabilitation of other symptoms (Alderman, 2003) such as physical, cognitive, and psychological difficulties, and result in more suffering for the individual and those around them (Braine, 2011). This thesis will focus on aggression following ABI. Different methodology will be used to explore

how aggression is defined, understood, triggered, assessed, and managed. Two empirical studies will be conducted in a forensic setting.

### ***Aims of the thesis***

First, validated measures that are used to measure aggression in people with an ABI will be identified by a systematic review **and meta-analysis**. The aim of the review is to collate the varied ways in which aggression is measured in this population, then to summarise the advantages and disadvantages of different methods and assess the quality of the measure. Clinically relevant recommendations will be made about the most reliable and valid measures to be used with people with ABI. With most work focusing on TBI (Cusimano, Holmes, Sawicki, & Topolovec-Vranic, 2014) this is the first systematic review **and meta-analysis** to focus specifically on measurement of aggression following ABI.

Second, a psychometric critique will be conducted on the Overt Aggression Scale – Modified for Neurorehabilitation (OAS-MNR; Alderman, Knight, & Morgan, 1997). The OAS-MNR is an observational measure of aggression, antecedents, and interventions. The scale will be evaluated in relation to its psychometric properties, and its contribution within research and clinical practice.

The first empirical study will use quantitative methods to assess aggression and its antecedents in a forensic ABI hospital, using a questionnaire based on the OAS-MNR. The literature on antecedents to aggressive incidents in this setting is limited, thus this study provides detail about the frequency, type, and triggers of aggressive incidents in a

forensic hospital. This study is important because, although the literature suggests high prevalence of ABI in forensic settings and increased aggression after ABI, antecedents to aggression in individuals with ABI have not been investigated in forensic settings. Further to this, the role of symptoms of ongoing mental health difficulties in triggering aggressive incidents will be investigated by adding additional items to the antecedent list which reflect common mental health problems observed in people with ABI, such as psychosis. The OAS-MNR does not currently include items relating to symptoms of mental health problems. Thus, adding these items will help to understand the relevance of these in this setting.

The second empirical study will use qualitative interviews to explore staff perspectives of antecedents to, and management of incidents in a forensic ABI setting. Staff perspectives on aggression following ABI have not been investigated in forensic settings. This will obtain further detail on antecedents gathered through the questionnaire methods, such as understanding in what ways certain triggers increase aggression. This allows for gathering more meaningful detail on how aggression occurs in forensic settings and what can be done to reduce or manage incidents.



## **Chapter Two**

**Assessing aggression following Acquired Brain Injury (ABI):**

**A systematic review and meta-analysis of assessment measures**

## Abstract

**Background:** Aggression is a common outcome of Acquired Brain Injury (ABI). Reliable and valid assessment measures of aggression are required to inform rehabilitation and monitor progress.

**Aims:** To conduct a systematic review and meta-analysis to identify, and assess reliability and validity of measures used to assess aggression in people with ABI.

**Methods:** Systematic searches of PsychInfo, Medline, Embase, PubMed, and CINAHL databases were conducted along with hand searching of grey literature and review articles. A total of 5,100 articles abstracts were screened, with 78 reviewed in full against the inclusion and exclusion criteria. Information about the sample, the measure, and psychometric properties was extracted and quality assessment performed using the COSMIN checklist. Meta-analyses were conducted where multiple studies assessed the same psychometric property of the same measure of aggression.

**Results:** Twenty-five articles met the criteria for analysis. Included articles assessed the psychometric properties of 17 different measures of aggression in adults with ABI. Meta-analysis was possible with two measures (ABS and NFI), with the remaining measures assessed for psychometric properties with a single study. Quality of evidence was often low, with limited psychometric properties assessed such as reliability, validity, and internal consistency. Four measures (MBPC-1990R, NFI, SASNOS, and KSMS) demonstrated positive evidence of at least one psychometric property with good quality evidence. It is

recommended these could be used to assess aggression in people with an ABI.

**Conclusions:** A variety of measures are available to assess aggression in adults with ABI for use in community and inpatient settings that capture a number of facets of aggression, often assessing other symptoms and behaviours following ABI. There is a lack of well validated measures in this population, and future research should assess the psychometric properties of these measures.

**Keywords:** Acquired Brain Injury (ABI), aggression, systematic review, assessment, measures, validity, reliability

## **Introduction**

Aggression can be problematic in people with an ABI (Alderman, 2007; Rao et al, 2009). Appropriate, valid, and reliable measures of aggression are important as they help determine an individual's placement where behaviours can be appropriately managed, inform relevant treatment, and contribute to monitoring progress over time, including changes following treatment. See Chapter one for full discussion of impact of aggression in people with ABI.

Aggression in people with ABI is typically measured using three methods: behavioural observation, patient self-report, and informant-report, these are described in Table 1. This table provides a description of each method, along with its advantages and disadvantages when used to assess aggression in people with ABI.

Table 1. Description of different measure types with their advantages and disadvantages

<b>Assessment of aggression</b>	<b>Typically completed by</b>	<b>Description</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b>Behavioural observation</b> (e.g., OAS-MNR)	An observer, typically a staff member	Rating an incident of aggression after witnessing	Captures objective detail of behaviours	Not always possible to observe all behaviours and does not capture the persons perspective
<b>Patient self-report questionnaire</b> (e.g., KSMS )	Person with an ABI	Responses to questions about aggression, usually on a Likert scale	Captures the person's self-reports of behaviours and feelings such as anger. Able to assess multiple areas of functioning. Can be completed when observation is not possible	Limited self-awareness or memory may impact accuracy of ratings (Hart, Seignourel, & Sherer, 2009; Sherer, et al, 2003)

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**Informant-report questionnaire (e.g., SASNOS )** Caregiver such Responses to Captures the informants' Informants may have limited as family questions or knowledge of the person's knowledge about the individual's member or statements about behaviour and feelings, also behaviours or feelings. Can be biased partner, can also aggression, able to assess multiple due to carer burden (e.g. behaviours be completed by usually on a Likert areas of functioning. Can rated as more problematic due to staff scale resolve biases of self-report personal involvement/ stressors; Malec, Machulda, & Moessner, 1997)

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Notes: OAS-MNR refers to the Overt Aggression Scale – Modified for Neurorehabilitation, KSMS refers to the sister Kenny Symptom Management Scale, and SASNOS refers to the St Andrew's-Swansea Neurobehavioural Outcome Scale.

To be clinically useful, measures of aggression must demonstrate adequate psychometric properties. Reliability of a measure refers to whether two different raters would achieve the same outcome (inter-rater) or whether the measure would achieve the same outcome on two occasions (test-retest). Reliability is particularly relevant for observational measures which would be completed by different observers at different times. Validity refers to the ability of a measure to accurately measure the construct it was designed to measure. Several types of validity are relevant to measures of aggression which include; the relatedness amongst items in a measure (internal consistency), whether the content of the measure accurately reflects the construct measured (content validity), the dimensions of the construct measured (structural validity), the construct compared to other known measures of the construct (construct validity), and whether the measure can detect change when change has occurred (responsiveness). Adequate validity ensures that the measure can assess the type of aggression or behaviour that is intended to measure in people with ABI and setting that it was designed to be used.

Previous studies have used meta-analysis to assess the reliability and validity of measurement tools. This method obtains an overall effect size statistic for each psychometric property of a measure, pooled from multiple studies, allowing conclusions to be made regarding the overall reliability and validity of a measure. For example, Erford, Jackson, Bardhoshi, Duncan, and Atalay (2018), used meta-analysis to synthesise data from studies assessing the reliability and validity of suicide ideation measures. This meta-analysis allowed for recommendations to be made

regarding reliable and valid measures for use in practice, and highlighted areas where more research is required. Similarly, Ehrenbrusthoff, Ryan, Gruneberg, and Martin (2018) used meta-analysis to determine reliable and valid sensorimotor measurement instruments for people with chronic lower back pain. Analysis pooled studies of the same measure and psychometric properties to investigate the reliability and validity of a number of measures, with recommendations regarding the use of these measures in practice, and future research. In another example, Meader, Moe-Byrn, Llewellyn, and Mitchell (2014) conducted a meta-analysis for screening measures of post-stroke depression. This study synthesised data about sensitivity and specificity to determine accurate measures for detecting post-stroke depression. To the author's knowledge, there are no previous systematic reviews or meta-analyses that assess the reliability and validity of measures of aggression in adults with ABI.

### **Aims of the systematic review and meta-analysis**

The primary aims of this systematic review and meta-analysis were to: (1) identify all measures used to assess aggression in people with ABI, to (2) assess the reliability and validity of these measures, using meta-analysis to pool data from studies where possible, and (3) to understand the characteristics of the sample in which each measure has been validated.



## Methods

### Protocol and registration

The reporting of this review has been in line with Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009). See Appendix One. The PRISMA guidelines are followed in order to improve on the reporting of systematic reviews. The protocol for this review was registered on Prospero Database of Systematic Reviews on 04/12/17, registration number CRD42017083116.

### Sources and search strategy

Five electronic databases were searched to obtain measures of aggression in people with an ABI. Database searches took place on 02/06/18. The following databases were selected; PsychINFO (1906 – May week 4 2018), Medline (1946 – May week 4 2018), Embase (1980 – 2018 week 23), PubMed (1965 - June 2018) and CINAHL (1982 – 2018).

Search terms were identified according to the PICO criteria; Population (brain injury), Intervention/exposure (assessment measures) and Outcome (aggression). Scoping searches were used within the databases to identify variants in key words to identify relevant literature. A number of terms were selected to describe brain injury, aggression and assessment measures, using Boolean terms to combine terms with "AND", or "OR", and with the use of asterisks to include variants of spelling. The following search criteria were used to search the five databases;

Brain injury terms: "Brain injury OR brain damage OR head injury OR head trauma OR neurorehabilitation"

AND

Aggression terms: "aggressi\* OR anger OR impulsiv\* OR irritability OR hostile\* OR violen\*"

AND

Assessment measure terms: "questionnaire OR indicators OR rating scale OR measurement OR psychometric OR factor structure OR factor analysis OR valid\* OR reliab\* OR inventory OR inventories OR assess\*"

No limits were set about the date of publication in the initial search. Articles from each database were combined using Endnote software and duplicates removed.

In addition to these database searches, terms describing brain injury, assessment measures, and aggression were searched through Google Scholar to identify literature which may not be identified through database searches. A shortened version of the search criteria was used including the terms; "brain injury" and "aggression" and "assessment or questionnaire or rating scale or outcome". A limit was set for this search to reviewing titles and abstracts for the first 1000 articles, a method which has been used in previous systematic reviews (Allely, 2016). Grey literature was also searched using the term "brain injury" and "aggression" through the British Library e-thesis online service (EThOS) and Open Grey online search, and through the Bielefeld Academic Search Engine (BASE) using the shortened search criteria.

Articles were screened through title and abstract using specific inclusion and exclusion criteria.

#### Inclusion criteria/exclusion criteria

Included studies needed **to assess** the psychometric properties of measures of aggression in adults (people aged 18 or over) with ABI as their main aim. Adolescents or children were not included due to the substantial literature base on child and adolescent brain injury which was beyond the scope of this review. The definition of ABI was inclusive of Traumatic Brain Injury (TBI) (e.g., physical trauma due to accidents or assaults), as well as any other acquired forms of injury or damage to the brain (e.g., stroke, brain tumour, infection, hypoxia or substance abuse including alcohol-related damage).

The study had to describe an assessment measure, 'assessment measure' **was considered** to include psychometric scales, questionnaire measures, rating scales, and observational measures. Aggression needed to be a component of the assessment. The definition of aggression included one or more of the following; verbal aggression (e.g., threats), physical aggression towards other people (e.g., hitting others), and aggression towards objects (e.g., smashing objects) or self (e.g., banging own head). Studies were included where aggression was either the main concept being measured or aggression was explicitly described as a factor where multiple factors **were** measured, using multiple items. Studies were excluded if aggression was only reflected in one item or single question within the assessment measure. Measures were excluded if they only assessed violence towards self or self-harm, sexual violence,

or intimate partner violence (IPV). These were considered as separate types of aggression each with their own substantial literature base which was outside of the scope of this review.

Only studies and measures in the English language were included.

#### Data extraction

Initial searches were completed by SW. Screening against inclusion and exclusion criteria of full texts **was** performed by both researchers (SW and KJ) separately and rated "include", "exclude" or "uncertain". Independent ratings were shared and uncertainties or different ratings discussed to come to an agreed rating. Initial agreement was obtained in 59.2% of papers, with uncertainties on 28.9% of papers and different ratings on 11.8%. A total of 31 papers were discussed and a rating agreed. Researchers were able to come to an agreement about all papers without involving a third reviewer. Where other review articles or systematic reviews were identified, these were hand searched by SW for further relevant references.

A final list of included studies was produced and data extracted using a structured table (See Appendix Two). The following information was extracted: sample size, sample characteristics (age, gender, country, and setting), aggression measure characteristics (name of measure, type of measure e.g. observational, patient self-report or informant-report, number of items, name(s) of sub-scale(s), and definition of aggression), details of psychometric properties measured, and statistical values. A narrative synthesis of data was then completed which involved reviewing and detailing the extracted data in narrative form.

## Meta-analysis

A meta-analysis was conducted, synthesising data from studies reporting psychometric properties of measures of aggression. Data were synthesised from studies where at least two studies measured the same psychometric property of the same measure, a method used in previous meta-analysis of assessment measures (Ehrenbrusthoff, Ryan, Gruneberg, & Martin, 2018). Meta-analysis was possible for studies assessing the psychometric properties of internal consistency, reliability, and construct validity.

To examine internal consistency, the total average Chronbach's alpha coefficients were extracted from each study and pooled using the statistical software Synthesizer 1.0. As internal consistency values cannot be transformed into an effect size, which would be used in a standard meta-analysis (e.g.,  $r$ , or  $d$ ), a method called reliability generalisation was used. Reliability generalisation is a method of meta-analysis of reliability coefficients which estimates the average reliability across studies, and variation in reliability. This method aggregates internal consistency estimates, computing the meta-analytic estimate of reliability, and confidence intervals, displayed in a forest plot. This method uses a varying-coefficient model proposed by Bonnett (2008, 2009) which does not require effect size homogeneity, or random sampling of effect sizes from a normal distribution.

To examine reliability and construct validity, Pearson Product-Moment Correlation coefficients were extracted for each study. Where correlation coefficients were reported for each item or rater separately, a total

mean correlation coefficient was calculated for each study using the method described by Hunter and Schmidt (2004). This was done by calculating the sum of the correlations multiplied by the sample size, divided by the sum of the combined sample size. Where related comparison measures in construct validity are reverse scored, such that a negative correlation indicates a correlation in the expected direction, these were transformed to positive values for input into meta-analysis, so that pooled effect sizes were in the same direction. Correlations were pooled using the statistical software package MedCalc version 19.1.7 (MedCalc Software, Ostend, Belgium). This programme provides a pooled correlation coefficient, and 95% confidence interval, under a fixed-effects and a random-effects model. Heterogeneity was assessed using the  $I^2$  statistic. The fixed-effects model uses the Hedges-Olkin (1985) method for calculating the weighted summary correlation coefficient, using a Fisher Z transformation of the correlation coefficients. When heterogeneity was present ( $I^2 > 50\%$ ) a random-effects model was used, which incorporates the heterogeneity statistic when calculating the summary correlation coefficient.

#### Quality assessment

The COSMIN (Consensus-based Standards for the Selection of Health Measurement Instruments) methodology for systematic reviews of Patient Reported Outcome Measures (PROM) (Mokkink et al, 2018) was followed for quality assessment (for example See Appendix Three). The COSMIN methodology can also be used for other types of outcome measures or applications, such as clinician reported, or performance-

based measures. It is recommended for such purposes that methodology be adapted appropriately, e.g., changing the term "patient" to "clinician", and considering the relevance of certain types of validity when other types of instruments are used, e.g., assessing the internal structure and relatedness amongst items may not be relevant in certain observational measures. These considerations were made when evaluating informant-report and observational measures.

The COSMIN Risk of Bias Checklist assesses the methodological quality of studies on measurement properties of outcome measures providing an overall quality of evidence score of 'very low', 'low', 'moderate', or 'high'. The COSMIN Risk of Bias Checklist assesses standards for PROM development, content validity, structural validity, internal consistency, cross-cultural validity/measurement invariance, reliability, measurement error, criterion validity, hypothesis testing for construct validity, and responsiveness. For each measurement property, a checklist of standards referring to design requirements and preferred statistical methods are assessed, and pooled where multiple studies assess the same property to come to an overall quality of evidence rating. The COSMIN checklist also provides a result quality score, which categorises the result or pooled results of the psychometric property as 'sufficient', 'indeterminate' or 'insufficient' using set criteria of values. Ratings were made by SW, with a second researcher KJ assessing 10% of papers to check for consistency. 60.7% consistency in ratings was achieved, where results were inconsistent these were discussed and agreement made. A third reviewer was not required. Inconsistencies often related to differences in interpretations of the COSMIN criteria (e.g., ratings where psychometric results are

presented both above and below the required values). These were discussed, and SW and KJ agreed upon the appropriate interpretation (e.g., rating according to the majority results). Adjustments were made by SW to the remaining 90% of papers, based on the agreed interpretations. A second reviewer was not involved in the remaining 90% of papers.

## **Results**

A total of 5,101 studies were identified through database searches, Google Scholar, and grey literature. Abstracts were reviewed against the inclusion criteria, a total of 78 of these were included to be reviewed in full. Hand-searching using systematic review articles did not add any additional references. The flow diagram of the search process is detailed in Figure 1.

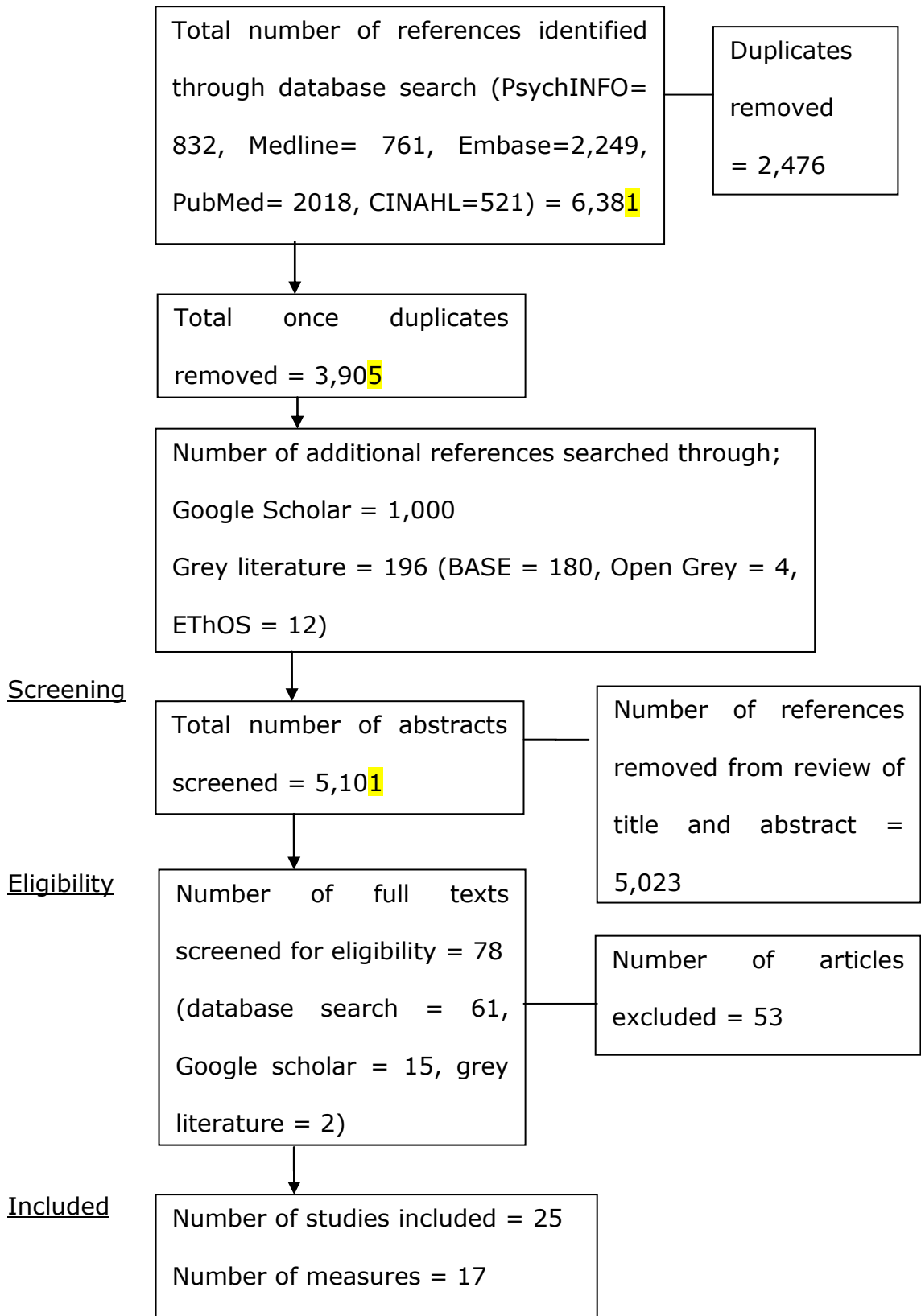
A total of 53 studies were excluded (See Table of Excluded Studies in Appendix Four). Twenty-two did not assess aggression by the inclusion criteria (e.g., assessed impulsivity or anger), 11 were review articles or books, 11 did not assess the validity of measures, four studies did not report on a brain injury sample, two did not provide details of the aggression scale, two were published in different languages, and one was not an adult sample.

A final total of 25 studies were included in the review, totalling 17 measures of aggression. These measures are listed in Table 2.



Figure 1. CONSORT flow diagram detailing review process

Identification



Of the 17 measures included, four were considered to be specific measures of aggression only (ATTACKS, BARS, OAS-MNR and OAS-MNR-E), 11 measured multiple factors including aggression (BAST $\beta$ , CBMT, CCB, ILS, MBPC-199R, NFI, NPI, OBS, OBS-SR, SASNOS and KSMS), and two measured agitation and irritability with aggression as a factor (ABS and NTUIS). Measures assessing aggression as one factor among other symptoms varied between 14-76 items in length, assessing between five to 12 different factors, with four to 14 items within the aggression scales. Aggression in these scales (e.g., NFI) was a small component of the full scale. Some papers provided limited detail regarding measures, including not stating the number of aggression items (BAST $\beta$  and ILS).

In regard to type of measure of included studies, Table 2 shows five were behavioural observational measures (ABS, ATTACKS, BARS, OAS-MNR, OAS-MNR-E), three patient self-report (BAST $\beta$ , OBS-SR, KSMS), five informant report by staff (CBMT, CCB, ILS, OBS, SASNOS) and one informant report by carers (MBPC-1990R). Three measures (NTUIS, NFI, NPI) were suitable for both self and informant report. Eight measures were designed or validated for use in inpatient settings, one for residential settings, and eight for use in community or outpatient settings. The majority (12 measures) were designed or validated for use with people with ABI, with five validated for TBI only. The brain injury characteristics of the included samples are detailed in Table 3. It can be seen in this table that TBI is the most common type of brain injury in all of the ABI samples (30% - 86.8% of patients). Other common types of injury include cerebrovascular accident (2.7% - 26%), cerebral hypoxia (4% - 20.9%), anoxia (2% - 17.1%), or infection (2.3% - 18%).

All studies that reported gender of the sample used both males and females to validate their measure, although gender balance in validation studies was skewed towards male samples. Four studies did not report gender of the sample (ABS, ATTACKS, ILS and OAS-MNR). Studies were conducted in a range of countries, with the majority of measures being validated in the UK (seven measures) and the USA (six measures). Other countries included Australia (two measures) and Taiwan (one measure). One measure (NFI) was developed and used across 14 different countries.

Each measure assessed between one to six psychometric properties. The measures were assessed for various psychometric properties which included; content validity (four measures), structural validity (five measures), internal consistency (eight measures), reliability (11 measures), construct validity (12 measures), and responsiveness (four measures). Six studies described the development of a new aggression measure.

Table 2. Data extracted from included studies

<b>MEASURE AND AUTHORS</b>	<b>SETTING, COUNTRY, INJURY (N SIZE) GENDER (% MALE) MEAN AGE (YEARS), SD, RANGE.</b>	<b>MEASURE TYPE</b>	<b>SCALE DESCRIPTION</b>	<b>DESCRIPTION OF AGGRESSION</b>
<b>AGITATED BEHAVIOR SCALE (ABS)</b> (1) CORRIGAN (1989)	Inpatient, USA TBI ( <i>n</i> =35), 82.9% male Mean age = 28.2.	Observation	A 14 item scale to monitor agitation in the acute phase of recovery from	Agitation with aggression factor (four items). Aggression includes
(2) CORRIGAN & BOGNER (1994)	Inpatient, USA ABI ( <i>n</i> =212), 73% male. Mean age = 31.2 (14.27), 13 - 72.	Observation	ABI. Statements which describe behaviours are rated following an observation period	violence or threats towards people or property, physical or verbal abuse to self, explosive
(3) BOGNER, CORRIGAN, STANGE, & RABOLD (1999)	Inpatient, USA, TBI ( <i>n</i> =45), Gender/age not stated	Observation	on a scale of 1-4 from "absent" to	anger, and being uncooperative.

					“present to an extreme degree”.
<b>ATTEMPTED AND ACTUAL ASSAULT SCALE (Attacks)</b>	Inpatient, UK ABI ( <i>n</i> =25), (1) DICKENS, ALDERMAN, & BOWERS (2011)	Gender not specified, Mean age = 38.25 (15.55), 19-63.	Observation		A measure of Aggression only: interpersonal physical violence, following witnessing an event. Five scores are produced regarding actual and intended severity of an assault, taking into account use of weapons, area targeted, number of times struck, commitment to

					achieving assault, and potential for injury.	
<b>BEHAVIOURAL SCREENING TOOL (BAST<math>\beta</math>)</b>	<b>ASSESSMENT</b>	Community, USA TBI ( <i>n</i> =11), Group 1: 100% male Group 2: 47% male, age range 25 – 68.	Patient report	self-	A 67 item measure of behavioural problems/emotion al symptoms, development not coping strategies yet published. and major life events. Statements are rated on a three point scale from “never” to “frequently”.	Multiple areas: The BAST is in Beta version with scale development not published. Items reflecting aggression include; anger and verbal aggression towards others (yelling and disagreements), physical fights with others, and inappropriate sexual comments.

<b>BIRT AGGRESSION RATING SCALE (BARS)</b> (1) JAMES (2012)	Inpatient, UK ABI ( <i>n</i> =309), 71% male, Mean age =42.0 (14.5), 17–74.	Observation	A rating scale used by staff witnessing aggression to aggression. Verbal record and includes directed, verbal non-directed, and physical threats of harm. Physical aggression, with Physical can be three levels of destructive or non-severity. Designed for measuring objects, self or impulsive other. aggression.
<b>CHALLENGING BEHAVIOUR MANAGEMENT TOOL (CBMT)</b> (1) ROYLE & WHITEHILL (2010)	Inpatient, UK ABI ( <i>n</i> =20), 60% male, Mean age = 51 (11), 23–67.	Informant-report (staff)	Records challenging behaviours, scored by staff over a specified time period using all Multiple challenging behaviours: Four aggression items. Includes Verbal aggression, physical aggression

available evidence. against people, and  
 Eight behaviours physical aggression  
 are scored on against objects and  
 intensity, against self.  
 management,  
 predictability,  
 frequency and  
 duration from  
 "mild" to "severe".

<b>Checklist of Challenging Behaviour (CCB)</b> (1) Gouick (2000)	Inpatient, UK ABI ( $n=22$ ), 81.8% male, mean age = 39.74 (10.36), 20-57.	Informant report (staff)	A 32 item scale Multiple areas: 14 rating aggressive Aggression items and challenging include physical behaviours on aggression towards frequency, severity others (e.g. biting, and management punching, throwing difficulty in the things), as well as preceding three unwanted sexual months. Items are contact and self-
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				rated on a five injury. point scale (0-4).
<b>INDEPENDENT LIVING SCALE (ILS)</b>	Inpatient, USA postacute TBI, (1) ASHLEY, PERSEL, & CLARK (2001)	sample details unclear	Informant report (staff)	A 44 item tool Multiple areas: assessing multiple areas of factor (number not functioning from stated) includes observational data items such as; over a one week physical period. Includes aggression, self- activities of daily abuse, property living, behaviour, abuse, angry and initiation. Each language, and item is weighted sexually aberrant for scoring on a behaviour. 100 point scale.
<b>MEMORY AND BEHAVIOR PROBLEMS CHECKLIST – 1990R (MBPC-1990R)</b>	Community, UK ABI ( <i>n</i> =222), male = 72%,		Informant-report (carer)	A measure of 25 Multiple areas: The problem aggression behaviours on subscale (six

<p>(1) JACKSON, TURNER - mean age = 46 (13.5), 18-72. STOKES, MURRAY &amp; LEESE (2007)</p>	<p>frequency over the items) includes past week and how items which reflect much each being suspicious, problem has upset angry, striking out, the carer, on a five behaviour point scale from dangerous to "not at all" to themselves, verbal "extremely". aggression or Assesses Four threats, and factors; excessive, uncooperative aggressive, behaviour. cognitive, and passive/low mood.</p>
<p><b>NATIONAL TAIWAN</b> Community, Taiwan <b>UNIVERSITY IRRITABILITY</b> TBI (<i>n</i>=64), <b>SCALE (NTUIS)</b> 47% male,</p>	<p>Patient and An 18 item Irritability: informant report measure of Annoyance and emotional and verbal aggression. behavioural Aggression (nine expressions of items) includes</p>
<p>(1) YANG, HUANG, LIN, TSAI Mean age = 35.11 (14.81). &amp; HUA (2011)</p>	

									irritability. Items getting into are rated on a six arguments, point scale, scored disagreeing with for pre-injury and others, and letting post injury. irritation show.
<b>NEUROBEHAVIOURAL FUNCTIONING (NFI)</b>	<b>INVENTORY</b>	Community, USA TBI ( <i>n</i> =520), 77% male, Age not specified.				Informant report (carer)	A self or informant-report tool assessing a range of behaviours and	Multiple areas: The aggression items (nine items) include how often the individual hits	
(1)	KREUTZER, MARWITZ, SEEL & SERIO (1996)								
(2)	WEINFURT, WILLKE, GLICK & SCHULMAN (1999)	Setting unclear, 14 different countries TBI ( <i>n</i> =655), Male 74%, Mean age = 31.64 (13.80).			Patient or informant report (carer)		symptoms or pushes others, following TBI in six makes factors depression, inappropriate somatic, comments, memory/attention, screams or yells,		
(3)	AWAD (2003)	Setting unclear, USA TBI ( <i>n</i> =586), 76.8% male.			Patient self- report		communication, threatens to hurt aggression and others, breaks or motor symptoms. throws things,		

		Age not specified.				Items are rated on a four point scale from "never" to "always". Several versions of the NFI have been described, a 70 item version (study 1), a 66 item version (study 2) and the most recent 76 item version (studies three and four).
(4)	CZUBA, ET AL. (2016)	Community, New Zealand (n=108), Male 73%, Age 20-87.		TBI Patient report	self-	
<b>NEUROPSYCHIATRIC INVENTORY (NPI)</b>		Setting unclear, USA		Informant report (carer)		Evaluates a number of disturbances on
(1)	KILMER, ET AL (2006)	TBI (n=51), 72% male,				Multiple factors: Agitation/aggression (seven items)

		Mean age = 38.06 (19.08).		severity, frequency includes slamming and caregiver doors, kicking distress across 12 furniture, hurting domains such as or hitting others, depression, shouting or cursing anxiety irritability, angrily. and disinhibition.
(2)	MALEC, ET AL (2018)	Community, USA TBI ( <i>n</i> =287), 61.8% male, Mean age=39.02 (12.71).	Patient and informant report (carer)	Each domain has a screening question followed by 7-9 questions about difficulties.
	<b>OVERT AGGRESSION SCALE - MODIFIED FOR NEURO-REHABILITATION (OAS-MNR)</b>	Inpatient, UK ABI ( <i>n</i> =18), gender and age not stated.	Observation	A scale rated Aggression only; following an Verbal aggression aggressive and physical behaviour. Records aggression against type of aggression objects, self, and (four types) and others.
(1)	ALDERMAN, KNIGHT & MORGAN (1997)			

				severity (range 1-4), antecedents observed (18 categories), and interventions used (14 interventions).
<b>OVERT AGGRESSION SCALE - MODIFIED FOR NEUROREHABILITATION EXTENDED (OAS-MNR-E)</b>	- Inpatient, USA ABI( <i>n</i> =34), - male = 82.5%, Mean age=54(13), 33-80.	Observation		A modification of Aggression only; the OAS-MNR to Verbal and physical include a "where" aggression against section (13 objects, self, and locations) and an others. "outcome/resolution" section indicating how the incident ended.
(1) GILES & MOHR (2007)				
<b>OVERT BEHAVIOUR SCALE (OBS)</b>	Community, Australia ABI ( <i>n</i> =30), gender unknown,	Sample 1: Informant report (staff)		A measure of Multiple areas; severity and Four aggressive frequency of nine behaviours;
(1) KELLY, TODD, SIMPSON,				

	KREMER & MARTIN (2006)	mean age = 31.5 (13.2) Sample 2: ABI ( <i>n</i> =28), 85.7% male, age unknown		challenging behaviours and the impact they have on others, rated on a five point scale.	Verbal aggression and physical aggression against objects, self, and others.
<b>OVERT BEHAVIOUR SCALE-SELF REPORT (OBS-SR)</b>		Community, Australia	Sample 1: Patient report	self-	As above, but language suited to self-report.
(1)	KELLY, SIMPSON, BROWN, KREMER & GILLETT (2017)	48.6% male, age = 51.7 (16). Sample 2: ABI ( <i>n</i> =34), 72.7% male, age=38.2 (13.1).			As above
<b>ST ANDREWS-SWANSEA NEUROBEHAVIOURAL OUTCOME SCALE (SASNOS)</b>		Inpatient, UK		Informant report (staff)	A 49 item measure to identify neurobehavioural disability, support received, goals
(1)	ALDERMAN, WOOD & WILLIAMS (2011)	ABI ( <i>n</i> =95), 73.7% male, Mean age = 40.3 (11.3), 18-62.			Multiple areas: aggression scale (12 items) of provocative behaviour (e.g.,

(2)	ALDERMAN, WILLIAMS, KNIGHT & WOOD (2017)	Inpatient, UK ABI ( <i>n</i> =145), 71% male, age not stated	Informant report (staff)	and measuring swearing), progress. Domains include; Interpersonal and overt
(3)	ALDERMAN, WILLIAMS & WOOD (2018)	Inpatient, UK ABI( <i>n</i> =50), 76.7% male, Mean age = 45.7 (13.7), 18 - 73	Informant report (staff)	behaviour, aggression (threatening others, physical inhibition, and aggression against communication. others, or objects). Items are rated on a seven point scale from "never" to "always".
<b>THE SISTER KENNY SYMPTOM MANAGEMENT SCALE (KSMS)</b>		Community, USA	Patient self-report	A 34 item tool to examine patients perceived difficulty with managing symptoms in five
(1)	MONTGOMERY, SOLBERG, MATHISON & ARNTSON-SCHWALBE	58.5% male, mean age = 41 (11.91) Study 1: ABI ( <i>n</i> =328), Study 2: ABI ( <i>n</i> =336),		Multiple factors; Aggression scale (eight items) includes losing temper, arguing,



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(2010)	57.1% male, 53.9%  male, age = 40.9 (11.52)	<p>areas; executive yelling, being functions, pushy or language, recent demanding, memory, destroying things, aggressive and physically behaviour, and attacking someone. physical symptoms. Items are rated on a five point scale.</p>
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Notes: Inpatient refers to patients with ABI residing in inpatient/residential neurobehavioural rehabilitation and treatment services where patients are cared for by staff. Community refers to patients with ABI residing in own homes including receiving support through family/carers or accessing outpatient treatment services.

**Table 3. Brain injury characteristics of samples in included studies**

<b>Measure and study</b>	<b>Brain injury sample characteristics</b>
<b>ABS:</b> Corrigan (1989)	TBI = 100% ( <i>n</i> =14)
Corrigan & Bogner (1994)	ABI ( <i>n</i> =212) TBI = 86.8% ( <i>n</i> =184) Cerebral anoxia = 6.1% ( <i>n</i> =13) Cerebrovascular accident = 2.7% ( <i>n</i> =6) Other = 4.2% ( <i>n</i> =9)
Bogner, Corrigan, Stange, & Robold (1999)	TBI = 100% ( <i>n</i> =45)
<b>Attacks:</b> Dickens, Alderman, & Bowers (2011)	ABI ( <i>n</i> =25) TBI = 60% ( <i>n</i> =15) Brain infection = 16% ( <i>n</i> =4) Cerebral anoxia = 8% ( <i>n</i> =2) Korsakoff's syndrome = 4% ( <i>n</i> =1) Cerebrovascular accident = 4% ( <i>n</i> =1) Cerebral hypoxia = 4% ( <i>n</i> =1) Secondary to epilepsy = 4% ( <i>n</i> =1)
<b>BASTβ:</b> Juengst, Terhorst, Dicianno, Niemeier, & Wagner (2018)	TBI = 100% ( <i>n</i> =11)
<b>BARS:</b> James (2012)	ABI ( <i>n</i> =299) TBI = 57% ( <i>n</i> =170.4) Cerebrovascular accident = 22% ( <i>n</i> =66)

	Brain tumour = 11% ( <i>n</i> =33)
	Cerebral infection = 8% ( <i>n</i> =24)
	Cerebral anoxia = 2% ( <i>n</i> =6)
<b>CBMT:</b> Royle & Whitehill (2010)	ABI ( <i>n</i> =20) TBI = 30% ( <i>n</i> =6) Subarachnoid haemorrhage/cerebral bleed = 25% ( <i>n</i> =5) Multiple sclerosis = 15% ( <i>n</i> =3) Encephalitis = 10% ( <i>n</i> =2) Other = 20% ( <i>n</i> =4)
<b>CCB:</b> Gouick (2000)	ABI ( <i>n</i> =22) TBI = 77.3% ( <i>n</i> =17) Cerebral anoxia = 9.1% ( <i>n</i> =2) Associated with seizures = 9.1% ( <i>n</i> =2) Neural surgery = 4.5% ( <i>n</i> =1)
<b>ILS:</b> Ashley, Persel, & Clark (2001)	TBI, sample number unclear
<b>MBPC-1990R:</b> Jackson, Turner-Stokes, Murray, & Leese (2007)	ABI ( <i>n</i> =222) TBI = 49% ( <i>n</i> =111) Cerebrovascular accident = 26% ( <i>n</i> =57) Brain infection = 18% ( <i>n</i> =39) Cerebral hypoxia = 4% ( <i>n</i> =9) Other = 3% ( <i>n</i> =7)
<b>NTUIS:</b> Yang, Huang, Lin, Tsai, & Hua (2011)	TBI = 100% ( <i>n</i> =64)
<b>NFI:</b> Kreutzer, Marwitz,	TBI = 100% ( <i>n</i> =520)

Seel, & Serio (1996)	
Weinfurt, Willke, Glick, & Schulman (1999)	TBI = 100% (n=655)
Awad (2003)	TBI = 100% (n=586)
Czuba, et al. (2016)	TBI = 100% (n=108)
<b>NPI:</b> Kilmer, et al. (2006)	TBI = 100% (n=51)
Malec, et al. (2018)	TBI = 100% (n=287)
<b>OAS-MNR:</b> Alderman, Knight, & Morgan (1997)	ABI (n=18) type not specified
<b>OAS-MNR-E:</b> Giles & Mohr (2007)	ABI (n=34) TBI = 50% (n=17) Vascular dementia = 23.5% (n=8) Alzheimer's dementia = 2.9% (n=1) Encephalitis = 8.8% (n=3) Astrocytoma/brain surgery = 2.9% (n=1) Cerebrovascular accident = 2.9% (n=1) Neuroleptic malignant syndrome = 2.9% (n=1) Huntington's disease and TBI = 2.9% (n=1)
<b>OBS:</b> Kelly, Todd, Simpson, Kremer, & Martin (2006)	Sample 1: TBI = 100% (n=30) Sample 2: ABI (n=28)

	TBI = 39.3% ( <i>n</i> =11)
	Cerebrovascular accident = 17.9% ( <i>n</i> =5)
	Cerebral hypoxia = 10.7% ( <i>n</i> =3)
	Other = 32.1% ( <i>n</i> =9)
<b>OBS-SR:</b> Kelly, Simpson,	Sample 1: ABI ( <i>n</i> =34)
Brown, Kremer, &	TBI = 63.6% ( <i>n</i> =21)
Gillett (2017)	Cerebrovascular accident = 18.2% ( <i>n</i> =6)
	Cerebral hypoxia = 12.1% ( <i>n</i> =4)
	Other = 6.1% ( <i>n</i> =2)
	Sample 2: ABI ( <i>n</i> =37)
	Brain tumour = 100% ( <i>n</i> =37)
<b>SASNOS:</b> Alderman, Wood,	ABI ( <i>n</i> =95)
& Williams (2011)	TBI = 62.3% ( <i>n</i> =59)
	Cerebral hypoxia-anoxia = 20.8% ( <i>n</i> =20)
	Cerebrovascular accident = 10.4% ( <i>n</i> =10)
	Brain infection = 3.9% ( <i>n</i> =4)
	Unknown = 2.1% ( <i>n</i> =2)
Alderman, Williams,	ABI ( <i>n</i> =145)
Knight, & Wood	TBI = 44% ( <i>n</i> =64)
(2017)	Cerebral anoxia = 17.1% ( <i>n</i> =25)
	Cerebrovascular accident = 15.6% ( <i>n</i> =23)
	Unknown = 23.3% ( <i>n</i> =33)
Alderman, Williams,	ABI ( <i>n</i> =50)
& Wood (2018)	TBI = 51.2% ( <i>n</i> =26)
	Cerebral hypoxia = 20.9% ( <i>n</i> =11)

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	Cerebrovascular accident = 16.3% ( <i>n</i> =8)
	Brain infection = 2.3% ( <i>n</i> =1)
	Alcohol induced brain injury = 2.3% ( <i>n</i> =1)
	Unknown = 7% ( <i>n</i> =3)

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<b>KSMS:</b> Montgomery,	ABI ( <i>n</i> =425)
Solberg,	Sample 1: ABI ( <i>n</i> =328)
Mathison, & Arntson-	TBI = 57.6% ( <i>n</i> =189)
Schwalbe (2010)	Cerebrovascular accident = 21.3% ( <i>n</i> =70)
	Brain tumour = 5.8% ( <i>n</i> =19)
	Cerebral anoxia = 4.6% ( <i>n</i> =15)
	Other = 10.7% ( <i>n</i> =35)
	Sample 2: ABI ( <i>n</i> =336)
	TBI = 71% ( <i>n</i> =239)
	Cerebrovascular accident = 14% ( <i>n</i> =47)
	Brain tumour = 3% ( <i>n</i> =10)
	Cerebral anoxia = 3% ( <i>n</i> =10)
	Other = 9% ( <i>n</i> =30)
	Sample 3: ABI ( <i>n</i> =73)
	TBI = 54.8% ( <i>n</i> =40)
	Cerebrovascular accident = 24.7% ( <i>n</i> =18)
	Brain tumour = 2.7% ( <i>n</i> =2)
	Cerebral anoxia = 2.7% ( <i>n</i> =2)
	Other = 15.1% ( <i>n</i> =11)

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### Quality assessment summary off all measures

The COSMIN study quality table (Table 4) summarises the overall study quality (or pooled study quality) for each measure. Only one measure (NFI) achieved "high" quality of evidence in all areas of psychometric property assessed; The NFI assessed structural validity, internal consistency, and construct validity. All other measures were assigned a "low" or "very low" rating for the quality of evidence in at least one area which was assessed.

Measures assessed for PROM development and content validity were frequently rated with "low" (e.g., CBMT, MBPC-1990R, OBS) or "very low" (e.g., BAST $\beta$ , OAS-MNR, SASNOS, KSMS) quality of evidence due to not involving the staff, carer, or patient in determining comprehensibility or comprehensiveness of the measure. Measures assessed for structural validity and internal consistency were often rated as "moderate" (e.g., ILS, NTUIS, SASNOS) or "high" (e.g., ABS, MBPC-1990R, NFI, NPI, KSMS) quality of evidence. Measures assessed for reliability, construct validity and responsiveness were often rated "low" or "very low" due to statistical methods not being considered optimal by the checklist (e.g., BARS, ILS, OBS, OBS-SR), or a small sample size (e.g., ABS, ATTACKS, CBMT, CCB, NTUIS, NPI, OAS-MNR, OAS-MNR-E, SASNOS).

The COSMIN psychometric result quality table (Table 5) summarises the values and quality of each psychometric result (or pooled psychometric results) for each measure. Five measures were considered to have sufficient psychometric results for all areas measured; the BARS and OAS-MNR for reliability and construct validity, the NTUIS and MBPC-

1990R for internal consistency and construct validity, and the OAS-MNR-E for reliability. All twelve other measures and areas of psychometric property had values which did not meet the threshold for a sufficient value or did not report the values required for the COSMIN criteria, these are detailed in [Table 5](#).



**Table 4. COSMIN quality assessment: Overall study quality**

<b>Measure</b>	<b>Development</b>	<b>Content Validity</b>	<b>Structural Validity</b>	<b>Internal consistency</b>	<b>Reliability</b>	<b>Hypothesis testing for construct validity</b>	<b>Responsiveness</b>
ABS			High	Moderate	Low	Very low	
Attacks				Low		Low	
BAST $\beta$	Very low	Moderate					
BARS					Moderate	Low	
CBMT	Low	Low			Very low		
CCB					Very low	Low	
ILS			Moderate		Very low		
MBPC		Low		High		High	
1990R							
NTUIS				Moderate		Low	
NFI			High	High		High	

NPI			High	Moderate			Low
OAS-MNR	Very low				Very low	Low	
OASMNR-E					Low		
OBS	Low				Very low	Very low	Very low
OBS-SR					Low	Very low	
SASNOS	Very low	Low	Very low	Moderate	Low	Low	High
KSMS	Very low			High	Very low	Moderate	Moderate

**Table 5. COSMIN quality assessment: Pooled psychometric results, number of studies, and result quality.**

	<b>Structural Validity</b>	<b>Internal consistency</b>	<b>Reliability</b>	<b>Hypothesis testing for construct validity</b>	<b>Responsiveness</b>
<b>Measure</b>	<b>Result, no. of studies, &amp; quality</b>	<b>Result, no. of studies, &amp; quality (Chronbachs alpha)</b>	<b>Result, no. of studies, &amp; quality (ICC or Kappa)</b>	<b>Result, no. of studies, &amp; quality (correlation coefficient)</b>	<b>Result, no. of studies, &amp; quality</b>
ABS	Rho value = .85 1 -	a = .801 to .921 2 +	No ICC or Kappa. 3 ?	(1) $r = .424 - .787$ 2 -	
Attacks		a = .38. 1 -		(1) $r = .50$ (2) $r = .39$ 1 +	
BAST $\beta$					
BARS			ICC = .92 1 +	(3) $r = .15.$ and $.22$ 1 +	
CBMT			No ICC or Kappa. 1 ?		
CCB			No ICC or Kappa. 1 ?	(1) $r = .468$ to $.638$ 1 +	
ILS	KMO = .94, BTS 1 ?  $p = .00.$ $R^2 = .77 -$  $> .85$		No ICC or Kappa. 1 ?		
MBPC		a = .69 to .80 1 +		(1) $r = .70$ to $.78$ (3) 1 +	
1990R				$r = -.02$ (2) $r = .24$ to $.56$	

NTUIS			a = .92	1	+		(1) r = .54, (3)	1	+	
							(2) r = .05			
NFI	CFI .86 to .93.	2	-	a = .79 to .95	3	+	(1) r = -.34 to .65.	3	-	
	RMSEA .08 to .12						(2) r = -.50 to .26			
NPI	CFI .977 to .991	infit	1	?	a = .758 to .914	1	+			d from -1.32 to -
	outfit	0.84 to 1.5								2.30.
OAS-MNR				Kappa .742 to 1.0	1	+	(1) r = .50 (2) r = .39	1	+	
OASMNR-E				Kappa .772 to .977	1	+				
OBS				No ICC or Kappa.	1	?	(1) r = .37 to .66	1	-	No effect size
OBS-SR				ICC .689	1	-	(1) r = .37 to .61	1	-	
SASNOS	Infit/outfit values	0.7	1	?	a = .62 to .93	1	+	ICC .59 to .96.	1	+
	to 1.3						(1) r = -.3 to .71	1	-	Effect size 0.71 to
							(3) r = .31			1.05
KSMS				a = .77 to .92	1	+	No ICC or Kappa.	1	?	(1) r = -.2 to .68.
										d = 0.34 to 0.81
										1
										?

Result quality; + = sufficient, ? = indeterminate, required values not reported and - = insufficient. Required values; Structural Validity: factor analysis, CFI >.95, RMSEA <.06, Rasch: Same as factor analysis, and residual correlations <.2, and adequate graphs or item scalability >.3, and infit/outfit mean squares  $\geq .5$  and  $\leq 1.5$  or Zstandardized values > -2 and <2 Internal Consistency: Chronbachs Alpha >.70 for all subscales Reliability: ICC or weighted kappa values >.70, correlations not sufficient Construct validity: correlations of >.50 with measures which are expected to relate (1), and <.30 for measures which are related but dissimilar (2), and <.30 for unrelated measures (3). Responsiveness: Area Under the Curve or effect sizes describing values which would constitute a good effect size

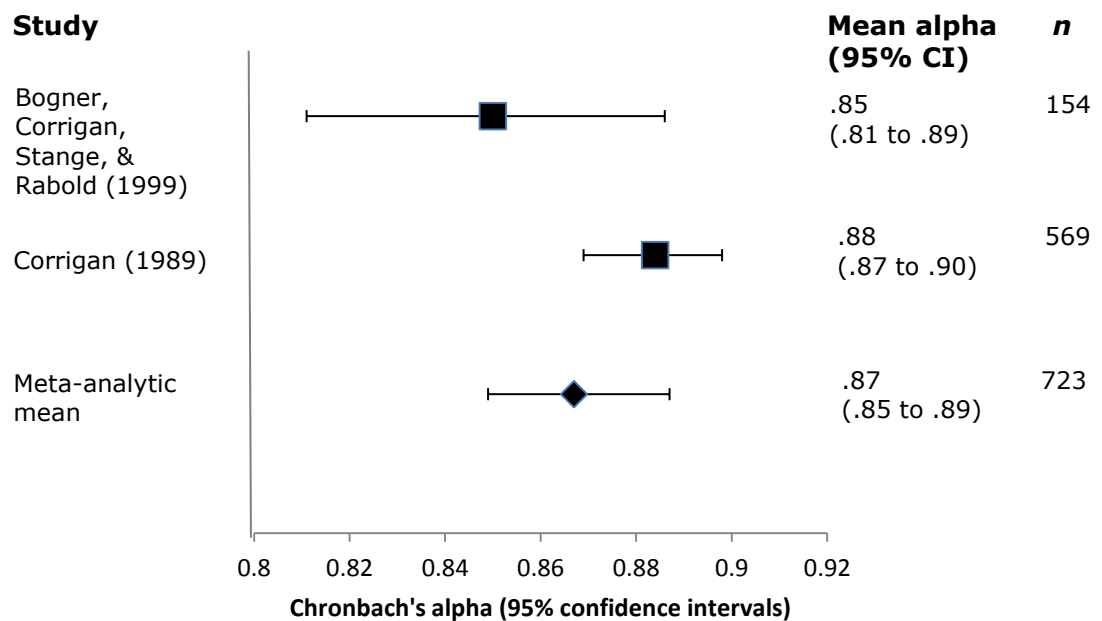
## Meta-analysis

A meta-analysis was conducted where multiple studies assessed the same psychometric property of the same measure. The majority of measures included in this review were assessed with a single study (13 measures), or multiple studies assessing different psychometric properties (two measures). Meta-analysis of multiple studies assessing the same psychometric property was possible on two measures (ABS and NFI). In total, five meta-analyses were completed on these measures, synthesising studies assessing the ABS (internal consistency, reliability, and construct validity) and the NFI (internal consistency and construct validity).

## ABS

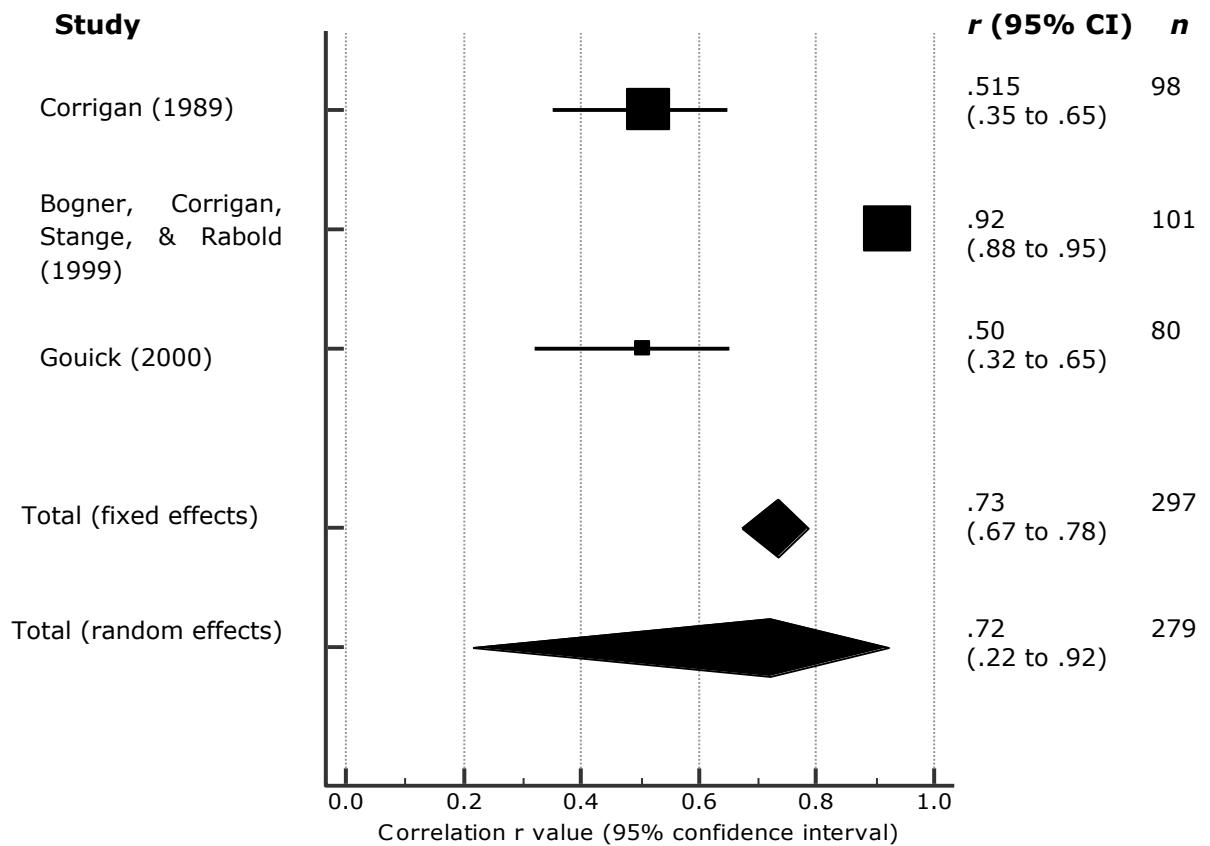
A meta-analysis of internal consistency estimates using Chronbach's alpha values was conducted. Two studies assessed internal consistency of the ABS. As the ABS is an observational measure, the number of observations are reported in each study as  $n$ . The alpha values had a meta-analytic mean of .87, 95% CI [.85, .89], ( $n = 723$ ). The alpha values and confidence intervals for studies are displayed in Figure 2. As Chronbach's alpha values above .70 are considered acceptable (Mokkink et al, 2018), this meta-analysis demonstrates good evidence of internal consistency of the ABS.

Figure 2. Forest plot of meta-analysis of ABS studies assessing internal consistency.



A meta-analysis of reliability using correlation coefficients between raters was conducted. Three studies assessed inter-rater reliability of the ABS. The  $I^2$  statistic was 96.96%, 95% CI [93.86, 98.49] indicating heterogeneity was present, therefore the random-effects model was used for meta-analysis. The pooled correlation coefficient under the random-effects model was .72, 95% CI [.22, .92]. This is displayed in Figure 3, along with  $r$  values and confidence intervals for each study. As correlation coefficients above .50 are considered large (Cohen, 1988), this meta-analysis demonstrates good evidence of the inter-rater reliability of the ABS.

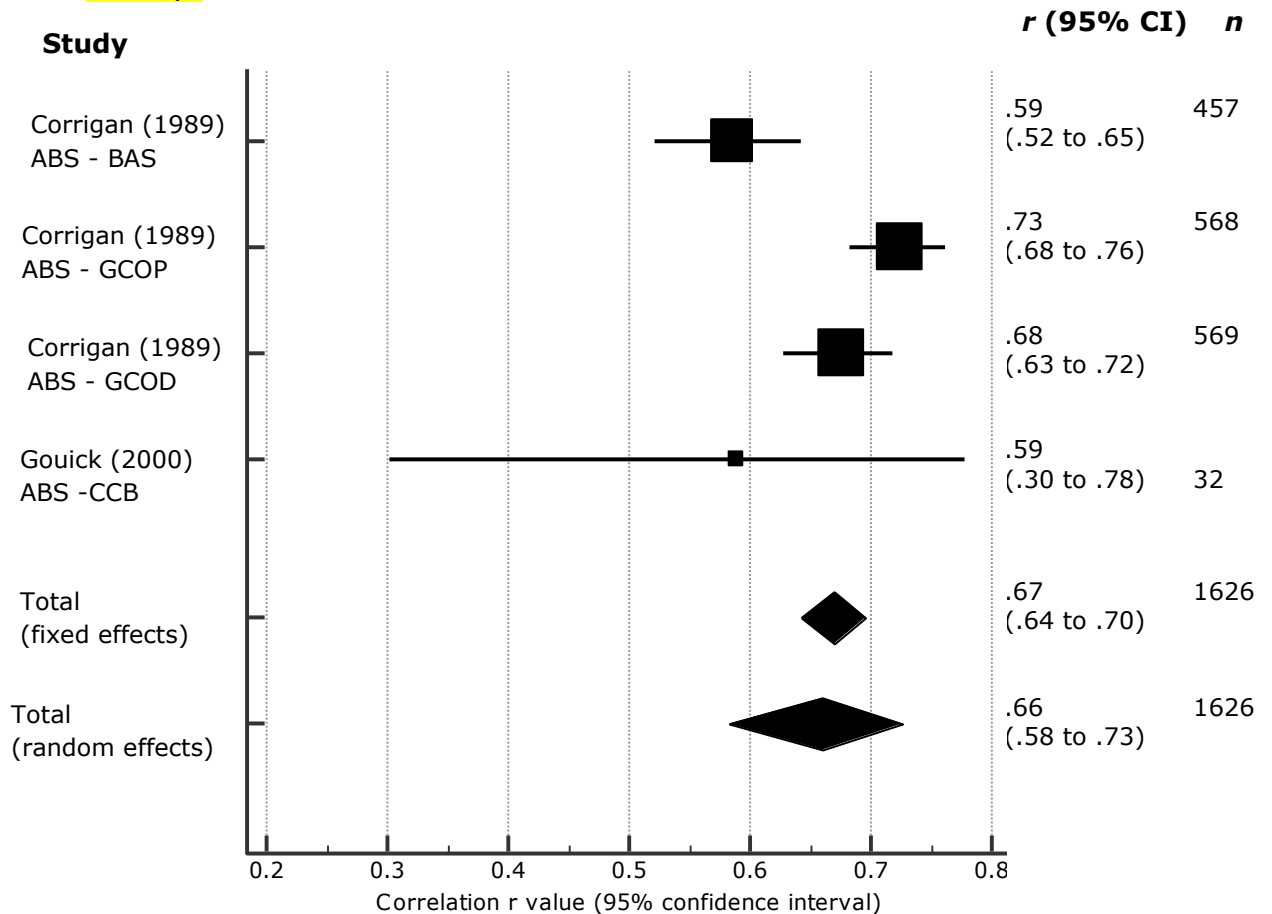
Figure 3. Forest plot of meta-analysis of ABS studies assessing reliability



A meta-analysis of construct validity using correlation coefficients was conducted. Two studies assessed construct validity of the ABS. Pearson Product-Moment Correlation Coefficients were reported, comparing the ABS to four related measures, the Baintree Agitation Scale (BAS), a 10 point global comparison with other patients (GCOP), a 10 point global comparison with other days (GCOD), and the Checklist of Challenging Behaviour (CCB). The  $I^2$  statistic was 81.16%, 95% CI [50.79, 92.79] indicating heterogeneity was present, therefore the random-effects model was used for meta-analysis. The pooled correlation coefficient under the random-effects model was .66, 95% CI [.58, .73]. This is displayed in Figure 4, along with *r* values and confidence intervals for each study and comparison measure. As correlation coefficients above .50 are considered

large (Cohen, 1988), this meta-analysis demonstrates good evidence of the construct validity of the ABS when compared against related measures.

Figure 4. Forest plot of meta-analysis of ABS studies assessing construct validity.



Overall, this meta-analysis demonstrates good internal consistency, inter-rater reliability, and construct validity of the ABS when used with adults in the acute phase of recovery with ABI. It is however noted that the study quality this is based on when assessed using the COSMIN criteria were considered to be "low" and "very low" quality, for reliability and construct validity. The studies assessing internal consistency had "moderate" quality of evidence.



## NFI

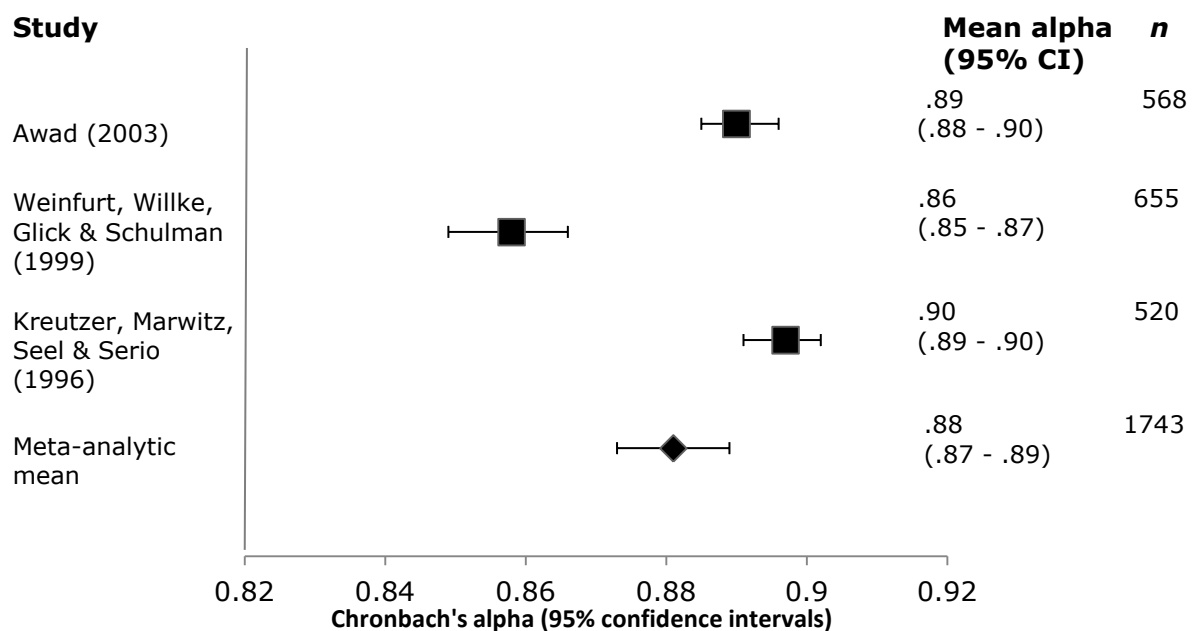
A meta-analysis of internal consistency estimates using Chronbach's alpha values was conducted. Three studies assessed internal consistency of the NFI. The alpha values for NFI factors, and the overall mean for each study is displayed in Table 6. When mean alpha values for NFI factors for each study were input into meta-analysis, the alpha values had a meta-analytic mean of .88, 95% CI [.87, .89]  $n = 1743$ . This is displayed in Figure 5, along with alpha values and confidence intervals for each study. As Chronbach's alpha values above .70 are considered acceptable (Mokkink et al, 2018), this meta-analysis demonstrates good evidence of internal consistency of the NFI.

Table 6. Chronbach's alpha values for NFI subscales, and overall mean, in each study.

Study	Factor	Chronbach's alpha	n
Kreutzer, Marwitz,	Depression	.93	520
Seel & Serio (1996)	Somatic	.86	520
	Memory/attention	.95	520
	Communication	.88	520
	Aggression	.89	520
	Motor	.87	520
	Total average	.90	520
Weinfurt, Willke,	Cognitive deficits	.92	655
Glick, & Schulman (1999)	Depression	.92	655
	Aggression	.79	655

	Somatic	.8	655
	Total average	.86	655
Awad (2003)	Depression	.93	568
	Somatic	.83	568
	Memory/attention	.95	568
	Communication	.88	568
	Aggression	.87	568
	Motor	.88	568
	Total average	.89	568

Figure 5. Forest plot of meta-analysis of NFI studies assessing internal consistency.

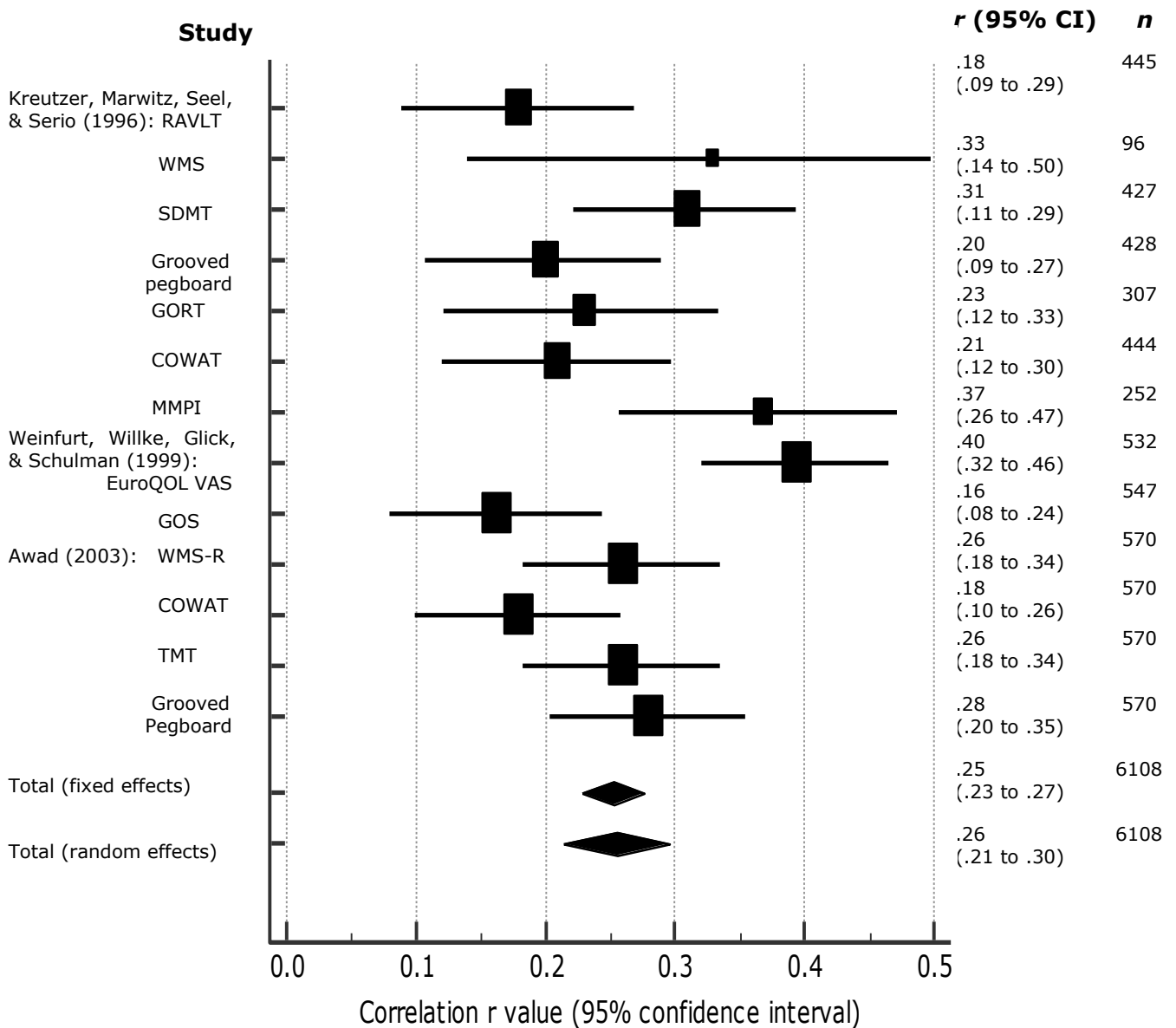


A meta-analysis of construct validity using correlation coefficients was conducted. Three studies assessed construct validity of the NFI. Pearson Product-Moment Correlation Coefficients were reported, comparing the

NFI to eight related measures, the Minnesota Multiphasic Personality Inventory (MMPI), the Euroqol Visual Analogue Scale (Euroqol VAS), the Glasgow Outcome Scale (GOS), the Wechsler Memory Scale-Revised (WMS-R) logical memory test, the Controlled Oral Word Association (COWAT), the Reitan Trailmaking Tests (TMT), and the Grooved Pegboard Test. The NFI communication scale has also been compared to tests of neuropsychological functioning; the Ray Auditory Verbal Learning Test (RAVLT), the Wechsler Memory Scale (WMS), Symbol Digit Modalities Test (SDMT), the Grooved Pegboard Test, the Gray Oral Reading Test (GORT), and the Controlled Oral Word Association (COWAT). The  $I^2$  statistic was 64.21%, 95% CI [35.2%, 80.23%] indicating heterogeneity was present, therefore the random-effects model was used for meta-analysis. The pooled correlation coefficient under the random-effects model was .26, 95% CI [.21, .30]. This is displayed in Figure 6, along with  $r$  values and confidence intervals for each study and comparison measure. As correlation coefficients between .1 to .3 constitute a small effect size (Cohen, 1988), this meta-analysis does not support the construct validity of the NFI when compared against related measures.

Overall, this meta-analysis demonstrates good internal consistency of the NFI, however does not demonstrate sufficient construct validity of the NFI when used with adults with TBI. The quality of the studies this is based on, when assessed using the COSMIN criteria, were considered to be "high" for both internal consistency and construct validity.

**Figure 6. Forest plot of meta-analysis of NFI studies assessing construct validity.**



**Notes: Kreutzer, Marwitz, Seel, and Serio (1996) RAVLT, WMS, SDMT, Grooved Pegboard, GORT, and COWAT are compared with NFI communication scale only. The remainder of studies compared measures with total NFI scores.**

## Discussion

This systematic review identified 17 different validated measures of aggression in adults with ABI. Only four of the included measures assessed aggression alone, with the remaining 13 measures assessing a number of areas of behaviour and functioning, which included aggression. Measures varied from observational measures, informant-reports, and patient self-reports and were validated across a range of different settings including inpatients units, and community settings. The majority of work was conducted in the UK and USA. Quality of measurement tools as judged by the COSMIN was often low with the MBPC-1990R, NFI, SASNOS, and KSMS being most valid with high quality evidence and sufficient psychometric properties demonstrated in at least one area. Reasons for low quality included; low sample sizes, lack of optimal statistical methods used, or not involving users in the development process.

Meta-analysis was possible on two measures (ABS and NFI), synthesising data to reach an overall effect size, pooled from multiple studies. Results were pooled for three studies assessing psychometric properties of the ABS, achieving an overall effect size for each property which demonstrated good internal consistency, inter-rater reliability, and construct validity. Whilst the internal consistency was pooled using studies of moderate quality, reliability and construct validity was pooled using studies assessed as low and very low quality using the COSMIN criteria. The pooled results of the psychometric property may be different from the true result, and further high quality studies are required. Results were pooled for three studies assessing psychometric properties of the

NFI, with an overall effect size supporting good internal consistency, however, construct validity of the NFI was not sufficient. This pooled result was found using three high quality studies when assessed using the COSMIN criteria, therefore the pooled results are likely to reflect the true psychometric properties of the NFI. This means the factors of the NFI had good internal consistency, however when compared against scores on other known related measures for construct validity, scores were not sufficiently related. It is noted that the comparator measures used did not reflect the full range of factors measured in the NFI, which may explain the low correlations. The remaining measures assessed psychometric properties using a single study, further research validating these measures is required for meta-analysis.

These results reflect the findings of the systematic review regarding the internal consistency, and construct validity of the NFI, and the internal consistency of the ABS. Some differences were found between the systematic review and meta-analysis. The reliability of the ABS was considered indeterminate in the systematic review, however, the meta-analysis, using correlation coefficients, demonstrated good reliability. The reason for this was that ICC's or Kappa values were not calculated in the included reliability studies, instead reporting correlation coefficients, which do not take into account systematic error, and are not considered sufficient in the COSMIN criteria used in the systematic review. These correlation coefficients can, however, be synthesised in meta-analysis. The construct validity of the ABS was considered insufficient in the systematic review, due to a number of correlations below the sufficient range (<.50), however when these correlations were pooled in meta-

analysis, the pooled correlation was in the sufficient range (.66). A large amount of this variance came from one smaller study. This demonstrates the impact of synthesising data from multiple studies.

*What types of aggression were measured?*

There was some variation in how aggression was defined. Most measures included verbal aggression, physical aggression towards objects, and aggression towards other people, with 11 out of 19 measures (57.9%) also measuring self-directed aggression. This finding was unexpected as self-directed aggression is often overlooked in literature, with only 36% of studies measuring aggression in inpatient settings including self-harm in their definition (Bowers, et al, 2011). This may be explained by a number of measures in this review basing their items on the criteria used in the Overt Aggression Scale (Yudofsky, 1986) which includes self-directed aggression. Some measures were developed for specific types of aggression such as interpersonal physical aggression (ATTACKS) and verbal aggression (NTUIS). A smaller number of measures also assessed sexual aggression (e.g., unwanted touching) as a sub-scale as part of a broader measurement of aggression (BAST $\beta$ , CCB, ILS). The limited measures which included this would suggest that sexual behaviours may be seen as relating to aggression but are not typically classed as aggression when assessed using these measures, or when defining aggression in the literature (Bowers, et al, 2011). This was therefore not covered within the definition in this review.

Although there were a variety of measures, the majority of these assessed aggression as a component of a complex presentation of other

symptoms and behaviours such as cognitive and emotional symptoms, rather than assessing aggression alone. A previous systematic review with TBI reported similar findings (Cusimano, Holmes, Sawicki, & Topolovec-Vranic, 2014). This reflects how aggression is only one of the many reported cognitive, behavioural, and emotional outcomes following ABI (Carroll et al, 2014; Levack, Kayes, & Fadyl, 2010). The limited number of measures available that were designed to assess aggression alone (e.g., ATTACKS, BARS, OAS-MNR, and OAS-MNR-E) were all observational measures to be completed by staff. Whilst these require minimal completion time, observational measures are not always appropriate. An aggression-specific measure is not available in self- or informant-report, thus the few measures that are available are not suited to all uses. In patient or informant self-report, aggression is measured among other symptoms, and the length of the measures can vary. In some cases, aggression is only a small component of the full scale, which should be considered when selecting a measure.

*What settings can these measures be used in?*

In inpatient and residential settings, there was a trend for use of aggression measures completed by staff either through observation or through a questionnaire or checklist. Staff are available in these settings to observe and record incidents, thus this is a pragmatic method to assess a patient's level of aggression. This review found five observational measures of aggression for use in inpatient settings (ABS, Attacks, BARS, OAS-MNR, and OAS-MNR-E), and four staff-informant measures (CBMT, CCB, ILS, and SASNOS). Inter-rater reliability has been



evidenced as sufficient in these measures when assessed, indicating that different staff raters often make the same judgements. Observational measures can be criticised for underreporting of incidents by staff when occurring frequently (Paxton, Anslow, Milne, & Grant, 1997). For example, a busy inpatient unit may struggle to document all observations of aggression, thus these could be used in conjunction with a staff-informant measure to capture overall aggression.

Within community settings, only one staff-informant measure (OBS) was identified. Staff presence is limited in community settings making staff-informant measures difficult to complete with fewer observation opportunities, instead, aggression tended to be measured through self or carer-informant report. Carer-informant questionnaires can be completed by someone who knows the individual well and who can offer insight into the individual's behaviour. One carer-informant questionnaire was identified in this review (MBPC-1990R) and three with both carer and self-report versions (NTUIS, NFI, and NPI). One of which included a measurement of the impact of the behaviour on the carer (MBPC-1990R). It is noted however that this level of impact could potentially be a cause of bias where behaviours may be rated as more problematic (Malec, Machulda, & Moessner, 1997). Using this alongside other measures such as patient self-report could help reduce this bias.

Patient self-report questionnaires (BAST $\beta$ , OBS-SR, and KSMS) have the advantage of being able to assess the individuals' own perception of aggression. Some have both carer and self-report versions (NTUIS, NFI, and NPI), however when comparisons are made, varied and often low

levels of inter-rater agreement have been found (Kelly, Simpson, Brown, Kremer, & Gillett, 2017). The inter-rater agreement varied dependent on the individual's awareness levels, suggesting this is a form of bias in self-report measures. Other research has demonstrated a similar lack of concordance between self and others reports of aggression (Dyer, Bell, Mccann, & Rauch, 2006; Hart et al, 2003). This finding is not unexpected as patient self-report scales reflect patients' inner thoughts and feelings regarding their aggression, whereas an observer/informant measure reflects observable aggressive behaviours. Patients' inner thoughts may not be known to an observer, and patients' observable behaviours may not be accurately recorded by the patient themselves, which would explain the low levels of inter-rater agreement. This may be the case after sustaining an ABI if lacking awareness or insight into their difficulties and behaviours, lacking memory, or if in denial of less desirable behaviours such as aggression (Dyer, Bell, Mccann, & Rauch, 2006). This would suggest that in some cases, self-report measures of aggression used with individuals with ABI may not be accurately assessing aggressive behaviours. This could potentially impact the results of validity studies, particularly where self-report measures may be compared against informant-report or observational measures (e.g., for inter-rater reliability as seen in the OBS/OBS-SR) and also lead to underreporting of difficulties when used in practice. It may be more appropriate when selecting a self-report questionnaire, to consider use of an informant questionnaire where possible to obtain a more accurate reflection of an individual's aggression.

A previous systematic review published in 2014 (Cusimano, Holmes, Sawicki, & Topolovec-Vranic, 2014) identified six measures of aggression for use in people with TBI. The current review expands on this with the addition of more recent measures for use in people with TBI (e.g., BAST $\beta$ ), additional measures for use with people with TBI which were not identified/included in the previous review (e.g., ABS, ILS, NTUIS, NPI: reasons unclear) and additional measures suitable for use in people with ABI (e.g., ATTACKS, BARS, CBMT, CCB, MBPC-1990R, OAS-MNR, OAS-MNR-E, OBS, OBS-SR, SASNOS, KSMS). The additional measures which are validated in patients with ABI consisted of samples with a variety of injury types, with the most frequent being TBI, however other types of brain injury such as cerebrovascular accident, hypoxia, anoxia, and infections were also commonly included.

Although the current review identified 17 measures, only one measure was included in both reviews (NFI). The current review used different inclusion and exclusion criteria, and a different definition for aggression. The current systematic review also excluded studies in which the aggression component of the measure comprised of an assessment of anger, rather than behavioural displays of aggression (verbal aggression or physical aggression). Indeed, for this reason one of the studies identified in the previous review was excluded (Psychosocial Outcome Risk Indicator; Watts & Perlesz, 1999). Measures were also excluded where the definition of aggression was unclear, such as when a description was not provided detailing the factors or items, where it was not possible to determine if the inclusion criteria were met. For this reason four of the studies identified in the previous review were excluded

(Katz Adjustment Scale; Barker, Schmidt, Heinemann, Langley, & Miranti, 1998; Minnesota Multiphasic Personality Inventory - 2; Palav, Ortega, & McCaffrey, 2001; Personality Assessment Inventory; Till, Christensen, & Green, 2009; Ruff Neurobehavioural Inventory; Johansson, Jamora, Ruff, & Pack, 2008).

#### *Limitations and future directions*

The current review and meta-analysis used a wide search criteria with over 5,000 articles reviewed for inclusion. Hand searching of review articles and exploration of grey literature made it less likely for measures to have been missed. This review is, therefore, likely to reflect the current literature on validated assessment measures for aggression in people with ABI.

A specific definition of aggression was adhered to in this review. Several measures which assessed aggression with a single question amongst other factors were excluded using this criterion, as well as measures of factors loosely related to aggression such as anger. Measures of related concepts would therefore not be captured in this review.

A wide variety of assessment measures was identified, however this review highlights the limited research investigating psychometric properties of the current measures, with the majority being limited to one study validating the measure in an ABI population with many psychometric properties not being assessed. This limits the ability to determine a tool's validity in the ABI population as the included studies were often limited by small sample sizes, potential for bias, and lacked

the required methodology or statistics for **evaluating** the psychometric **properties**.

Research within this area is ongoing and would benefit from further validation of the current measures to enable clinicians to identify the more appropriate measures to use when assessing aggression. Authors of the current measures have identified further work such as confirming the factor structure of the BAST $\beta$  along with further validity testing (Juengst, Terhorst, Dicianno, Niemer, & Wagner, 2018) and ongoing projects revising and validating the SASNOS.

#### *Applying findings to clinical practice*

Due to the variety of constructs which are measured and the mixture in quality of evidence, it is not practical to recommend a specific tool for use across all settings. Instead, a clinician should consider the types of aggression and other behaviours that are relevant to assess and select a tool based on this. Some measures such as the MBPC-1990R, NFI, SASNOS, and KSMS did demonstrate positive results for psychometric properties in areas where high quality evidence was used. These should be used with caution due to the limited number of studies and psychometric properties assessed. In an inpatient setting, a measure such as the OAS-MNR/OAS-MNR-E or the BARS may be useful for staff as a way of documenting and monitoring incidents of aggression as they occur. These measures have the advantage of having good evidence for reliability between raters. The ABS demonstrated good evidence of internal consistency which could be used where agitation and aggression are relevant to record.

For lengthier assessment of aggression and other areas of functioning, a number of measures with good internal consistency were identified. A self or informant report tool such as the NFI or the NPI could be of use, the NPI through its screening approach allows for a larger number of areas to be assessed in fewer questions. Shorter measures which assess multiple areas such as the KSMS could be used as a self-report, or the NTUIS as a self- or informant-report where irritability and verbal aggression is relevant to record. The MBPC-1990R could be used for an informant to document the frequency and impact of a number of problem areas. The SASNOS had the highest number of psychometric properties assessed, achieving good evidence for internal consistency, reliability, and responsiveness. Although quality of evidence was rated low in some areas, this was due to a small sample size. Remaining areas within the COSMIN checklist were often rated as adequate, indicating the SASNOS may be a helpful tool for staff assessing aspects of neurobehavioural disability in inpatient settings. When selecting a specific type of measure, the limitations of the measure type should be considered. Most accurate information regarding aggression would be obtained by a combination of observational, self, and informant reports.

### *Conclusions*

In conclusion, a wide variety of measures are available to assess aggression in adults with ABI, with tools available for use in community and inpatient settings that capture a number of facets of aggression. This review and meta-analysis highlights that, although a number of measures exist, there is a lack of well validated measures within this population

which has resulted from a small number of, often low quality, studies assessing limited aspects of validity. Some assessment measures demonstrate good evidence of some aspects of validity (e.g., MBPC-1990R, NFI, SASNOS, and KSMS), although further research to validate these measures would be required. The following chapter will provide a detailed critique of one measure, the OAS-MNR, which is the only identified measure to include assessment of antecedents to aggressive incidents. This will provide a more detailed evaluation of its reliability and validity, and look at how this measure can be used to assess aggression in practice.

## **Chapter Three**

### **A critical evaluation of the Overt Aggression Scale- Modified for Neurorehabilitation**



## Introduction

As we have seen in chapter two, The Overt Aggression Scale Modified for Neurorehabilitation (OAS-MNR; Alderman, Knight, & Morgan, 1997) is a measure that can be used to capture information about patient aggression. The OAS-MNR was designed as an observational measure of aggressive behaviours in people with brain injury in neurobehavioural units, which can be used routinely by hospital staff to capture specific information about observed behaviours, allowing for monitoring of aggression throughout treatment to track progress. A strength of the OAS-MNR is that it does not rely on self-report, as people with ABI often have reduced insight into their behaviour which can impact on accuracy of self-reports (Hart, Seignourel, & Sherer, 2009; Sherer et al, 2003).

A review of the literature found a lack of standardised data on aggressive behaviours in brain injury, there was also an absence of measures to record and quantify these behaviours. As such, Alderman, Knight and Morgan (1997) developed the OAS-MNR. The scale was modified from the Overt Aggression Scale (OAS) developed by Yudofsky, Silver, Jackson, Endicott, and Williams (1986) which is an observational measure of aggressive behaviours in psychiatric settings. The OAS-MNR modified the OAS by providing a method of classifying aggressive behaviours for use in neurorehabilitation.

It was outlined in chapter two, that the OAS-MNR is the only identified measure which assesses aggression along with the antecedents to the aggressive incident. Having a standardised method of classifying the antecedents to aggressive incidents is important as it allows for

functional analysis of aggressive incidents to be facilitated (Alderman, Knight, & Morgan, 1997). A functional analysis is a method of understanding the function of a behaviour, by assessing the external events in the environment which precede a behaviour, and examining how these maintain the behaviour (Sturmey, 2007). These external events, or antecedents, can then be modified to assess the impact on the behaviour, with the aim of modifying the behaviour to a more desirable response, which forms the basis of behaviour therapy approaches (Alderman, 2003). The neurobehavioural approach used in ABI services integrates these behavioural therapy principles with neuropsychological principles to address symptoms and behaviours arising from ABI, including aggression (Alderman, 2003). Direct observation plays an important part in functional analysis of behaviours in patients with ABI as self-report, through questionnaires or interviews, can be impacted by lack of insight or bias (Sturmey, 2007). This makes the recording of aggressive behaviour, its antecedents and interventions used, especially relevant when assessing and planning behavioural interventions with patients with ABI. The OAS-MNR was therefore developed as a standardised tool to meet this purpose.

#### Background of the OAS-MNR

To set the context for the OAS-MNR, the Overt Aggression Scale (OAS) (Yudofsky, Silver, Jackson, Endicott, & Williams, 1986) and its development will first be described. The OAS was initially developed as a rating scale to objectively measure aggression in adults and children in psychiatric settings. At the time of its development many scales

measured angry feelings and reactions using self-report questionnaires, but scores on these scales often did not correlate with observable aggressive behaviour (Edmunds, 1976). The authors developed the OAS to quantify the number, type, and severity of overtly aggressive behaviours.

In the OAS, aggressive behaviours were divided into four categories; verbal aggression, and physical aggression against objects, self, and other people. Within each category of aggression, a rating was made for severity by selecting the appropriate rating from a list of behaviours. For example, physical aggression against other people varied from the least severe rating of "makes threatening gesture, swings at people, grabs at clothes" to the most severe rating of "attacks others, causing severe physical injury". The date, time, and duration of an incident were also recorded on the scale, along with the interventions used to control the behaviour which were selected from a list, such as "talking to the patient".

The OAS demonstrated good inter-rater reliability, with Intraclass correlation coefficients between 0.72 – 1.0 in an adult psychiatric inpatient sample without brain injury (Yudofsky, Silver, Jackson, Endicott, & Williams, 1986). The OAS has since been used in a number of studies such as Hellings et al, (2005) and Waite, Hillbrand, and Foster (1992) and is more effective in documenting incidents of aggression compared to hospital records (Silver & Yudofsky, 1991).

The OAS has been subject to two further modifications within psychiatric settings. For example, for the Modified OAS (MOAS; Kay, Wolkenfeld, &

Murrill, 1988), the authors changed the recording and scoring procedure, and removed the intervention categories. In the OAS-Modified (OAS-M; Sorgi, Ratey, Knoedler, Markert, & Reichman, 1991), the authors recorded behaviours over the previous week instead of following each behaviour.

### The OAS-MNR

In 1997, the OAS was modified for use in neurorehabilitation settings specifically for people with ABI. The aim of the OAS-MNR was to provide a standardised classification of aggression, and to assist in functional analysis of aggression. The definition of aggression in the OAS-MNR remained the same as in the OAS. Specifically, this includes verbal aggression, and physical aggression towards objects, self or others. As with the OAS, the function of the OAS-MNR is to document the type and severity of an incident, with severity rated from one to four. In reviewing the literature on brain injury and aggression, Alderman, Knight, and Morgan (1997) noted there was a particular lack of information in the literature regarding antecedents and responses to aggression, which is a requirement for analysis of behaviour. The main modification to the OAS scale therefore involved adding a range of 18 antecedents which were observed could precede an incident of aggressive behaviour, such as "noisy environment". Each of these were given a numbered code between one to 25 to record on a rating sheet. An "other" category was included to document an antecedent not stated on the list. The OAS-MNR was designed so that multiple antecedents and interventions may be recorded and listed on the rating sheet in order of occurrence. The range of

possible interventions to manage the aggressive behaviour was extended from the OAS from 11 to 14, to reflect strategies used in neurorehabilitation. These were each assigned a code for recording on the rating sheet.

The OAS-MNR has since been extended by Giles and Mohr (2007), to create the OAS-MNR-E which is also used to measure aggression within neurorehabilitation, with language adapted for the US. The main additions included adding a "where" section to 13 possible locations where the incident took place, adding an "outcome/resolution" section indicating how the incident was resolved, and one item "reassurance" was added to the intervention categories. The type, severity of aggression, and antecedents remain identical to the OAS-MNR.

This review aims to examine the OAS-MNR in terms of: a) its psychometric properties, b) its practical use of measuring aggression for research purposes, and c) its practical use of measuring aggression in clinical practice.

#### How will the OAS-MNR be evaluated?

The OAS-MNR will firstly be evaluated for its psychometric properties as an aggression rating scale, in particular its reliability between raters, and validity. Secondly, as the scale was developed to provide a standardised classification of aggression, this chapter will review the use of the OAS-MNR in the scientific literature to determine whether standardised recording is successful, and what this can add to our academic understanding of aggression in people with ABI. The final section will

discuss the clinical use of the OAS-MNR, and how this can facilitate analysis of behaviour through case studies.

Although the OAS-MNR-E is a more recently modified scale, this chapter will focus on evaluation of the OAS-MNR due to its routine use within ABI settings within the UK which has been evaluated for both reliability and validity, however reference will be made to the OAS-MNR-E and its use within research due to its overlap with the OAS-MNR.

## **Psychometric properties of the OAS-MNR**

### Reliability

As outlined in chapter two, reliability of a measure refers to whether two different raters would record the same outcome (inter-rater) or whether the same outcome would be recorded on two occasions (test-retest). As the OAS-MNR is an observational scale, test-retest reliability is not relevant as observations at different time points would not necessarily be expected to relate. However, as this measure is completed by different observers, it is important to establish whether staff who observe the same incident would provide the same rating, making inter-rater reliability relevant.

In determining inter-rater reliability of categorical data, Cohen's Kappa is an appropriate statistic as it takes into account the probability of the agreement occurring by chance. This value can range between -1 and +1, with values between 0.61 - 0.81 interpreted as "substantial agreement" and 0.81 - 1.00 as "almost perfect agreement" (Cohen,

1960). These criteria will be used in interpreting the inter-rater reliability of the OAS-MNR.

To demonstrate inter-rater reliability, 18 participants with brain injury (type not specified) were observed in a high dependency ward in the UK (Alderman, Knight, & Morgan, 1997). Fifteen of these participants were observed in person over a four-week period, two were observed via video recording, and one through clinical notes. Two observers witnessed aggressive behaviour on the ward and completed the OAS-MNR ratings independently. A total of 76 behaviours were observed and recordings made on the OAS-MNR. These ratings were compared and Kappa values calculated for each category (type of aggression, severity rating, antecedents, and intervention). The OAS-MNR demonstrated inter-rater reliability within the substantial and almost perfect range within each area. A Kappa value of 1.0 was obtained for the type of aggression rating, indicating perfect agreement between raters, the rating for severity obtained a Kappa value of 0.936, and intervention 0.952 indicating almost perfect agreement between raters. The antecedent category obtained a Kappa value of 0.742, however, when the antecedents were separated into events with a single antecedent and events with multiple antecedents selected, inter-rater reliability varied (0.944 vs. 0.638) suggesting reliability reduced as multiple antecedents were rated, although this was still within the substantial range.

This demonstrates that different raters observing the same aggressive behaviour often obtain the same rating on the OAS-MNR. It is noted however, that the two observers in this case were authors of the OAS-

MNR. This is significant because staff who use the OAS-MNR to record aggression on the ward are unlikely to have the same level of expertise in the measure as the authors. It is unclear what training is required for staff to use the OAS-MNR to this standard and having observers with different knowledge and experience could weaken inter-rater agreement. Whilst this demonstrates good evidence of inter-rater reliability of the OAS-MNR, this may not reflect reliability in practice.

### Validity

The validity of a scale refers to its ability to accurately measure the construct it was designed to measure. Several types of validity can be assessed in observational measures, but the OAS-MNR has only been assessed for convergent validity. Convergent validity reflects the ability to accurately measure the construct of aggression compared to other known measures of aggression.

To determine convergent validity, the OAS-MNR should be compared to results from a related scale. Relationship between scores on both scales can be calculated by correlating both scores using Pearson correlation coefficients. However, due to lack of standardised values which quantify the extent of convergent validity (Westen & Rosenthal, 2003), this evaluation will reflect the criteria suggested in the COSMIN methodology (Mokkink et al, 2018) detailed in chapter two. Correlations with instruments measuring similar constructs should be highest, equal to or above 0.50, correlations with instruments which are related but dissimilar should be lower than this (e.g. 0.30 - 0.50).



To determine convergent validity, 40 patients with ABI in a neurorehabilitation service were observed by clinical teams (Dickens, Alderman, & Bowers, 2011). Data were recorded using the OAS-MNR along with a measure of interpersonal physical violence, the Attempted and Actual Assaults Scale (ATTACKS). As described in chapter two, the ATTACKS is a clinician-reported scale which records the actual and attempted severity of physical assaults observed. A total of 1,066 incidents were recorded by staff on the OAS-MNR and 50 incidents on the ATTACKS scale.

Evidence of convergent validity was reported by correlating the overall severity score on the ATTACKS with the weighted severity score of the OAS-MNR, both measuring severity of incidents. A significant correlation of 0.50 was achieved ( $p < .01$ ) demonstrating evidence for convergent validity. The OAS-MNR intrusiveness of intervention score was compared with a related but dissimilar construct, the ATTACKS overall severity score. A lower but significant correlation of 0.39 was achieved ( $p < .01$ ), supporting evidence for the convergent validity of the OAS-MNR, and indicating that more severe physical assaults require more intrusive interventions to manage such as restraint of the patient.

It is relevant to note that in determining convergent validity of the OAS-MNR, only the severity and intervention scale have been assessed. Evidence of convergent validity is not provided for the type of aggression, or the antecedents. In chapter two, only a small number of tools were identified which objectively record aggression, with the OAS-MNR being the only identified tool which records antecedents to aggressive incidents.

This limits the ability to make comparisons against other known measures, making convergent validity of all aspects of the measure difficult to demonstrate.

### **How does the OAS-MNR contribute to standardised recording of aggression in the literature?**

To review the use of the OAS-MNR in standardised recording of aggression, research using the OAS-MNR and the OAS-MNR-E to record incidents of aggression in neurobehavioural services will be discussed.

Four studies have used the OAS-MNR in clinical settings to comment on aggression and its antecedents in people with an ABI (Alderman, Knight, & Morgan, 1997; Alderman, Knight, & Henman, 2002; Alderman, 2007; Dickens, Alderman, & Bowers, 2011). Four studies have used the OAS-MNR-E (Giles & Mohr, 2007; Giles, Wager, Fong, & Waraich, 2005; Kalapatapu, & Giles, 2016; Narevic, et al, 2011). It is worth noting that all studies using the OAS-MNR were completed in the same neurorehabilitation unit in the UK. Similarly, studies using the OAS-MNR-E were completed in two units in an ABI rehabilitation site in the US. Thus, while this provides us with detailed information about aggression in people with ABI within these settings, the generalisability of these findings are limited.

A finding that can be obtained through standardised recording with the OAS-MNR is the frequency of different types of aggressive behaviours. Studies using the OAS-MNR within the same setting demonstrate consistent findings regarding the frequency of behaviours (Alderman, Knight, & Henman, 2002; Alderman, 2007). For example, the most

common type of aggression reported is verbal aggression (73.7 – 77.2%), followed by physical aggression towards others (11.3 – 13.1%), and physical aggression towards objects (7.9 – 8.5%). The least common behaviour is physical aggression towards self (3.6 – 4.7%) (Alderman, Knight, & Henman, 2002; Alderman, 2007).

If we compare frequency of type of aggression with findings using the OAS-MNR-E, results are less consistent. For example, only one study (Kalapatapu & Giles, 2016) found that verbal aggression was the most common type of aggression (65% of incidents), with the remaining three reporting physical aggression as the most common, up to 100% of incidents (Giles, Wager, Fong, & Waraich, 2005). These differences should be interpreted with caution, as while this could demonstrate different prevalence rates of behaviours, it could also reflect variance in recording styles across services.

The purpose of data collection may also make a difference in reporting. For example, when staff were instructed to record all aggressive behaviours for research purposes, verbal aggression was reported, with similar, or higher frequency than physical aggression (38.5 – 65% of incidents) (Giles & Mohr, 2007; Kalapatapu & Giles, 2016). Conversely, when analysing routinely collected OAS-MNR-E data, verbal aggression was infrequent (Giles, Wager, Fong, & Waraich, 2005; Narevic et al, 2011). When used in clinical practice, verbal aggression did not trigger an OAS-MNR-E recording, as staff were instructed to complete the OAS-MNR-E only for incidents of physical aggression towards peers or towards objects when significant property damage was caused (Giles, Wager,

Fong, & Waraich, 2005; Narevic et al, 2011), neglecting verbal aggression and more minor physical aggression. This likely reflects organisational views of aggression where more minor incidents are not considered relevant to record in the same way. These differences in the way the scale is completed across settings highlights how different services view and class aggression differently, which impacts on completion of OAS-MNR/OAS-MNR-E forms, and does not support standardised recording of aggression across the literature.

When looking at other components of the OAS-MNR and OAS-MNR-E, how antecedents are reported, and what type of intervention is used will likely be influenced by cross-clinic differences. Studies using the OAS-MNR again found consistent results in terms of the reported antecedents which often included; being given a direct verbal prompt to comply with an instruction (up to 27.6%), no obvious antecedent (up to 28%), and as a result of another verbal interaction such as a conversation (up to 25%). The most frequent intervention was consistently "aggression being ignored" by using "time out on the spot" (up to 85.5%) (Alderman, Knight, & Henman, 2002; Alderman, 2007). These findings are likely to reflect the preferred aggression management strategy used in this service. Antecedents reported in the OAS-MNR-E studies were more varied, with little consistency between studies which likely reflects how different types of incidents are reported. Similarly, interventions used to manage aggressive behaviours were less consistent than in OAS-MNR studies described above (Alderman, Knight, & Henman, 2002; Alderman, 2007). For example, Kalapatapu and Giles (2016) also found the most common intervention was to ignore aggression (up to 61.3% of

incidents), but Giles, Wager, Fong, and Waraich (2005) did not use this as an intervention in any of the incidents reported in the study. The authors concluded that differences between their findings and the findings from authors in the UK (Alderman, Knight, & Morgan, 1997) reflect differences in the ethos of the rehabilitation programme in which ignoring aggression is seen as unhelpful.

A consistent finding across studies using both scales is that regardless of the type of aggression being described, aggression in the majority of cases **could** be managed without the need for physically intrusive interventions. For example, in one study physical restraint was only used in 1.6% of incidents, and seclusion up to 0.08% (Alderman, Knight, & Henman, 2002). Other studies did not use this method at all (Giles & Mohr, 2007). Examining data from both the OAS-MNR and the OAS-MNR-E is therefore useful in telling us about preference for less intrusive means of managing aggression incidents in people with ABI in the UK and **the** US.

### **How can the OAS-MNR be used in clinical practice?**

The clinical use of the OAS-MNR will now be reviewed to consider how this assessment tool can facilitate analysis of behaviour in clinical practice.

All five studies describing the OAS-MNR in clinical practice have been conducted in the UK (Alderman, Davies, Jones, & McDonnell, 1999; Alderman, Bentley, & Dawson, 1999; Watson, 2001; Alderman, 2003;

Alderman, Knight, & Brooks, 2013). Several case studies demonstrate how the OAS-MNR can be used as a way of monitoring aggression, and case studies by Alderman, Bentley, and Dawson (1999), Alderman (2003), and Alderman, Knight, and Brooks (2013) use the OAS-MNR to demonstrate a reduction in frequency of aggression over a period of assessment and intervention. Watson (2001) described a case in which aggression recorded by the OAS-MNR was used as the primary outcome measure in a behavioural programme aiming to reduce challenging behaviour through positive reinforcement. Specifically, a reward was given when OAS-MNR aggression frequency count fell below a specified target range.

Within these case studies, it was notable that recording of antecedents allowed for monitoring of situations that were more likely to precede aggression. These in turn have been used to guide behavioural programmes. For example, Alderman, Davies, Jones, and McDonnell (1999) used the OAS-MNR to monitor aggression, and plan behavioural interventions. The OAS-MNR provided insight about the antecedents of this patient's aggression towards others. Specifically, aggression was most often preceded by members of staff verbally prompting the patient to carry out his hygiene tasks in the appropriate order (59.8%). The case study documents how, by recording the frequency and antecedents to aggression, it was possible to modify staff involvement with the patient's hygiene to reduce frequency of incidents. Examples of methods used were: minimising verbal prompts, or using visual prompts. The OAS-MNR was used to document incidents throughout each modification phase, with the recording of aggression and its antecedents informing the next

phase, until a reduction in incidents was seen. The OAS-MNR is therefore helpful in clinical work, providing a means of monitoring aggression and antecedents which can be used to directly influence management of patients to reduce incidents.

The OAS-MNR has also demonstrated utility in service evaluation. A performance indicator was developed using frequency and weighted severity score (Alderman, Knight, Stewart, & Gayton, 2011). When scores are combined and compared over time, patients median scores significantly reduced between the first three months of admission (407.5) and the last three months (212.7). This difference was statistically significant demonstrating that the OAS-MNR can be used in service evaluation as an indicator of reduction in aggressive behaviour through treatment.

### **Limitations**

The OAS-MNR can be criticised for the modifications of the scale, with unclear methods by which the additions of antecedent and intervention items were made. In chapter two, the OAS-MNR was assessed against the COSMIN criteria for PROM development (Mokkink et al, 2018) and given a "very low" rating. These criteria were adapted to reflect staff observational measures rather than PROM's, for example, testing the measure with staff observers, not patients, and asking staff rather than patients about the comprehensibility of the measure. In order to achieve a higher rating, data should be gathered on antecedents from interviews with clinicians, and involvement of staff respondents to develop items. It was unclear from the OAS-MNR development study (Alderman, Knight, &

Morgan, 1997) how antecedent and intervention items were added to the scale, and whether all the observed antecedents and interventions **could** be captured.

At the time of development, there was a general lack of published literature about antecedents to aggression in people with ABI. Since its inception, research in this area has progressed. Qualitative research examining staff-reported antecedents to aggression in patients with ABI found that many of the reported antecedents reflected those in the OAS-MNR such as "other clients behaviour" (Giles, Scott, & Manchester, 2013, **p. 743**). However several antecedents were not documented in the OAS-MNR including environmental factors such as "crowding/overstimulation" (reported in 16% of incidents), as well as factors intrinsic to the client such as symptoms of mental health problems "hallucinations, delusions, psychosis, mania, depression" (reported in 9% of incidents). These factors represent a **considerable** proportion of incidents in which antecedents may not be fully reflected in the OAS-MNR.

To demonstrate the relevance of intrinsic factors, a study by Giles, Wager, Fong, and Waraich (2005) found 60% of their sample with ABI manifested psychotic symptoms during the study period, with mental health concerns such as schizophrenia, bipolar disorder, schizoaffective disorder, major depression, and anxiety disorder. These mental health and environmental-related antecedents are not recorded on the OAS-MNR, and given the potential for high rates on mental health concerns within this population, this could potentially miss important antecedent data. An update on the antecedent categories may be required to reflect



new research in this area. It is possible however that observers may document antecedents within the "other" category when not included in the list, which was used for example by Kalapatapu and Giles (2016) to document mental health related antecedents. It would be beneficial for individual services to incorporate into their training consistent responses for documenting frequently used "other" antecedents to increase standardisation of recording.

## **Conclusions**

The OAS-MNR is a scale which can be used by staff to document details regarding observed incidents of aggression. At the moment, the OAS-MNR and its extended version, the OAS-MNR-E, are the only observational measures able to record antecedents to aggression, and the management of aggression validated in people with ABI. However, its reliability and validity testing is limited to two studies with small sample sizes, and reliability testing which **may** not reflect the use of the OAS-MNR in clinical practice. Validity of the scale may be difficult to establish due to limited comparator measures (assessing related concept). It is recommended further testing of both reliability and validity is conducted.

Authors have made the recording forms and instructions available meaning the measure is accessible for clinical use (Alderman, Knight, & Morgan, 1997). The OAS-MNR has demonstrated its clinical use in monitoring aggression during treatment. It has also demonstrated its use within research to increase understanding of aggression and its antecedents within ABI settings, although the antecedent list may not be fully inclusive of all observed antecedents, for example mental health

symptoms. This research is currently limited to a small number of studies, in only two clinical settings which limits generalisability to other settings. Research about aggression and antecedents in ABI settings is limited and would benefit from work demonstrating use of the scale to further understand aggression and its antecedents across different settings, and different countries and allow for comparisons within the literature. In particular, research in different settings would allow us to see how antecedents may differ, for example in different hospital settings.

A questionnaire based on the OAS-MNR will now be used to assess aggression and its antecedents in a UK forensic ABI hospital, a setting in which OAS-MNR data is lacking. Further antecedents based on more recent research will be included in this questionnaire to address the limited environmental and mental health related antecedents.

## **Chapter Four**

### **Perceived triggers to aggression in a secure forensic hospital: A quantitative study of staff working on an ABI ward**

## Abstract

**Background/Aims:** To use a modified version of the OAS-MNR antecedents to identify what staff working in a forensic ABI service report as patient triggers to aggression. To explore the role of co-morbid mental health problems in triggering aggression.

**Methods:** The OAS-MNR was modified to include antecedents related to the hospital environment and internal factors such as mental health. Fifty-seven staff members working in a secure hospital completed 82 questionnaires following incidents of patient aggression (verbal, physical, to other, objects, and self) witnessed over a 2-month period, selecting all the factors they believed triggered the incident.

**Results:** Questionnaire data were analysed by counting frequencies and inferential statistical analysis. Staff reported aggression was most commonly triggered by the patient being agitated or distressed (53.7%), being frustrated at not being able to get what they want (47.6%), having to comply with instructions (39%), being over-stimulated (35.4%), having requests denied (30.5%), and the environment being noisy (30.5%). Most common mental health problems rated as triggers of aggression included psychotic symptoms of being paranoid (25.6%), and experiencing delusions (22%). The additional items were some of the most frequently selected triggers. Four triggers were found to differ in frequency in different types of aggressive incidents (in response to other patients' verbal behaviour, during restraint, agitated/distressed and over-stimulated). The remaining triggers were selected in similar frequency in different types of aggressive incidents. Staff characteristics of experience

and job role were found not to impact the type of aggressive incidents reported.

**Implications:** Incidents of aggression in a forensic ABI ward are complex with multiple types and triggers to aggression. The addition of further internal and environmental triggers is helpful in capturing the complexity of triggers to aggression following ABI, which should be considered in future research and clinical work. A supportive approach from staff may be required when prevention of triggers is not possible.

**Keywords:** Aggression, ABI, assessment, quantitative, triggers, antecedents.

## Introduction

As we have started to learn in chapters one and two, aggression can be triggered by a variety of factors. In chapter three when reviewing clinical case studies, we saw that understanding the factors which may trigger aggression is important in terms of recognising, and preventing future incidents. In particular, assessing triggers to aggression is important for functional analysis of aggressive behaviour, which is used in neurobehavioural approaches to intervention (Alderman, 2003). Functional analysis is an approach that is used in forensic settings to identify triggers preceding aggression, and identify targets for intervention, which is relevant in forensic settings where incidents of aggression are highly prevalent (Ivanoff & Schmidt, 2010; Uppal & McMurrin, 2009). This demonstrates that it is important to identify triggers to aggression in forensic ABI settings. A number of studies have looked at triggers to aggression in patients with ABI using questionnaire-based measures such as the OAS-MNR and OAS-MNR-E (Alderman, 2007; Alderman, Knight, & Henman, 2002; Alderman, Knight, & Morgan, 1997; Dickens, Alderman, & Bowers 2011; Giles & Mohr, 2007; Giles, Wager, Fong, & Waraich 2006). The OAS-MNR was evaluated in chapter three, which highlighted that important antecedents may have been missed in this tool. This chapter therefore uses a modified version of the antecedents from the OAS-MNR in a questionnaire to understand triggers to aggression in a forensic ABI hospital.

### Aggression in forensic settings

Incidents of aggression frequently occur in forensic mental health settings (Uppal & McMurrin, 2009). For example in the UK, a medium and low secure hospital recorded 3,133 incidents from 373 patients in a 15 month period (Dickens, Picchioni, & Long, 2013). A forensic hospital is an ideal setting to conduct this research, but there have been limited investigations about triggers to aggression conducted with patients with ABI in this setting. In other residential ABI treatment settings, common triggers include frustrations over environmental factors such as goal frustrations and interpersonal stressors (Giles, Scott, & Manchester, 2013). This frustration and interference with goal achievement as a trigger provides support for the relevance of the frustration-aggression hypothesis in this population (Dollard et al, 1939; Miller, 1941). A forensic environment is likely to provide different environmental triggers to that of rehabilitation settings due to the increased restrictions in this environment.

### Antecedents to aggression

When the OAS-MNR data has been completed in a UK neurorehabilitation unit, the most frequent antecedents to aggressive incidents included: Direct verbal prompt to comply with instruction (17.3% - 27.6%), no obvious antecedent (20.8%-28%), agitated/distressed (13.1% - 20%), and following physical guidance/facilitation (8.1% - 15.4%) (Alderman, 2007; Alderman, Knight, & Henman, 2002; Alderman, Knight, & Morgan, 1997; Dickens, Alderman, & Bowers, 2011). In an ABI rehabilitation unit in the USA (Kalapatapu & Giles, 2016), staff reported antecedents to

incidents remained similar with regards to being given a direct verbal instruction (14% - 27.7%), and the patient being agitated or distressed (14.6% - 31.6%). In the same unit, when staff were instructed to report only on physically aggressive incidents, **these** were most frequently a direct response to **another** clients' verbal behaviour (32%) or another clients' behaviour (e.g. screaming, 23%; Giles, Wagner, Fong, & Wairaich, 2005).

The studies which assess antecedents to aggression consisted of ABI samples similar to that described in chapter two. Where type of injury was reported, TBI was consistently the most frequent type of brain injury (26.7% - 67.4%), with a variety of other ABI types included in each study, with cerebrovascular accident (2.9% - 10.9%), infection (5.7% - 16%), and anoxia (0 - 13%) also frequently reported. When reported, severity of brain injury was classed as "severe" or "very severe". Studies have not made comparisons between different types, or severities, of brain injury and aggression.

In a study which examined individual characteristics on aggression using the OAS-MNR, Alderman (2007) found patient factors to be predictive of aggression, with communication and neurobehavioural difficulty being the most reliable predictors of aggressive behaviour. When patients were categorised by communication and neurobehavioural disability, they found that the majority of aggression (54.8%) was attributed to those with poor communication, and high levels of neurobehavioural disability. This varied by aggression type, with proportionally more physical aggression towards others being displayed by those with most impairment (poor communication and high levels of neurobehavioural



functioning) whereas physical aggression against objects and verbal aggression was proportionally more common in the group with least impairment. Higher levels of disability were therefore associated with more frequent and severe types of aggression.

When studies have assessed for individual characteristics, differences have also been found on antecedents to aggression. Kalapatapu and Giles (2016) compared two brain injury samples which differed with regards to their levels of impairment in activities of daily living, language, and cognition. Aggression in the sample with greater levels of impairment was more likely to be triggered by; being agitated/distressed, by other patient's behaviour, or as a direct response to other patient's verbal behaviour. Aggression in the sample with least impairment was more likely to be triggered by; being given a direct instruction, having a request explicitly denied, or any other verbal interaction. This demonstrates that individual differences in symptoms following ABI impact how aggression is triggered.

Other studies such as Kerr, Oram, Tinson, and Shum (2011) using incident report forms with patients with ABI found verbal and physical aggression was most often preceded by staff assisting patients with activities of daily living (50%). The patients deemed to be most aggressive were often reliant on staff for activities of daily living, which requires a greater degree of contact with staff. While there are several common antecedents, the types of triggers can vary depending on the type of aggression reported on and the level of impairments the patients

with ABI experience. This gives some insight as to what staff believe are the most common triggers to aggression in people with an ABI.

### *The link between ABI and mental health problems*

A model of understanding aggression and violence in mental health settings has been proposed by Nijman (2002). This model explains **how** patient factors (such as underlying psychopathology), staff factors, and **how** ward characteristics interact and can cause aggression in patients. For example, a symptom of mental health problems such as distorted cognitions, combined with stressors on the ward, **may** result in frustration and eventual aggression. The authors propose staff variables, such as problematic communication and inconsistency, also play an interactive role.

In chapter one, **it was** highlighted that mental health problems occur frequently with ABI. The perceived role of symptoms of mental health problems on aggressive incidents has **been the object of** limited research in the ABI literature, and it is unclear whether staff believe symptoms of these conditions play a role in triggering aggressive incidents. Though staff are presented with a number of different triggers on the OAS-MNR, they are not given the option to select symptoms of mental health problems. This is an important gap that **this study aims** to address.

### *Aims*

As there is little ABI research in secure hospitals, it is important to explore the potential barriers of conducting research in this setting. Therefore a mixed-method approach, gathering both quantitative and

qualitative data, has been chosen to ascertain what data collection methods work best in a busy and complex environment. This chapter will focus on the quantitative **method**.

Primary aims are to:

- Construct a questionnaire about **antecedents to aggression based on the OAS-MNR**, modified to include further internal and environmental triggers to aggression (e.g., related to mental health).
- Collect information from staff working in a secure hospital about aggressive incidents witnessed or experienced over one month using the questionnaire. The questionnaire **is designed to** collect information about types of aggression experienced, and perceived triggers to the aggression.

Secondary aims are to:

- Examine the uptake of questionnaires (sign-up rate, attainment of target sample size).
- Note barriers to conducting research of this nature in **a** secure hospital setting.

### ***Hypothesis***

1. **Consistent with previous literature (Alderman, Knight, & Henman, 2002; Alderman, 2007) it would be predicted that verbal aggression will be the most frequent type of aggression reported in this study.**

2. There may be biases in staff reporting of incidents, as discussed in chapter three, where less severe incidents are not considered relevant to report. It is hypothesized that more experienced staff, or staff who spend more time with patients (ward-based staff), will be biased towards reporting more severe incidents. This is based on previous findings of staff reporting a tolerance to aggression (Jansen, Dassen, Burgerhof, & Berry, 2006; Whittington, 2002), and that staff who spend more time with patients are more likely to be the targets of aggression (Giles, Scott, & Manchester, 2013; Nolan et al, 1999).
3. Consistent with the frustration-aggression hypothesis, triggers which relate to patient's frustration, through blocking of achieving a goal, will be frequently selected as triggers to aggression. In particular; a request being denied, during restraint, frustration with not getting what they want, frustration with rules, and communication difficulty.
4. Similarly, as the frustration-aggression hypothesis states that the number of frustrated responses will intensify an aggressive response, it would be predicted that more severe forms of aggression will be preceded by a greater number of triggers than less severe forms of aggression.
5. It is predicted there will be similarities in the frequencies of antecedents in each type of aggression. This is based on the finding that the most frequent antecedents across each type of aggression remained similar when reported in previous studies (Alderman, 2002; Alderman 2007). However, previous studies

have not reported the frequency of all antecedents, or made comparisons of all antecedents in each aggression type, therefore no specific hypothesis are made about individual antecedents in each aggression type.

## **Methods**

### *Design*

This was a quantitative study using a brief questionnaire constructed for the purpose of the study. It is part of a mixed-methods study. Both studies ran in parallel and did not inform one another until they had both concluded. Qualitative information from staff is presented in chapter five.

### *Ethical approval*

Ethical approval was obtained from the Faculty of Medicine and Health Sciences Ethics Committee (Approval reference: 104-1707, see Appendix Five and Six). Approval was also granted from the Lancashire NHS Trust to allow data to be collected on an NHS site (See Appendix Seven). Participants gave written informed consent, and were aware that the research was voluntary, and that they could withdraw at any time. Participants were given a unique code to identify their questionnaires, which was not linked to their name. Care was taken to ensure responses were anonymous.

### *Setting*

The study setting was an ABI service in a National Health Service (NHS) secure hospital based in Lancashire (England, UK). Patient data was unable to be accessed for the purpose of this research, the following

description is provided for an overview of the characteristics of patients admitted to the service. The service includes two medium secure wards and a low secure ward with 27 patients overall during the study period. The ABI service admits only male patients with a history of ABI with discrete injury to the brain, current disabilities and mental health problems relating to the ABI, and significant risk-related behaviours such as risk of harm towards others. Typical injuries include: traumatic injuries, stroke, tumours, epilepsy, and damage to the brain from drugs or alcohol. The service does not admit patients with degenerative or progressive organic disorders, major physical disabilities, or patients in the immediate phase of TBI.

### *Participants*

Participants were staff members in the ABI service with regular patient contact (defined by at least one hour a week). Job roles included; ward-based support staff, (health care assistants and rehabilitation coaches) these staff spend the majority of time with patients, supporting with day to day tasks; ward-based qualified nurses (registered mental health nurses and learning disability nurses) who also spend their time working with patients; student nurses, who work under training by a qualified nurse; multidisciplinary office based staff (psychologists, psychiatrists, occupational therapists, social workers, or ward managers) who are directly involved in patients' care but remain primarily office-based.

### *Recruitment*

Recruitment for the study took place between 02/10/18 to 30/11/18. The initial approach for recruitment into the study was through an e-mail

from the ward manager (gatekeeper) and a poster advert in the staff offices. Participants were asked to contact the researcher directly if interested in taking part. The researcher (SW) was present on the ward during the recruitment period, and able to describe the study, and ask staff directly if they would like to take part. Staff who volunteered were provided with the information sheet, and given a verbal summary of the study before signing the consent form to begin the study.

#### *Patient information*

Patient information (such as the nature of the brain injury, or co-morbid mental health diagnoses) was based on staff accounts rather than taken from hospital notes, this was due to **the hospital being unable to provide patient data**. Data was not collected about aggressive incidents, or mental health diagnoses from patients themselves, as many would not be in a suitable mental state to provide information, or may not have adequate insight into their aggression. As such this study relies and focuses on staff perceptions only.

#### *Modified OAS-MNR antecedent questionnaire*

A brief questionnaire was devised for the purpose of the study to allow participants to record information about an incident of aggression and what they saw as triggers to that incident. This questionnaire was developed using items from the OAS-MNR (**i**ncident type and antecedent categories), a tool staff members routinely use in this service. Additional antecedents were included that have been found to trigger aggression as described in the critique of the OAS-MNR in chapter three (Giles, Scott, &

Manchester, 2013). The antecedents used are detailed in Table 7. A copy of this questionnaire is included in Appendix Eight.

The questionnaire collected the following information;

### *Demographics*

Demographic information about the staff member completing the questionnaire included: age, gender, job role, and length of time worked with patients with a brain injury (in years and months).

### *Incident information*

The questionnaire documented when the aggressive incident occurred (date), whether the staff member was directly involved or witnessed the incident (or both), whether the incident was directed towards the staff member or towards somebody else (or both).

As patient records could not be accessed for this study, staff members were asked to confirm whether the patient had a brain injury, and to record on the questionnaire whether they were aware of the patient having any other diagnosis, and if so to record this diagnosis (e.g., depression).

Using the same categories as the OAS-MNR, participants were asked to indicate the type of aggression experienced (physical towards others, physical towards self, physical towards objects, and verbal aggression). If more than one was relevant (for example, verbal aggression, and aggression towards an object) staff were able to record this on the form. The OAS-MNR asks staff members to score each incident sub-type for



severity however this was not included on this brief questionnaire as measuring incident severity was not planned in the aims of this study.

### *Antecedents to aggression*

Participants were asked to indicate what they believed triggered the incident, for ease of completion these were grouped into verbal interactions (e.g., being asked to comply with instructions), physical interactions (e.g., being given physical guidance to complete a task), internal difficulties (e.g., being agitated or distressed) and environmental triggers (e.g., a structured activity).

The triggers on the questionnaire were adapted from the OAS-MNR antecedents, with minor changes in wording to be suitable for this study, for example, changing the word 'client' to 'patient', and language simplified for ease of completion and to fit within the planned layout of the questionnaire. For example, 'given direct verbal prompt to comply with instructions' was changed to 'being asked to comply with instructions'. An additional 12 items were added. These additional items were added based on previous research which used content analysis to document staff reported antecedents to aggression in a brain injury unit (Giles, Scott, & Manchester, 2013). These additional items were added to capture internal difficulties, difficulties around mental health symptoms (nine items), and additional environmental triggers (three items), to ensure a full range of antecedents were captured in this questionnaire.

An 'other' box was also included under each group where participants could record a trigger that was not included in the list. This was to enable

further modification of the questionnaire for ABI settings in future research.

Interventions used to manage the aggressive behaviour were not included in this study (which is a feature of the OAS-MNR) because the focus in this part of the study was to explore the role of additional antecedents, rather than how these incidents are managed. Interventions and management strategies are explored in the qualitative interviews (see chapter five).

#### *Piloting of new questionnaire*

Prior to starting the study, the questionnaire was piloted by two staff members who worked on the ward (both male ward-based support staff), who were asked to complete the questionnaire about a recent incident. The researcher was present and asked pilot participants to provide feedback about the questionnaire in relation to question structure and content, the data collection process, and the likelihood of busy staff being able to complete these questionnaires after an incident of aggression. Length of time to complete the questionnaire was noted (approximately five minutes), thus staff confirmed others would be able to complete the questionnaire quickly when in a busy environment. Staff feedback about question structure and wording was positive, as a result no changes were required following the piloting of the questionnaire.

**Table 7. List of triggers to aggression in modified OAS-MNR antecedent questionnaire with new items indicated with an asterisk**

<b>Verbal interactions</b>	<b>Physical interactions</b>	<b>Internal difficulties</b>	<b>Environmental triggers</b>
Asked to comply with instructions	Physical guidance to complete a task	Agitated or distressed	Structured activity
Given verbal guidance with a task	In response to other patient's aggressive behaviour	Frustration with not getting what they want*	Noisy environment
Given feedback about performance	During restraint	Frustration with rules*	Change in routine*
In response to other patient's verbal behaviour	Given an item	Communication difficulty*	Over-stimulated*
A request is denied	Behaviour is played down or	Physical pain/medical	Under-stimulated*

	ignored by others	problems*	
Other verbal interaction	Other physical interaction	Hallucinating*	Other environmental difficulty
		Paranoia*	
		Delusion*	
		Mania*	
		Depression*	
		Other internal	

Notes: Staff were given the option to indicate no obvious antecedent or other that is not covered by any of the above.

### Procedure

Participants who consented to take part in the study were provided with a number of copies of the questionnaire with their unique identifier code, with spare questionnaires available on the ward. Participants were verbally instructed on completing the questionnaires. This included describing how to record participant information and incident information on the questionnaire. Participants were informed the aggression categories reflected the OAS-MNR categories which they routinely use, with a verbal description provided. A verbal description was provided of the different types of triggers, and how to record triggers, including "other" triggers. Participants were given time to read the list of triggers, with opportunity to ask questions. Participants were asked to complete questionnaires after any incident of patient aggression experienced throughout their one-month participation period. Participants were not required to complete questionnaires following all incidents. This was to ensure they did not feel pressurised to report on incidents they may have found distressing. Participants were asked to complete the questionnaire when they felt able to do so and were not required to do this immediately following an incident. Participants were able to post completed questionnaires in a secure box located in each staffing office. The researcher was present on the wards approximately three times a week throughout the study period to collect completed questionnaires and speak with participants if required.

## **Statistical analysis**

Questionnaire data was cleaned, coded, re-categorised if necessary, and entered into IBM SPSS (Version 24). Data was organised by incident, with staff details recorded next to each incident (e.g., age, gender, role, duration of time working with ABI). The International Classification of Diseases – 10 (ICD-10) was consulted and followed where possible to organise staff reporting of patient diagnoses. Missing data was coded by the researcher in SPSS. The free-text 'other' column was examined by both researchers. It was agreed for responses that fit pre-existing antecedents, **to be** re-categorised as such. Where this was unclear, or the response was considered to be not covered by any other questionnaire item, the response was kept as a string variable.

To look for patterns within the data, frequency counts and means were obtained from data. **Inferential statistical analysis was used on data for type of aggression, staff characteristics, and antecedent data (e.g., Chi-Square, Fisher's Exact Probability test, Pearson's Product-Moment Correlation, and Kruskal-Wallice one way ANOVA).**

## **Results**

Out of approximately 95 staff members who were eligible to take part, 57 people consented to take part in the study (30 female, 27 male) meaning approximately 60% of the target workforce at that time were recruited. **Table 8** shows demographic information of participants.

**Table 8. Demographic information of participants (n=57)**

<b>Participants</b>	
<b>Gender</b>	
<i>Male</i>	27 (47.4%)
<i>Female</i>	30 (52.6%)
<b>Age (mean, SD, range)</b>	33.86 (10.42, 19-56)
<b>Job role</b>	
<i>Ward-based support staff n (%)</i>	38 (66.7%)
<i>Ward-based qualified nurses n (%)</i>	15 (26.3%)
<i>Student nurses</i>	2 (3.5%)
<i>Multi-disciplinary office-based *</i>	2 (3.5%)
<b>Mean duration working with patients with brain injury (years, months)</b>	2 years, 4 months (1 day - 10 years). Median = 1 year, 5 months

\*Specific disciplines of these participants not specified to protect anonymity.

### **Patient characteristics based on staff accounts**

As this study aims to examine triggers related to co-morbidity, staff were asked to indicate if they were aware of any other diagnoses. Participants reported patients had an 'other diagnosis' in 54.9% of incidents. Staff reported a range of diagnoses including mental health diagnoses, most commonly psychotic disorders (n=20). However, Korsakoff's Syndrome (n=6), Personality Disorder, (PD) (n=1) and Organic PD (n=2) were reported. One member of staff reported a patient had a learning disability (n=1). Staff also reported neurological problems such as epilepsy (n=3),

and dementia ( $n=1$ ). Staff reported that some patients had multiple diagnoses (e.g., Combinations of disorders such as Asperger's Syndrome and bipolar disorder). Some participants stated there was an 'other diagnosis' but did not record the diagnosis ( $n=9$ ). These diagnoses could not be compared for accuracy with hospital records, however this information indicates participant's level of consideration and perceived awareness of co-morbidity in diagnosis and mental health issues in addition to brain injury in the patients.

### **Characteristics of aggressive incidents during the study period**

Over the two-month study period, questionnaires captured 82 aggressive incidents (48 incidents reported by female, and 34 reported by male members of staff). Individual participants reported an average of 1.44 ( $SD=1.05$ ) incidents on the questionnaires during the study period with a range of 1-7 questionnaires per participant. Of all 82 incidents, 49 (63.6%) were reported to be towards someone else (witness to aggression), 20 (26%) were reported to be towards the staff member themselves, eight (10.4%) towards both another person and themselves, there were five incidents where the staff member did not complete this question (missing data).

### **Type of aggression**

Participants recorded the aggression type (physical to others, physical to self, physical to objects, verbal), with the option to code more than one if relevant. During the 82 incidents, there were 133 aggressive behaviours



recorded. There was an average of 1.62 ( $SD=0.78$ ) aggressive behaviour types per incident (range 1 – 4) with 45.1% of incidents involving multiple behaviour types. Verbal aggression was most common, and recorded in 61 incidents (45.8%), followed by physical towards others in 37 incidents (27.8%), physical towards objects in 28 incidents (21.1%) and physical towards self in seven incidents (5.3%). Of the incidents of verbal aggression, 26 were verbal aggression only (42.6%), with the remaining 35 incidents (57.4%) also including physical aggression.

To test hypothesis one, statistical analysis was used to examine for any significant differences in the frequencies of each type of aggression which staff reported. As participants could select multiple aggression types per incident, incidents were first coded according to the most severe aggression type reported. This was coded using the same criterion for severity of aggression categories as the OAS-MNR (Alderman, Knight, & Morgan, 1997), where verbal aggression is considered to be the least severe category, followed by physical aggression to objects, physical aggression towards self, with physical aggression towards others considered to be the most severe category. Frequency of each type of aggression according to this rating is reported in Table 9.

To examine whether each type of aggression was reported in equal frequency, a one-variable Chi-Square test was conducted. The Chi-Square test was significant ( $\chi^2(3, n=82)= 28.54, p <.001$ ), demonstrating that types of aggression were not reported in equal frequency. Physical aggression towards others was reported most frequently, followed by verbal aggression, this was inconsistent with

hypothesis one. Physical aggression to objects and self were less frequently reported.

**Table 9. Frequency of each type of aggression when coded according to the most severe type reported per incident. Listed from most severe to least severe (n=82).**

Type of aggression	Frequency	Percentage
Physical to others	37	45.1%
Physical to self	5	6.1%
Physical to objects	14	17.1%
Verbal	26	31.7%

#### *Examining staff characteristics on aggression reported*

To examine hypothesis two, statistical analysis was carried out on participant demographic data (months of experience and job role) and incident data (type of aggression reported, the number of aggressive behaviours reported per incident, and number of antecedents reported), to examine if any participant characteristics related to the types of incidents they reported.

Firstly, participants' number of months working with ABI was compared in each type of aggression, to determine if experience level affected the type of aggression reported. As the data were not normally distributed, a Kruskal-Wallis one-way ANOVA was performed on the four aggressive behaviour types. Results revealed no significant difference between the

type of aggression reported and number of months worked with ABI ( $\chi^2(3, n=81) = 1.78, p = .618$ ).

Secondly, participants' job role was compared to aggression type, to determine if job role impacted the type of aggression reported. A 4 X 4 Fishers Exact Probability Test was used to examine the relationship between job role (ward based non-qualified, ward based qualified, student, or MDT) and type of aggression (others, self, objects, or verbal) (68.8% of cells had an expected cell count of <5). The relationship was non-significant (Fishers Exact value = 13.87,  $n=82, p=.066$ ) indicating no significant relationship between participants' job role and type of aggression reported.

These results indicate no significant associations between the type of aggression reported and participant characteristics of experience and job role.

Statistical analysis was used to examine if participant characteristics had an impact on number of aggressive behaviours reported per incident, as this would indicate reporting more complex or severe incidents where multiple aggressive behaviours occur. A non-significant Pearson Product-Moment Correlation was revealed between participants' experience with ABI in months, and the number of aggressive behaviours per incident ( $r(79) = .20, p = .074$ ). Revealing that level of experience did not relate to the number of behaviours reported per incident. As the data were not normally distributed, a Kruskal-Wallis one-way ANOVA was performed with job role data. A non-significant difference was found between the number of behaviours reported in each job role ( $\chi^2(3, n=82) = 3.91, p =$

.271), revealing that the number of aggressive behaviours reported per incident did not differ by job role.

Statistical analysis was used to examine if participant characteristics impacted on number of antecedents reported per incident, as this would also be an indicator of reporting more complex incidents, which are triggered by the combination of multiple antecedents. A non-significant Pearson Product-Moment Correlation was revealed between participants' experience with ABI in months, and the number of antecedents per incident ( $r(79) = -.02, p = .890$ ). Revealing that level of experience did not relate to the number of antecedents reported per incident. As the data were not normally distributed, a Kruskal-Wallis one-way ANOVA was performed with job role data. A non-significant difference was found between the number of antecedents reported in each job role ( $\chi^2(3, n=82) = 2.90, p = .407$ ), revealing that the number of antecedents reported per incident did not differ by job role.

These results suggest that participant characteristics including months of experience and job role, did not relate to the type of aggressive incident, number of behaviours reported per incident, and number of antecedents reported. Hypothesis two was therefore not supported.

### **Antecedents to aggression**

Participants were asked to report what they thought triggered the aggressive incident, and could tick as many antecedents as they thought were relevant. The mean number of antecedents selected was 5.29 ( $SD = 2.90$ ), with a range of 1 - 16. Antecedents across all incidents are displayed in Table 10, along with the number of times and percentage of

incidents they were selected. To examine whether antecedents were selected in equal frequency, a one-variable Chi-Square test was conducted. The Chi-Square test was significant ( $\chi^2(30, n=434) = 264.14, p < .001$ ), demonstrating that the antecedents which staff perceived as triggering aggressive incidents were not selected in equal frequency. Some antecedents were selected more frequently than would be expected if distributed equally (expected value = 14), these are highlighted in Table 10. Table 10 shows that the patient being agitated or distressed was the most commonly endorsed (53.7%) across all 82 reported incidents.

Hypothesis three stated that triggers which relate to patients' frustration, through blocking of achieving a goal, would be frequently selected as triggers. As can be seen in Table 10, frustration with not getting what they want, being asked to comply with instructions, a request being denied, frustration with rules, and communication difficulty, were all selected more frequently than the expected values, supporting this hypothesis. During restraint was, however, not a frequently selected trigger.

Table 10 also highlights the frequency in which the 12 additional items were endorsed (indicated by \*). The additional items, which reflect internal difficulties for the patient, and environmental antecedents were endorsed by participants, with some being selected more frequently than others. The most frequent was the patient being frustrated at not getting what they want (47.6% of incidents). The additional items which reflect symptoms of mental health problems were also selected as antecedents

by participants, particularly the patient showing signs of paranoia (25.6%) and presenting with delusion (22%).

**Table 10. Number of times each antecedent was reported as being related to an aggressive incident (in order of most to least frequent)**

Antecedent	Total (out of 82 incidents)	Percentage
<b>Agitated/distressed (ID)</b>	44	53.7%
<b>Frustration with not getting what they want (ID) *</b>	39	47.6%
<b>Asked to comply with instructions (VI)</b>	32	39%
<b>Over-stimulated (ED) *</b>	29	35.4%
<b>A request is denied (VI)</b>	25	30.5%
<b>Noisy environment (ED)</b>	25	30.5%
<b>Frustration with rules (ID)*</b>	24	29.3%
<b>Paranoid (ID)*</b>	21	25.6%
<b>Communication difficulty (ID)*</b>	18	22%
<b>Delusion (ID)*</b>	18	22%

<b>Given verbal guidance with a task (VI)</b>	17	20.7%
<b>In response to other patient's verbal behaviour (VI)</b>	14	17.1%
<b>Change in routine (ED)*</b>	14	17.1%
<b>Other verbal (VI)</b>	10	12.2%
<b>Behaviour is played down or ignored by others (PI)</b>	10	12.2%
<b>Given an item (PI)</b>	9	11%
<b>Other internal (ID)</b>	9	11%
<b>Hallucinating (ID)*</b>	8	9.8%
<b>Structured activity (ED)</b>	8	9.8%
<b>No obvious antecedent (O)</b>	8	9.8%
<b>Other (general) (O)</b>	8	9.8%
<b>Physical guidance to complete a task (PI)</b>	7	8.5%
<b>During restraint (PI)</b>	7	8.5%
<b>Physical pain/medical problems (ID)*</b>	7	8.5%
<b>In response to other patient's aggressive behaviour (PI)</b>	6	7.3%
<b>Given feedback about performance (VI)</b>	4	4.9%



<b>Mania (ID)*</b>	4	4.9%
<b>Depression (ID)*</b>	3	3.7%
<b>Other Environmental (ED)</b>	3	3.7%
<b>Other physical (PI)</b>	2	2.4%
<b>Under stimulated (ED)*</b>	1	1.2%

Notes: **Highlighted values represent more frequent than expected values if distributed equally.** ID= Internal difficulties, VI= Verbal interactions, PI= Physical interactions, ED= Environmental difficulties, O= Other. \*additional items added. Other verbal included: "Compliant with verbal direction", "reminded how long here for", "said have to get what I want or I'll hit someone", "explaining menu in a too complex form", "wanted a spoon" and "told to wait". Other physical included: "Staff walking out of office". Other Internal included: "Dementia", "sexual disinhibition", "confusion", "memory problems", "injury to toe – wants treatment", "racially motivated", "female attention" and "waiting". Other environmental included: "Change in ward structure whilst laying flooring" and "move room". Other (general) included: "Request during protected meal times", "female interaction", "fatigue", "wanted meds but due them at tea time", "jealousy to male staff receiving female attention", "confusion/disorientation" and "verbally aggressive with peer stating he is the world's best footballer".

Antecedents are displayed by aggression type in Table 11, coded to reflect the most severe aggression type in each incident. This table details the percentage of incidents within each aggression type for which each antecedent was selected.

Hypothesis four predicts that more severe forms of aggression will be preceded by a greater number of triggers than less severe forms of aggression. In order to test this hypothesis, a one-way ANOVA was performed. A statistically significant effect was seen ( $F(3, 78) = 3.20, p = .028$ ) demonstrating a difference in the number of antecedents reported (dependent variable) in the different types of aggressive incidents (physical aggression towards others, towards self, towards objects, and verbal aggression). Post hoc LSD tests revealed that incidents of physical aggression towards others ( $M = 5.95, SD = 2.80$ ) had significantly more antecedents selected than incidents of verbal aggression ( $M = 4.35, SD = 2.59$ ) ( $p = .028$ ). Incidents of physical aggression towards self ( $M = 7.60, SD = 4.83$ ) had significantly more antecedents selected than incidents of verbal aggression ( $p = .019$ ) and incidents of physical aggression towards objects ( $M = 4.50, SD = 2.18$ ) ( $p = .036$ ). As more antecedents were selected in the more severe incidents of physical aggression towards others and self, this is in support of hypothesis four.

#### *Comparison of antecedents within each aggression type*

To examine whether antecedents were selected in equal frequency in each type of aggression, a Chi-Square test was conducted for each type of aggression separately. The Chi-Square test (Monte Carlo method due to low frequency count) was significant for verbal aggression ( $\chi^2(24, n=113) = 54.48, p < .001$ ),

demonstrating that the antecedents which staff perceived as triggering verbally aggressive incidents were not selected in equal frequency. Some antecedents were selected more frequently than would be expected if distributed equally (expected value = 4.50), these are highlighted in Table 11.

The Chi-Square test was significant for physical aggression towards others ( $\chi^2(29, n=220)= 133.46, p <.001$ ), demonstrating that the antecedents staff perceived as triggering physically aggressive incidents towards others were not selected in equal frequency. Some antecedents were selected more frequently than would be expected if distributed equally (expected value = 7.30), these are highlighted in Table 11.

The Chi-Square test (Monte Carlo method due to low frequency count) was non-significant for physical aggression towards objects ( $\chi^2(24, n=63)= 31.84, p =.140$ ), and physical aggression towards self ( $\chi^2(22, n=38)= 15.26, p =.883$ ), demonstrating that the antecedents within both physical aggression towards objects, and towards self, were all selected in similar frequency.

#### *Comparison of antecedents across different types of aggression*

Hypothesis five states that there will be similarities in the frequencies of antecedents in different types of aggression. To examine whether antecedents (selected, not selected) were selected more frequently across the four types of aggressive incident (verbal, physical towards objects, self, and others), a 2 x 4 Fishers Exact Probability Test was carried out on each of the 31 antecedents due to frequency counts falling below required values. Four antecedents were found to significantly differ across aggression type:

A significant relationship was found between frequency of selecting the antecedent "in response to other patient's verbal behaviour (Verbal interaction)" and type of aggression (Fishers Exact value = 8.18,  $n=82$ ,  $p=.027$ ). Table 11 indicates this antecedent was more frequently selected for incidents of verbal aggression, and physical towards objects and self, than physical towards others.

A significant relationship was found between frequency of selecting the antecedent "During restraint (Physical interaction)" and type of aggression (Fishers Exact value = 7.25,  $n=82$ ,  $p=.034$ ). Table 11 shows this antecedent was more frequently selected for incidents of physical aggression towards others.

A significant relationship was found between frequency of selecting the antecedent "Agitated or distressed (Internal difficulty)" and type of aggression (Fishers Exact value = 8.32,  $n=82$ ,  $p=.035$ ). Table 11 shows this antecedent was more frequently selected for incidents of physical aggression (objects, self, and others) than verbal aggression.

A significant relationship was found between frequency of selecting the antecedent "Over stimulated (Internal difficulty)" and type of aggression (Fishers Exact value = 10.06,  $n=82$ ,  $p=.014$ ). Table 11 shows this antecedent was more frequently selected for incidents of physical aggression towards self and other.

The remaining 27 antecedents were not found to relate to the type of aggressive incident, indicating that they were selected in similar frequency across each type of aggression. Although there were some differences in triggers, the majority of triggers were selected in similar frequencies in different types of aggression, supporting hypothesis five.

**Table 11. Percentage of times each antecedent was reported as being related to an aggressive incident by each type of aggression (in order of most frequent to least frequent)**

<b>Antecedent</b>	<b>Verbal (total = 26)</b>	<b>Physical Objects (total = 14)</b>	<b>Physical Self (total = 5)</b>	<b>Physical Others (total = 37)</b>
Agitated/distressed (ID)	(n = 8) 30.80%	(n = 9) 64.30%	(n = 4) 80%	(n = 23) 62.20%
Frustration with not getting what they want (ID) *	(n = 13) 50%	(n = 6) 42.90%	(n = 4) 80%	(n = 16) 43.20%
Asked to comply with instructions (VI)	(n = 7) 26.90%	(n = 3) 21.40%	(n = 3) 60%	(n = 19) 51.40%
Over-stimulated (ED) *	(n = 6) 23.10%	(n = 2) 14.30%	(n = 4) 80%	(n = 17) 45.90%
A request is denied (VI)	(n = 7) 26.90%	(n = 2) 14.30%	(n = 1) 20%	(n = 15) 40.50%
Noisy environment (ED)	(n = 10)	(n = 3)	(n = 2)	(n = 10)

	38.50%	21.40%	40%	27%
	( <i>n</i> = 7)	( <i>n</i> = 4)	( <i>n</i> = 2)	( <i>n</i> = 11)
Frustration with rules (ID)*	26.90%	28.60%	40%	29.70%
Paranoid (ID)*	( <i>n</i> = 4)	( <i>n</i> = 2)	( <i>n</i> = 1)	( <i>n</i> = 14)
	15.40%	14.30%	20%	37.80%
Communication difficulty (ID)*	( <i>n</i> = 5)	( <i>n</i> = 2)	( <i>n</i> = 2)	( <i>n</i> = 9)
	19.20%	14.30%	40%	24.30%
Delusion (ID)*	( <i>n</i> = 8)	( <i>n</i> = 3)	( <i>n</i> = 1)	( <i>n</i> = 6)
	30.80%	21.40%	20%	16.20%
Given verbal guidance with a task (VI)	( <i>n</i> = 5)	( <i>n</i> = 3)	( <i>n</i> = 1)	( <i>n</i> = 8)
	19.20%	21.40%	20%	21.60%
In response to other patient's verbal behaviour (VI)	( <i>n</i> = 6)	( <i>n</i> = 4)	( <i>n</i> = 2)	( <i>n</i> = 2)
	23.10%	28.60%	40%	5.40%
Change in routine (ED)*	( <i>n</i> = 5)	( <i>n</i> = 2)	( <i>n</i> = 1)	( <i>n</i> = 6)
	19.20%	14.30%	20%	16.20%
Other verbal (VI)	( <i>n</i> = 3)	( <i>n</i> = 1)	( <i>n</i> = 1)	( <i>n</i> = 5)

	11.50%	7.10%	20%	13.50%
Behaviour is played down or ignored by others (PI)	( <i>n</i> = 2) 7.70%	( <i>n</i> = 1) 7.10%	( <i>n</i> = 1) 20%	( <i>n</i> = 6) 16.20%
Given an item (PI)	( <i>n</i> = 4) 15.40%	( <i>n</i> = 2) 14.30%	0	( <i>n</i> = 3) 8.10%
Other internal (ID)	( <i>n</i> = 1) 3.80%	( <i>n</i> = 3) 21.40%	( <i>n</i> = 1) 20%	( <i>n</i> = 4) 10.80%
Hallucinating (ID)*	( <i>n</i> = 1) 3.80%	( <i>n</i> = 1) 7.10%	( <i>n</i> = 1) 20%	( <i>n</i> = 5) 13.50%
Structured activity (ED)	( <i>n</i> = 1) 3.80%	( <i>n</i> = 2) 14.30%	0	( <i>n</i> = 5) 13.50%
No obvious antecedent (O)	( <i>n</i> = 2) 7.70%	( <i>n</i> = 1) 7.10%	( <i>n</i> = 1) 20%	( <i>n</i> = 4) 10.80%
Other (general) (O)	( <i>n</i> = 2) 7.70%	0	( <i>n</i> = 1) 20%	( <i>n</i> = 5) 13.50%
Physical guidance to complete a task (PI)	0	( <i>n</i> = 1)	( <i>n</i> = 1)	( <i>n</i> = 5)

		7.10%	20%	13.50%
During restraint (PI)				(n = 7)
	0	0	0	18.90%
Physical pain/medical problems (ID)*	(n = 2)		(n = 1)	(n = 4)
	7.70%	0	20%	10.80%
In response to other patient's aggressive behaviour (PI)	(n = 2)	(n = 3)		(n = 1)
	7.70%	21.40%	0	2.70%
Given feedback about performance (VI)	(n = 1)	(n = 1)	(n = 1)	(n = 1)
	3.80%	7.10%	20%	2.70%
Mania (ID)*				(n = 4)
	0	0	0	10.80%
Depression (ID)*		(n = 1)		(n = 2)
	0	7.10%	0	5.40%
Other Environmental (ED)	(n = 1)		(n = 1)	(n = 1)
	3.80%	0	20%	2.70%
Other physical (PI)	0	0	0	(n = 2)



				5.40%
Under stimulated (ED)*	(n = 1)			
	0	7.10%	0	0

*Notes: Highlighted cells represent antecedents which were selected more frequently than would be expected if distributed equally, as indicated in the Chi-Square analysis. Verbal aggression expected value = 4.50, physical aggression towards others expected value = 7.30.*

## Discussion

### Principal findings

Eighty-two incidents of aggression were reported in a medium and low secure ABI service over a two-month period. Most commonly identified triggers included the patient being: agitated or distressed, frustrated at not getting what they want, asked to comply with instructions, over-stimulated, having a request denied, in a noisy environment. An average of five triggers were selected per incident which shows staff are aware that incidents are complex and not triggered by a single factor. The 12 additional triggers were selected with varying frequency, with some (such as frustration at not getting what they want and being over-stimulated) being amongst the most frequently selected triggers, suggesting these are a helpful addition. The majority of incidents reported involved multiple types of aggression suggesting that the display of aggression was also complex, with verbal aggression being most common, followed by physical aggression against others, physical aggression against objects and physical aggression towards self. The triggers for different types of aggression remained similar, however four triggers were found to differ between aggression types (in response to other patient's verbal behaviour, during restraint, agitated/distressed, and over-stimulated). Staff characteristics (experience and job role) did not impact the type of aggression reported, number of behaviours per incident, or number of triggers per incident, suggesting these staff experiences and characteristics did not bias towards reporting more severe or complex incidents.

The secondary aims of the study were to examine the uptake of questionnaires and make note of barriers to conducting research of this nature in a secure hospital setting. The initial aim for recruitment was for a minimum of 20 staff members to complete 50 questionnaires. As 82 questionnaires were completed by 57 staff members, this was achieved. Although uptake of the study exceeded target numbers, staff members working in a busy environment reported that they found it difficult to complete questionnaires following incidents. As a result, incidents that took place in particularly busy periods may have been missed. The questionnaires analysed and presented in this chapter captured approximately 60% of staff members who worked in the ABI wards at this hospital, and roughly equal gender across participants. Participants' job role appeared to reflect the proportions seen in the wards with the majority being support staff, followed by qualified nurses, and student nurses, with a smaller number of MDT staff. The demographic data captured a range of experience level with ABI, between one day to 10 years, although the majority of the participants were towards the lower end.

### **Findings in relation to other literature**

Hypothesis one states that incidents of verbal aggression would be reported more frequently than other types of aggression in this study.

This frequency of types of aggression across incidents reflects previous research using the OAS-MNR, with verbal aggression being most frequent (73.7 – 77.2%), followed by physical towards others (11.3 – 13.1%), physical towards objects (7.9-8.5%) and physical towards self (3.6 –

4.7%; Alderman, Knight, & Henman, 2002; Alderman, 2007). Although the current study followed the same pattern of aggressive behaviours, there was comparatively less verbal aggression recorded (45.9% of behaviours), and higher rates of physical aggression to others (27.8% of behaviours) and objects (21.1% of behaviours), with similar rates towards self (5.26% of behaviours). Although findings showed verbal aggression was most frequent overall, this was impacted by the finding that incidents of verbal aggression often co-occurred with physical aggression. When incidents were categorised by the most severe type of aggression (physical to others, self, objects, then verbal aggression), incidents of physical aggression to others was most frequent (45.1%), followed by verbal aggression (31.7%), physical aggression towards objects (17.1%), with physical aggression towards self the least frequent (6.1%). Thus hypothesis one was not supported. This may demonstrate higher levels of physical aggression in a forensic setting compared to non-forensic, neurorehabilitation units.

Hypothesis two predicted that there would be biases in staff reporting of incidents, specifically that more experienced staff, or ward-based staff, would have a tendency to report more severe incidents of aggression than those less experienced or working in other roles. This however was not supported, as staff characteristics, such as level of experience or job role, did not impact on the type of aggression reported.

The findings of this study are consistent with previous research which finds significantly higher rates of aggression and violence in forensic inpatient units compared non-forensic inpatient units (Bowers et al,

2011). In the forensic setting, patients are detained under the Mental Health Act (1983) in a medium or low secure setting in order to manage risk of violence towards others, often being transferred from prison. It would be expected that the types of aggression displayed in this setting would involve more physical aggression towards others. It is however noted that staff can be biased towards reporting more severe incidents. As identified in chapter three, organisational views of aggression may influence reporting, resulting in staff overlooking verbal aggression (Giles, Wager, Fong, & Waraich, 2005; Narevic et al, 2011). When aggression occurs frequently in psychiatric settings, staff can report 'tolerance' to aggression and attitudes of normalisation (Jansen, Dassen, Burgerhof, & Berry, 2006; Whittington, 2002). Staff may not perceive these incidents as relevant to report. Although staff characteristics did not impact on the type of incidents reported, it is possible that these biases affected all staff regardless of their level of experience or job role. It is possible that verbal aggression may have occurred more frequently than documented, these results should therefore be interpreted with caution.

Hypothesis three was supported by the findings of this study. Consistent with the frustration-aggression hypothesis, triggers which related to patients' frustration, through blocking of an anticipated goal, were frequent triggers of aggression. This included triggers such as frustration with not getting what they want (47.6%), being asked to comply with instructions (39%), a request being denied (30.5%), and frustration with rules (29.3%), all of which involve the environment and restrictions interfering with a desired goal. Having a communication difficulty was

also a frequent trigger (22%), this meets the definition of frustration in that a patient is unable to achieve their goal of communication. Although these triggers are amongst the most frequent, other triggers which do not relate to frustration were reported frequently, for example being agitated/distressed (53.7%). Thus the frustration-aggression hypothesis does not explain all triggers in this study.

The frustration-aggression hypothesis states that the number of frustrated responses will intensify an aggressive response, and therefore it would be expected that more severe forms of aggression would have on average more triggers reported (hypothesis four). This was observed, in that the least severe category of verbal aggression had significantly less triggers reported on average than the most severe category of physical aggression to others, and the second most severe category of physical aggression towards self. The frustration-aggression hypothesis describes that the number of frustrated responses affects the instigation to aggression, in this case, the number of triggers which cause frustration. This frustration can build up and intensify an aggressive reaction, such that the more triggers which are present would lead to more severe aggression.

Many of the top five most common antecedents identified in previous studies (Alderman, 2007; Alderman, Knight, & Henman, 2002; Alderman, Knight, & Morgan, 1997) shared similarities with the most common OAS-MNR triggers in this study, such as the patient being agitated or distressed, or being asked to comply with instructions. However, there were differences in frequency of other antecedents. For example, 'being

given physical guidance' (8.5%) was less frequently endorsed in this study as it was in previous studies (8.1%-15.4%), and having 'no obvious antecedent' (9.8%) was not as often endorsed in this study as it was in previous studies (20.8% - 28%). This could suggest that staff members felt more able to identify triggers in this study, or felt the incident had a specific cause. This was potentially influenced by having additional triggers to select.

This study collected data from a forensic setting, whereas other similar studies have examined triggers to aggression in non-forensic settings. This study found the environment being noisy was a frequently reported antecedent (30.5% of incidents) which was much less frequent in previous studies within neurorehabilitation units (1.1% - 9.5% of incidents; Alderman, 2007; Alderman, Knight, & Henman, 2002; Kalapatapu, & Giles, 2016). This forensic environment may be more likely to have higher noise levels, which then precedes incidents, compared to the non-forensic neurorehabilitation units. 'Having a request denied' was also more frequent in a forensic setting (30.5% of incidents) compared to other clinical settings in the UK, of between 0.9% - 10% in a neurorehabilitation unit (Alderman, 2007; Alderman, Knight, & Henman, 2002; Dickens, Alderman, & Bowers, 2011). This may reflect the increased restrictions in the secure forensic environment. Kalapatapu and Giles (2016) in a neurorehabilitation unit in the US found that having a request denied preceded 9.8% of incidents in the unit for more functionally impaired patients, and 24.8% of incidents in the unit for patients with less functional impairment. Patients' abilities may also impact on requests being denied as a trigger, as well as the environment.

This could not be speculated on in this sample as the functional abilities of patients were not measured. Future studies would benefit from measurement of patients neurobehavioural disability, communication ability, and ability to perform activities of daily living, as these individual differences in symptoms have been found to impact how aggression is triggered, and would allow for more accurate comparisons to be made in the literature.

Hypothesis five states that there will be similarities in the triggers to each type of aggression. This hypothesis was supported, as the majority of triggers were selected in equal frequency in different types of aggressive incident. Previous studies have not provided the full list of triggers per aggression type, however when the most frequent triggers were reported, similarities were observed. For example, all types of aggression frequently reported no obvious trigger, a verbal prompt most often triggered verbal aggression along with physical aggression towards others and objects, and agitation was in the top three triggers for verbal aggression, physical aggression towards self and objects (Alderman, 2002; Alderman, 2007). As only the top 1-3 triggers were reported in previous studies, is it not known how frequent these triggers were in all aggression types for comparison. In the current study, some differences were found, in that other patient's verbal behaviour was more likely to trigger verbal aggression, whereas being agitated or distressed was more likely to trigger physical aggression (all types). Being over-stimulated was more likely to trigger physical aggression towards self or others, and restraint only triggered physical aggression towards others. This demonstrates that other patient's verbal behaviour is likely to trigger a



similar verbal response, likely in retaliation, whereas the internal difficulties of agitation, distress or feeling over-stimulated from the environment is more likely to trigger a more severe aggressive response. The finding that restraint was only reported in incidents of physical aggression towards others is expected, as restraint would only have been utilised in the service for aggression of this severity.

This study identified how staff perceived different types of factors can trigger aggression in patients in a hospital setting. Factors internal to the patient, as well as external factors from staff and the environment were endorsed as triggers, consistent with Nijman's (2002) model of understanding ward aggression. Environmental factors were identified such as noise levels and being over-stimulated. Staff factors in this setting included the verbal and physical interactions with patients, particularly being asked to follow rules or denying patient's requests. Factors internal to the patient were identified such as agitation, individual symptoms, and frustrations around the environment and rules on the secure ward. In addition to these factors, peer related factors were also identified by participants, with other patients verbal or physical behaviour recorded as triggering aggressive incidents. Participants tended to select multiple triggers which preceded the aggression. This demonstrates how the incidents did not have a single trigger but rather a combination of events that may have interacted to precede the aggressive incident. Some of the previous studies instructed participants to select only one trigger per incident (e.g., Alderman, 2007; Alderman, Knight, & Henman, 2002). In previous research where participants could select multiple triggers, an average of 1.4–1.81 triggers were selected per incident

(Giles, Wagner, Fong, & Waraich, 2005; Kalapatapu & Giles, 2016). This is lower than the 5.29 triggers reported in the current study. It is unclear whether this increase reflects the addition of 12 further triggers, or the **difference** in study setting. This does, however, demonstrate the complexity of triggers, and how having a wider range of antecedents allows this complexity to be recorded.

#### Additional triggers and mental health

Many of the additional items, particularly those relating to internal processes, were the most frequently endorsed triggers to aggression. Patients' frustration at not getting what they want was the second most frequent off all triggers identified (47.6%), frustration with rules was also frequently selected (29.3%), as was having a communication difficulty (22%). Of the new mental health items added, being paranoid was the most commonly selected mental health item (25.6%), followed by experiencing a delusion (22%). The items that relate to psychotic symptoms were therefore more frequently endorsed as triggers, which is consistent with the level of co-morbidity with psychotic-related diagnosis which participants reported. Previous studies in the US identified that 60% of their sample manifested psychotic symptoms in addition to ABI during their study period (Giles, Wagner, Fong, & Waraich, 2005). In the same unit, Kalapatapu and Giles (2016) identified using the OAS-MNR-E that up to 9.8% of incidents were triggered by an "other antecedent" of hallucination/delusion. Rates are higher in the current study, which likely reflects having this listed as a trigger as opposed to having to specify this

as an "other antecedent". The additional items appear to be helpful for identifying triggers in this population.

Of the three environmental items, being over-stimulated was one of the more frequently endorsed triggers (35.4%), followed by a change in routine (17.1%), whereas the patient being under-stimulated was the least frequent of all triggers (1.2%). Over-stimulation refers to a sensory overload which occurs when there are too many stimuli, such as noise, to process. Research finds this can be more salient in people with brain injury (Mayfield & Homack, 2005; Nijman & Rector, 1999). This may relate to executive function difficulties seen after brain injury (Galvin, Froude, & Imms, 2009). An individual may struggle to process, and cope with stimuli, leading to a "fight or flight" response, and subsequent aggression (Mayfield & Homack, 2005). These results suggest that over-stimulation is particularly important to be aware of in this population.

Participants were provided with an 'other' trigger option, many of these responses provided valuable insight into triggers which were not reflected in the questionnaire items. Some of these reflected impairments due to the brain injury such as memory problems or confusion, and other patient factors such as racial attitudes of individuals. Some of these responses related to verbal triggers from staff, which was as a function of being in a secure environment (such as having to wait and wanting items). To maintain safety in the forensic environment, patients' access to certain places, or certain items is restricted. Patients are reliant on staff for access to these everyday items and are often required to wait for available staff, triggering aggression. These additional triggers recorded

by staff could be useful to include in any further study into triggers to aggression using questionnaire measures in a similar setting.

### **Limitations**

Eighty-two incidents were recorded in this study over a two month period, which is less than previous studies of up to 5,548 incidents over a two week period (Alderman, 2007). Staff completed only a small number of questionnaires each, and these were not completed after each incident (often due to the busy environment of the ward). Previous studies such as Alderman (2007) typically analysed routinely collected data, which was not the case in the current study. It is also possible that informing participants that they were not required to fill out a questionnaire after every incident may bias results. This may make it more likely that staff would record the more severe incidents of physical aggression towards others rather than more minor verbal aggression, which was found in this study. The incidents recorded in this study are therefore not reflective of the full range of incidents which occurred on the ABI wards during the study period. Comparisons were not made to determine how representative these data are of the total aggression which occurred during the study period, or whether the aggression which occurred was similar to other time periods. Analysing routinely collected incident data rather than separate questionnaires would give a more accurate account of the frequency of aggressive incidents.

Further to this, it is possible that some incidents were double counted, where multiple staff members may have completed a questionnaire based on observation of the same incident. Attempts were made to

monitor this by recording the time of incident on the questionnaire, however an exact time was often not provided (e.g., providing date of incident only, providing month of incident, or providing time with no date) making it difficult to determine whether data reflect the same incident. Future questionnaires should explicitly ask for both date and time of the incident to ensure these comparisons can be made.

Participants in this study were not provided with specific guidelines or definitions of each aggression type within the questionnaire. Staff in the study were familiar with the original OAS-MNR, and a verbal explanation was provided prior to taking part. However, it is possible that participant's own perceptions of what constitutes each aggression type (e.g., what harm to self means) could have influenced their selection due to not being explicitly indicated on the form. There is evidence that certain types of self-harming behaviours can be overlooked in male patients. For example, banging or punching objects with the intention of hurting oneself has been reported as the most common method of self-harm in males (Whitlock et al, 2011), which is often overlooked as a method of self-harm (Kimbrel, Calhoun, & Beckham, 2017). These perceptions are likely to influence reporting of each behaviour type. Perceptions on what constitutes aggression is explored in the qualitative interview study (chapter five).

As the OAS-MNR was used routinely in the study site, it is possible that participants with experience in this measure may have been biased towards selecting familiar items which were taken from this measure. These staff may be more likely to recognise these triggers when witnessing an aggressive incident, and select these responses on the

questionnaire, rather than the additional unfamiliar items. The newly added items were however, some of the more frequently selected triggers, which suggests staff were not always biased towards OAS-MNR items. Further to this, there were no effects of staff experience or job role on the types of aggression reported on, or number of antecedents selected, which suggests that staff's experience level was not biasing responses.

Another limitation is that the study did not obtain data on incident severity, therefore could impede on the ability to compare to studies in other settings. This study found more incidents of physical aggression towards others and objects than previous studies (Alderman, Knight, & Henman, 2002; Alderman, 2007), however we do not know whether these incidents were considered to be more severe (e.g., threatening gestures or severe physical injury). Measuring severity of incidents was not part of the aims of this study to ensure that, for pragmatic reasons, the questionnaire was brief and focused on identifying triggers within the forensic setting, however this could be recorded on any future more in-depth questionnaires.

A further limitation is that hospital records could not be accessed for the purpose of this study, due to the hospital being unable to provide this data. This means patient data, such as details of their brain injury, or presence of any other diagnoses, relies solely on staff accounts. Although these accounts should be interpreted with caution, they do serve the purpose of understanding staff's awareness of patients' conditions for reporting the additional triggers. As patient details were not recorded on the questionnaire, it is not known how many patients were involved in

the recorded incidents. It is often the case that a small number of patients account for a large number of incidents. For example Dickens, Alderman, and Bowers (2011) recorded 1066 aggressive incidents in an ABI setting, and found that two patients accounted for 78.9% of incidents. It is possible that the observed triggers in this study reflect the individual characteristics of a small number of patients rather than reflecting the overall patients in the service. As this was not recorded, it is unclear how representative these results are of patients with ABI in the service.

### **Clinical implications**

This study highlights the frequency and complexity of aggression in a forensic hospital with patients with ABI. A high number of incidents were triggered by the patient being over-stimulated or being in a noisy environment. This has implications for modification of environments to reduce unnecessary stimuli, and create calm-zones where patients could go **when they feel** overwhelmed.

Many of the common antecedents identified in this study are more difficult to change. For example, patients being agitated or distressed is complex and unique to the individual patient. There are also issues specific to being in a secure environment, such as patients not being able to immediately get what they want, or having to comply with instructions. In these cases, the knowledge of the potential for these to act as a trigger should enable staff adopt a more supportive approach in the way in which security of the ward is enforced, or for staff to plan for extra support when these triggers are more likely to be present. These

results reflect the combined triggers to aggression, individual patients are likely to present with specific triggers which staff should identify in order to appropriately remove or manage.

## **Conclusions**

This study took place in a busy forensic ABI ward, and the level of engagement from staff was sufficient. New items added to the questionnaire in addition to the OAS-MNR antecedents were frequently selected as triggers suggesting that these are helpful additions to include when measuring triggers to aggression in ABI. Triggers were often reported which relate to co-morbid diagnoses in patients with ABI, particularly psychotic disorders, which should be considered when looking at factors which could relate to aggression.

Overall, incidents of aggression on the ward were complex with numerous triggers and types, and target of aggression. The forensic setting had more reports of physical aggression than a non-forensic setting, with having a noisy environment and being over-stimulated as a more frequent trigger. The identification of these triggers in a forensic hospital with patients with ABI may serve to increase staff awareness of the potential for these events to trigger aggression in this population and aim to reduce these triggers where possible as a preventative measure. More in depth exploration of aggression in patients with ABI is explored in chapter five.



## **Chapter Five**

### **Exploring staff perceptions and experiences of aggression in a secure Acquired Brain Injury unit: A qualitative study**

## **Abstract**

**Aims:** The study aimed to gain in-depth accounts of staff's experiences of aggression in a forensic Acquired Brain Injury (ABI) service, to understand perceived triggers to aggressive incidents and explore the role that brain injury and mental health problems play in aggressive incidents.

**Methods:** Semi-structured interviews were completed by 15 low-to-medium secure ABI hospital staff members exploring their experience of patient aggression. Interview transcripts were analysed using thematic analysis.

**Results:** Eight main themes were identified. Staff consistently reported a pattern of aggression that is quick to escalate and short lasting. Staff felt frustration was the starting point of aggression, and that patients behaved aggressively because of frustration in response to internal and environmental triggers. Frustration would lead to aggression if the patient was unable to control or communicate their frustration. Staff believed aggression was increased through; impairment as a result of the brain injury such as difficulties in processing information, symptoms of mental health problems, pre-injury characteristics, and being in a stimulating and challenging environment (noise, restrictions, crowding, and difficult relationships). Aggression was often normalised in this environment. Management techniques focused on reducing patients' aggression by distraction, and removal of the incident trigger.

**Implications:** Environmental alterations may be needed to reduce triggers on the ward (such as quiet zones). Knowing individual patients'

triggers and early warning signs is vital to managing quickly escalating aggression. As aggression can be easily re-triggered following an incident, further support is often required following initial de-escalation.

**Keywords:** Aggression, ABI, qualitative, triggers, management, de-escalation.

## Introduction

Frontline staff are often the target of patient aggression in forensic settings, thus it is important to capture their perspective (Daffern, Mayer, & Martin, 2003). Chapter four documented the frequencies of different types of aggression and triggers to these incidents, but qualitative research captures the staff experience of witnessing or being a target of such aggression. Staff accounts may add insight about why patients behave aggressively and in what ways these triggers influence aggression.

Qualitative research about aggression in forensic ABI settings is lacking, however there have been a handful of studies with staff in non-forensic ABI rehabilitation units (Beaulieu, 2007; Giles, Scott, & Manchester, 2013; Pryor, 2004). In one UK study, 15 Occupational Therapists (OTs) explored the causes, and management of aggression using Grounded Theory analysis. Staff described that aggression was more likely when patients **experienced** fear, frustration, anger, or irritation in response to the environment (Beaulieu, 2007).

In Australia, 28 nurses described a series of "irritants" leading to aggression. Irritants were grouped using **the** Critical Decision Method into the following triggers; too much stimulation from noise or overcrowding, too many restrictions, and interactions with others (Pryor, 2004). In the USA, 63 staff, including nurses and other therapeutic staff, described precipitants to aggressive incidents. These were categorised using Content Analysis into; staff-related, client-related, and environmental antecedents. Descriptions involved frustration as an antecedent to

aggression, with the main cause of frustration being denial of things that the patient wanted (Giles, Scott, & Manchester, 2013).

Research up until now demonstrates the variety of factors which can trigger aggression in patients with ABI, highlighting the impact of the environment. Qualitative research into aggression in ABI from the staff's perspective is currently limited to three studies within non-forensic ABI units. Aggression in a forensic ABI hospital setting has not been researched qualitatively, this is an important gap to address to understand staff views in this specific setting.

#### Management of aggression in patients with ABI

As described in chapter two, staff often use less intrusive aggression management approaches, such as talking to the patient (Alderman, 2007). Qualitative research has also documented staff accounts of verbal de-escalation techniques (Beaulieu, 2007) such as calming the client down, making them feel safe, giving space, and lowering their voice. The OTs in this study described that having knowledge of the client and triggers gave them confidence in managing aggression. Qualitative research in the area of aggression and its management is lacking, specifically in forensic ABI settings.

#### Aims

Given the lack of research in this area, this study aims to explore accounts of aggression in patients with ABI from staff in a forensic setting. As described in chapter four, a mixed-methods approach was

chosen, this section will focus on qualitative staff interviews. The study will attempt to address the following primary research questions.

1. How do staff working in a forensic ABI setting describe and define the concept of aggression?
2. What do staff perceive as triggers to aggressive incidents in patients with an ABI in this setting?
3. Do staff feel having a brain injury and a mental health problem affects aggression?
4. How do staff manage aggression when it occurs on the ward?

Secondary aims are to:

1. Examine the uptake of the interview (sign-up rate, attainment of target sample size).
2. Record barriers to conducting qualitative semi-structured interviews in a secure hospital setting.

## **Methods**

### *Design*

One-to-one semi-structured interviews were chosen to obtain in-depth qualitative accounts of participants' perceptions and experiences of aggression on the ward, without influence from other's perceptions. Thematic analysis was chosen to analyse data, as a flexible approach to identify the patterns that staff describe regarding their experiences of aggression. Interviews were conducted over the same time period as the quantitative study. **There was no requirement** to take part in both,

however when this occurred, questionnaires were completed first. The COREQ checklist was followed for reporting of qualitative studies (Tong, Sainsbury, & Craig, 2007). See [Appendix Nine](#).

### *Setting*

The study took place in the same secure hospital as the quantitative study (see chapter four for details). To maximise convenience for staff, interviews took place in quiet rooms on wards.

### *Participants and recruitment*

The characteristics of target participants and recruitment followed the same process as the quantitative study (see chapter four) except participants were asked if they would like to take part in an interview. If interested, a description was provided by the researcher.

Staff who volunteered were provided with the information sheet, and given a verbal summary of the study and interview questions, before signing the consent form and arranging to complete the study. Participants were aware the research was conducted as part of a doctoral thesis. Recruitment ended following data saturation.

### *The interview*

A semi-structured interview schedule was designed to gather rich detail about participant's perceptions of patient aggression on the ward, as well as perceived triggers, and more information about patient's mental health (see [Appendix Ten](#)). One-to-one interviews were conducted by SW. Due to [the](#) interviews taking place during staff shifts, the interview schedule was devised to be short (approximately 30 minutes) depending

on participant's responses. Open-ended questions were used, with further prompts to gain more detail. See **Appendix Eleven** for development and piloting of the interview.

### *Procedure*

The semi-structured interview schedule was adhered to. Travel, or **out-of-pocket** expenses were not provided, however participants were given refreshments. Interviews were **audio-recorded** and transcribed verbatim by the researcher. Field notes were made by SW. Interviews were not repeated and a copy of the transcribed interview was not provided to the participant.

Following the interview, participants were verbally debriefed and thanked for their time, with opportunity to ask questions. A debrief sheet was provided containing contact details of relevant support services (e.g., Samaritans).

### *Thematic analysis*

Thematic analysis was conducted following the methodology described by Braun and Clarke (2006). **Thematic analysis was chosen as a way of gaining insight into a topic in which current understanding is limited. This approach allows the uncovering of a broad understanding of the staffs perceptions and experiences, in which patterns within the data are examined to report on themes.** A realist method of thematic analysis was used, reporting on the experiences, meanings, and the reality of



participants working with patients with ABI in this setting. The analysis was planned to be theoretically driven, rather than inductive, looking for triggers to aggression and factors explored in the quantitative part of the study relating to the overarching aims of the study.

Researcher SW read each transcript to generate 33 initial codes describing meaningful features within the data. These codes were grouped where relevant concepts overlapped which were collated into initial themes to reflect the overall patterns within the data. SW independently identified six themes, and four subthemes using NVivo software. Researcher KJ then independently read two transcripts and developed potential codes and common patterns. Initial themes were refined and discussed between KJ and SW. It was agreed the number of themes was increased to eight with three subthemes, and themes were given clear names, which are detailed in Table 12. SW developed a codebook of themes, which was refined in November 2018.

Trustworthiness of themes was examined by sending two transcripts identified by random number generator with the codebook to a researcher (JY) independent to the study (November 2018). JY independently reviewed both transcripts and identified themes, 71.8% agreement was achieved, with a Cohen's Kappa value indicating substantial agreement ( $k = 0.67$ , 95% CI [0.56, 0.77],  $p < .001$ ), according to the criteria by Cohen (1960). In December 2018, a three-way meeting was conducted with SW, KJ, and JY to discuss themes. The following revisions were made based on peer feedback: Adding further detail to theme 1, broadening theme 2b to reflect other difficulties

following ABI, the addition of detail regarding staff training in theme 7, and alternative methods of managing aggression in theme 8.

#### *Reflexive statement from all researchers*

Researcher SW conducted interviews, transcribed the recordings and generated themes from data. SW (female) has experience of working with patients with ABI and aggression, and knowledge of aggression through studies (BSc, MSc). This included working in a ward-based support role during the study period. SW was therefore familiar with the study site and participants.

Researcher KJ was involved in the theme generation phase of analysis. KJ has knowledge of aggression based on academic study, but **has** not worked with people with ABI, and did not attend the recruitment site, or meet participants.

Researcher JY was involved in peer review of themes. JY has a wealth of experience in qualitative analysis, as well as staff experiences of dementia, and was independent from this research project.

## **Results**

Of approximately 95 eligible staff members, 15 volunteered to take part in the study (16% recruitment rate). Reasons for non-participation included; time constraints, and reluctance to be recorded. Eight participants were female and seven male. The average age was 35.8 years ( $SD=6.9$ ), and length of time worked in the service ranged

between 1-120 months with an average of 34.7 months ( $SD=39.9$ ). Participants included ward-based support staff (Healthcare assistants/Support workers,  $n=7$ , 46.7%), ward-based qualified nurses (Mental Health Nurses/Learning Disability Nurses,  $n=4$ , 26.7%), student nurses ( $n=3$ , 20%), and multi-disciplinary team staff ( $n=1$ , 6.6%). The interviews lasted between 9-46 minutes (average 21.3 minutes). Due to the busy ward environment, six interviews were interrupted, and resumed as soon as possible.

### *Definition of aggression*

Participants were asked to provide their own definition of aggression. Full responses are provided in Appendix Twelve. These definitions were not used in the thematic analysis. Most participants provided a definition which included descriptions of verbal and physical aggression towards others. Some spontaneously identified that aggression can be towards objects, and one participant counted self-harm as aggression (e.g., participant 12). Some considered sexual comments and behaviours towards others to be aggression (e.g., participant nine). Some thought how the behaviours are interpreted by others, or the intention of the behaviour, can determine whether they would consider it as aggression (e.g., participant four).

### *Themes*

Eight themes were identified within the interview transcripts and are summarised in Table 12. These themes identify the nature of aggression

on the ward, perceived triggers to aggression, factors which impact aggression, along with participant’s experiences of de-escalating aggression.

**Table 12. Themes and subthemes.**

Number	Theme name
1	When aggression occurs, it can escalate quickly
2	Frustration is the starting point of aggression
2b	Impairments as result of brain injury can make aggression more likely
3	Aggression is normal and understandable
4	Being on the ward can trigger aggression
4b.	The restrictive nature of the environment means patients are not able to have what they want, leading to aggression
5	Patient’s attitudes, personality, or history play a part in the expression of aggression
6	Having co-occurring mental health problems can impact aggression
7	The relationship you, other staff, and patients have with each other affects aggression
7b.	“If you know what makes people angry, you can prevent aggression from happening”
8	“It’s very complex and we manage it best we can. We are very good at de-escalating people on the ward”

1. *When aggression occurs, it can escalate quickly*

Aggression on the ward was most often described as verbal and escalating in a typical pattern. Staff described how aggression with this patient group tended to escalate very quickly with rapid de-escalation.

[P8] *"With typical brain injury you get like this heightened aggression, then it dips really quickly, then it goes back up again, then it dips really quickly and it starts wearing off really slow."*

Some staff who had worked on other (non-ABI) wards compared this pattern to the aggression seen in other patients without brain injury;

[P5] *"so like on a general mental health ward you kind of know when you're going in what to expect erm what mood they're in already, but on here, they can be fine for half an hour and then go for an hour and then go back to being fine".*

Although aggression was described as short-lasting, participants also described how aggression in people with brain injury can easily be re-triggered in the period after an incident which may lead to further aggression.

[P10] *"Something can re-trigger the aggression and that's different with brain injury so staff have to be aware that if someone's been*

*aggressive that there is potential for a further incident following de-escalation."*

## *2. Frustration is the starting point of aggression*

Aggression was seen to arise when the patient experienced frustration, which was central to most accounts of why certain triggers lead to aggression. Staff felt aggression occurs from a build-up of frustration, when patients are unable to communicate or control their experience of frustration.

Here, this participant separates the idea of anger from frustration, and describes the participant's loss of control as the trigger of aggression.

[P12] *"He was just frustrated, he wasn't angry towards anyone or anything, he was just frustrated at his situation and just couldn't quite keep a lid on it."*

### *2b. Impairments as result of brain injury can make aggression more likely*

This sub-theme describes how having a brain injury can lead to impairment which can increase frustration, or impact on how patients experience frustration.

[P10] *"We have a couple of service users who struggle with communication and stuff then they can become verbally aggressive or physically aggressive because they are unable to communicate their frustrations and stuff."*

Staff explained how cognitive control mediated frustration and aggression. They felt that, as a result of their injuries, patients were less able to control their frustrations and were more impulsive.

[P12] *"Obviously the frontal lobe brain injuries, they tend to get frustrated, in general they tend not to be able to control that frustration so it's a lot easier for them to become frustrated over things".*

Specific problems as a result of the brain injury (e.g., memory loss, difficulties communicating, or problem solving) were thought to impact aggression through the person thinking or responding differently. This can make it more likely that day-to-day triggers and emotions result in the expression of aggression.

[P2] *"If you look at how brain injury affects you, your executive functioning it's not really there with X anymore. His memories not great, his ability to reason is not great, his ability to problem solve is very limited."*

On the other hand, when describing incidents some staff did not think the brain injury played a role in aggression for example;

[P3] *"It's not specific to brain injury I don't think it would be. When somebody's told they can't do something it makes you cross doesn't it whether you've got a brain injury or not".*

### *3. Aggression is normal and understandable*

Staff talked about having often experienced aggressive behaviours from patients and becoming de-sensitised to the experience. Some felt comfortable dealing with aggression, some not.

[P9] *"You kind of get a bit desensitised to it, working here so long"*

Staff were generally empathetic and understanding of the difficulties that patients face. Staff often saw the situation from the patient's perspective and compared how they would feel if faced with the same triggers.

[P5] *"yeah the set rules, I can understand their frustration, if all they want to do is like get some milk out of the fridge and they have to wait."*

Although staff were used to dealing with aggression, they described times when it was difficult to deal with. In this example, a participant explains it was hard because there was so much of it.

[P8] *"it was really really challenging it was, because it was constant".*

### *4. Being on the ward can trigger aggression*



Features of the ward environment were cited as triggers of aggression. Staff talked about patients being 'overstimulated' with a focus on noise levels and the ward being 'unsettled'. For example;

[P15] *"With brain injury what I've observed so far the environment itself it matters most. If the environment is highly stimulated it's not helpful for them with people moving around or if they're in a loud environment it's not quite good. But if it's calm and relaxed I've seen them responding well to that."*

[P3] *"We did used to have one service user on here who didn't like the noise and he used to kick off all the time if it was noisy".*

Staff crowding was also identified as a trigger of aggression. This member of staff takes the patient's perspective to understand why this could be triggering.

[P8] *"A load of people will turn up, over the amount of people that need to be there will turn up, and that makes someone 10 times worse.....it makes them want to fight with you, your body goes into that fight or flight response doesn't it....So the less people there are the better I think."*

Staff would often comment on how anything on the ward could act as a trigger for a patient for example;

[P9] *"There could have been more triggers that we weren't aware of, anything can trigger on this ward, noise, environment, people around, other people going out on leave when he sees it and he wants leave."*

4b. *The restrictive nature of the environment means patients are not able to have what they want, leading to aggression.*

Staff talked about the rules and restrictions that are features of the secure ward environment. This person vividly describes imagery of the restrictive environment from the patient's perspective.

[P12] *"Certain people will look outside the window and see that's freedom out there and get frustrated at being detained again, or just having observable locked doors sometimes, or fences that are in view of the window is frustrating to certain people, we've had incidents because of that".*

Staff explained patients get frustrated at not being able to do what they want, with subsequent aggression typically being targeted at those who have to enforce the rules.

[P6] *"Sometimes with us with the staff if we can't facilitate or we've got to deny or not let somebody do something if they wanna do it, if we've gotta then put restrictions in place for that individual ... were the ones that are at the focus of it..."*

Some staff felt that rules are too strict and could be reduced;

[P1] *"We over push the patient, 'no you can't do this no you can't do this', maybe you could have just allowed a level of playing field or whatever to let the patient do whatever they're supposed to do which will not cause any harm to anybody".*

Some talked about how rules and restrictions meant reliance on staff by patients to get the things that they want. Staff were often busy and patients would have to wait, which they felt increased the chance of aggression. This person explains how this situation is exacerbated by the brain injury as the patient takes information literally.

[P2] *"Staff not being able to facilitate things instantly, that can cause quite a lot of frustration and leads to aggression"...*  
*"Obviously again goes back to the cognitive functioning, the ability to for example, someone's leave is delayed for 10 minutes because there are not staff at that moment in time. A 'normal' person might be able to think okay that's not an issue, but with people with a brain injury that can be a trigger, it says 4 o'clock I need to be out at 4, they can't reason and don't understand other peoples pressures and time pressures and stuff"*

As a result of being in a secure setting the wards often had negative culture which staff perceived was a result of patients having come from a prison environment.

[P8] *"Our patients have always got, this like a hierarchy, they do it in prisons and stuff. So you'll have a person who, like again inverted commas here 'run the ward' if you will."*

5. *Patients' attitudes, personality, or history play a part in the expression of aggression*

Staff explained that patient's own attitudes and personality characteristics, which have been present throughout their lives, will influence how aggressive they are on the ward. They felt some patients have attitudes which normalise aggression as a response to certain situations and attributed this to their upbringing and past trauma (for example, abuse, or witnessing violence). Staff described how patients had incidents of aggressive behaviours before they sustained their brain injury, and believed that their aggressive nature was part of their personality independent of the brain injury. However, having a brain injury could still make it more difficult for them to stop or control the aggression. For example;

[P11] *"As well as ABI, some people also have traumatic upbringings, incidents, erm some of the index offences that people have committed. People have also had crimes committed against them, some people have been sexually abused, physically abused which is then normalised it for them....Coupled with the ABI is the environment people have been raised in can be a massive factor, just what people accept as normal or reasonable behaviour."*

[P4] *"Some of the service users here in particular they were already quite an aggressive person before they had a brain injury. And erm I think the brain injury exacerbated the aggression"*

#### *6. Having co-occurring mental health problems can impact aggression*

Staff described the different types and symptoms of mental health problems they typically see expressed on the ward and how specific symptoms such as hearing voices and paranoia can sometimes trigger aggression. Staff described how brain injury and mental health problems occurring together can influence aggressive behaviour. For example;

[P10] *"He does also suffer with schizophrenia and has active auditory hallucinations so he will shout at them in response to what they're saying to him.... During those times he, like I say he can either target somebody because they're talking to him in his head or start randomly shouting, it's quite abusive language really."*

Some staff saw the brain injury and mental health problems as two separate difficulties which would often co-occur in patients, but can sometimes interact. Thus, they found it difficult to decide which one is driving a particular behaviour such as aggression as illustrated here.

[P7] *"The problem with mental illness as well is you've got the masking first and foremost, because you don't know if it's the ABI that's creating part of their thoughts if there's significant brain trauma and things like that. Was it before or was it after..."*

This participant reasoned that ABI may exacerbate pre-existing symptoms, giving the example of schizophrenia.

[P4] *"I think that having a diagnosis does impact on aggression to an extent and that possibly the brain injury does make it that extra bit worse. So say if you had schizophrenia and you already had voices telling you to harm people...without a brain injury you've already got that aggressive nature in your mind and I suppose, if you've got a brain injury and you're not able to control that and the voices and things like that then obviously that's going to impact on you more."*

#### *7. The relationship, you, other staff and patients have with each other affects aggression*

This theme refers to how staff and other patients, and the nature of their relationships with one another influence aggression. Discussions focused on how having a good relationship, and positive attitude towards patients can reduce the likelihood of incidents. Some participants explained how aggression can be triggered if patients **do not** know a staff member very well, or **do not** get on with staff members or peers.

[P5] *"Sometimes I think if its unfamiliar staff they can be very wary, I think you have to definitely get to know them a few times. It's almost like they have to trust you don't they"*

[P2] *"Being brought here being on a ward with people you don't know that you don't get along with, there might be certain staff that they have issues with"*

Staff explained the difficulty of building good rapport with patients. They felt that strong relationships could paradoxically trigger aggression because patients come to over rely on particular members of staff, and struggle if that staff member is not there.

[P1] *"sometimes they become aggressive to get that attention now, to get staff back to them, so that they do not feel that emptiness".*

Some members of staff described their experiences of poor relationships with patients. In particular, they felt incidents of aggression were targeted personally at them. Others described outbursts of aggression which was not towards a specific target.

[P14] *"He basically don't like me personally I can tell, that's what I experience."*

7b. *"If you know what makes people angry, you can prevent aggression from happening".*

Staff explained how getting to know patients and being aware of their triggers was one of the main ways they would try to prevent incidents on the ward. They felt by understanding patients, they could work to build

on their strengths and minimise triggers to reduce incidents of aggression.

[P7] *"By knowing everything that upsets that patient what makes them angry, by dealing with all that, reinforcing some of the positive stuff, you know, 9 times out of 10 you'll get a positive outcome."*

Staff made suggestions on what can be helpful, frequently speaking positively about the training they receive which they felt helped them to understand and work with their patients.

[P9] *"I think if you do know a little bit about it it gives you a better understanding of the service users as well, so you know if they've got brain injury they could have problems with this this and this you know"*

8. *"It's very complex and we manage it best we can. We are very good at de-escalating people on the ward"*

Staff spoke about the unique way in which aggression is de-escalated in ABI wards in comparison to other services, and often spoke positively about incidents being managed well. Staff had a preference for verbal de-escalation techniques such as talking to, and supporting, the patient by allowing them to feel heard, giving them time, and moving them to a quieter environment. Staff tended to focus more on distraction away from



the trigger rather than focusing on the aggressive behaviour and often referred to quick de-escalation when their attention was distracted away from the thing that is frustrating them.

[P10] *"Talking to them, offering them distractions ... it's actually more like lets go have a game of pool or go and do this or like, you know like what's going on here lets go and do that kind of thing. It's a different way of managing it within the brain injury service, certainly on this ward."*

Although this staff member felt they did a good job, they reflected on the challenges of their role.

[P5] *"I think we manage it well across the ABI we do, but I think it is the hardest ward to work on"*

Sometimes de-escalation methods didn't work and alternative methods were required, such as restraint. Staff would describe using this as a last resort and did not like having to use it, with the perception that restraint can lead to further aggression. Staff tended to only use more restrictive methods such as seclusion for shorter periods due to the rapid de-escalation of aggression.

[P8] *"Obviously we want to get away from putting hands on people. I don't want to put my hands on people".*

[P7] *"If somebody's that posing that much of a danger that requires seclusion for that long then they might not necessarily be suitable for ABI. You know, as quickly as it starts it finishes."*

One participant presented as a deviant case in this analysis, presenting unique views which did not fit within themes. This participant would describe enforcing rules with a strict and inflexible approach, with suggestions that staff are unhelpful when managing incidents more flexibly, which in turn increases aggression. This is reflective of individual staff traits and preferred methods of control and management which can impact on aggression.

## **Discussion**

### **Principal findings**

The majority of staff considered both verbal and physical acts to be classed as aggression. Staff tended to focus on other people as the target, but some described aggression towards objects such as throwing property. The way staff interpreted behaviours, and the intention of the behaviour, also influenced whether they consider it to be aggression. Staff reported a set pattern of aggression that is quick to escalate, short lasting, and quick to de-escalate which staff perceived to be specific to patients with ABI.

The term "frustration" was used consistently when describing aggression. Frustration was identified as a frequent trigger in chapter four, this chapter allowed explanation on the process, whereby a trigger may cause

frustration, but it is whether the patient can control their response, or effectively communicate their frustration, that will influence aggression. Good relationships with staff who are aware of patients' triggers make incidents less likely. Staff preferred less restrictive methods of de-escalation such as talking to the patient, and offering distraction.

Triggers to aggression involved complex interrelationships between environmental, social, and organisational factors. For example, being on the ward can trigger aggression, through noise or crowding of staff. Similarly, demands on staff time meant unmet patient **requests**, which could lead to frustration, and then aggression. Staff described how the restrictive nature of the environment would trigger aggression through patient **being unable to have what they want**, limited freedom, and a prison-like culture. They described how features of the environment such as locked doors, or fences, reminded participants of their limited freedom, which could influence aggression. Patients' attitudes, personality, or history were described as playing a part in the expression of aggression, such as aggressive **behaviour** prior to the ABI. Having co-occurring mental health problems can impact aggression through experiencing symptoms such as paranoia. The relationship you, other staff, and patients have with each other affects aggression (e.g., patients interacting with staff or patients they dislike).

Secondary aims of the study were to examine barriers to conducting research of this nature in the forensic hospital setting. The minimum requirement of 10 participants was exceeded and 15 participants were interviewed. Although uptake was good, challenges included staff

members finding time to take part, and interviews being interrupted. Interviews worked best when arranged on an ad-hoc basis rather than planned in advance, when the ward was settled and sufficiently staffed. This involved telephoning wards throughout the week to determine suitability of approaching staff at that time. Available staff were approached to participate, often agreeing to take part in the interview there and then, otherwise a different date would be agreed. Arranging a specific time in advance often resulted in non-attendance due to the busy environment, this worked best when participants were instead approached or telephoned on the agreed day to determine availability to fit in with their shift plan. Typically quieter times of day e.g., early mornings, were more successful. These findings are useful when planning other research in similar settings.

### **Findings in relation to other literature**

Frustration and other negative feelings in response to environmental stimuli are consistently reported as a trigger to aggression in patients with ABI in this study and within different hospital settings (Beaulieu, 2007; Giles, Scott, & Manchester, 2013; Pryor, 2004). In this study, staff also described how the ABI in turn influenced frustration, through symptoms such as memory loss, and communication difficulties. Many of these internal triggers to aggression reflect similarities with patients with dementia, where staff and patients' relatives describe similar problems with frustration over reduced abilities and communication (Duxbury, Pulford, Hadi, & Sykes, 2013). Staff in the current study felt that, due to

patient's brain injury, patients had reduced capacity to control their frustration, thus increasing the likelihood of aggressive incidents.

The restrictive nature of the environment was consistently a frustration/irritant in this study which fits with previous research, such as locked doors triggering aggression (See: Pryor, 2004; Giles, Scott, & Manchester, 2013). Our study found staffing levels could indirectly increase aggression through frustration. Organisationally, low staffing may mean patient's needs could not be met due to restrictions on the ward, a finding consistent with previous ABI qualitative studies in a non-forensic rehabilitation setting (Pryor, 2004). This would suggest that, regardless of the level of security within the hospital setting (medium, low, and rehabilitation unit), having restrictions put in place is one of the main causes of frustration in patients with ABI in hospital settings. This is further exacerbated by having fewer staff to respond to patient's needs and requests.

Too much stimulation was described as a trigger in this study, referring to a noisy environment, from other patients making noise, to music and television overstimulating patients, or crowding of staff. This was consistent with previous research in ABI settings in which noise was an irritant which would trigger aggression (Pryor, 2004). This has also been found in non-ABI psychiatric settings where overstimulation through crowding and noise was found to contribute to aggression (Nijman & Rector, 1999; Welsh, Bader, & Evans, 2013). This would suggest that noise and too much stimulation are consistent triggers to aggression within different settings. Theories suggest noise can increase aggression

through physiological arousal, with the frontal lobe playing a large part in processing responses to such arousal (Baron & Richardson, 2004). Information processing may be impaired in people with ABI, making noise a more likely trigger.

Symptoms of mental health problems were also identified as a trigger to aggression, particularly responding to hearing voices, or paranoia. As described in chapter one, mental health problems can often occur alongside ABI. The research linking ABI and mental health to aggression is lacking, however, psychosis and symptoms such as paranoia have been linked with aggression in non-ABI populations (Darrell-Berry, Berry, & Bucci, 2016; Fazel, Gulati, Linsell, Geddes, & Grann, 2009). Staff in this study perceived that ABI may further exacerbate any difficulties from experiencing symptoms of mental health problems through difficulty controlling responses.

### **Clinical implications**

Triggers identified in this study focused on the environment causing frustration which led to aggression. While many of these triggers can be difficult to control in a forensic setting (increased restrictions, noise, difficult relationships), knowledge around the propensity for these external events to become a trigger to aggression could be helpful in terms of increasing levels of support around these events from staff who have good rapport with the patient, or better preparing staff through training for the likelihood of aggression.

The pattern of the quick escalation of aggression in response to triggers described by staff demonstrates the importance of knowing the patients,

their triggers, and early warning signs of frustration to be able to respond early. Aggression in patients with ABI can be quick to de-escalate when appropriate methods are used and staff would benefit from using distraction techniques to distract the patient away from the frustration and removing the trigger to the aggression. There was a tendency for aggression to be easily re-triggered in the time following the initial period of aggression, which is important for staff to be aware of in terms of planning for the management of incidents and additional support in this time period. Staff preferred to manage incidents with less restrictive means such as distraction, with restraint only used as a last resort consistent with other ABI literature (Alderman, Knight, & Henman, 2002).

### Limitations

A limitation is the potential bias as a result of researcher SW's familiarity with the study site and participants. This familiarity is likely to have encouraged participation, with rapport already established, allowing participants to feel comfortable taking part (McConnell-Henry, James, Chapman, & Francis, 2010). This does, however, have the disadvantage of the interviewer being part of the culture in the site, and the potential for this to bias interpretations of data (McDermid, Peters, Jackson, & Daly, 2014). In an attempt to reduce bias, thematic analysis was subject to an independent peer review process. Independent coding of transcripts revealed high agreement between researchers, with only minor changes to themes identified. This would indicate that biases were reduced.

It is also noted that participant's background information was not gathered. On reflection, information such as training about ABI, aggression management (or both), or previous work in other settings (e.g., prisons) would have been useful. This information should be collected in future studies to give context to individual staff member's perceptions of patient aggression.

### Conclusions

Frustration in response to various internal and environmental triggers was regarded by staff as the main reason why patients responded with aggression. Staff perceived that frustration increased as a result of impairment related to the brain injury. They discussed how this, in combination with symptoms of mental health problems, patient personality characteristics, environmental frustrations (noise, restrictions, crowding, and difficult relationships), and organisational factors (staff shortages) would lead to aggression. This was particularly true if the patient, as a result of the injury, was unable to control or effectively communicate their frustration.

A clear pattern of aggression was identified involving quick escalation followed by rapid de-escalation which is helpful to be aware of when managing incidents and training new staff. Effective de-escalation techniques included reducing frustration by removing the trigger to the incident, distracting or empathising with the patient. Getting to know the patient, their triggers to aggression and early warning signs are effective in reducing and managing incidents.



## Chapter Six – Discussion

This thesis explored aggression in individuals who have an ABI in a forensic hospital setting. Despite the high prevalence of ABI and aggression in forensic settings (Shiroma et al, 2010; Slaughter, Fann, & Ehde, 2003) this thesis filled a gap using different methodologies to explore how and why aggression occurs in forensic ABI hospital settings, being the first to examine aggression and its triggers in a forensic setting. This thesis aimed firstly, to explore how aggression can be assessed in this population. Following this, this thesis aimed to explore how aggression is defined, triggered and managed from the perspective of staff members who work in a medium and low secure ABI forensic hospital.

The systematic review and meta-analysis provided a summary of the measures available to assess aggression in people with ABI. The review highlighted reliability, validity, and general quality of the measure. A detailed critical evaluation of the OAS-MNR, a measure which can be used to assess aggression in a forensic hospital setting, followed. A questionnaire was then developed, based on the OAS-MNR, with adaptations based on its limitations, to explore the types of aggression and triggers to aggressive incidents in a forensic hospital setting. The final chapter interviewed a sample of these staff members to understand; how staff define aggression, what staff perceive as triggers to aggressive incidents, how staff perceive both brain injury and mental health affects aggression, and finally how staff manage aggression when it occurs.

Overall, this thesis aimed to be able to inform how we understand and work with patients with ABI who are aggressive in hospital settings.

### **Main results of each chapter**

The systematic review **and meta-analysis** of assessment measures identified **17** different measures. Measures assessed different aspects of aggression using staff observation, or through staff, carer, or self-report, with informant reports by staff and carers most common. These measures mostly assessed aggression along with other behavioural, emotional or cognitive symptoms following ABI, with only four specific measures of aggression (ATTACKS, BARS, OAS-MNR, and OAS-MNR-E). This was consistent with the high prevalence rates of other symptoms which have been found to co-occur with aggression (Johansson, Jamora, Ruff, & Pack, 2008; Rao et al, 2009), and demonstrates that it is important to consider other behaviours and symptoms when assessing aggression.

**This** review found clinicians have a wide choice of assessment tools, but the majority of these measures had very limited validity testing in an ABI population. Validity testing was often limited to one study, testing one or two aspects of validity with several aspects not assessed. In addition to this, the quality of these studies was often low, for example not reporting on the required methodology or appropriate statistics. A smaller number of measures (MBPC-1990R, NFI, SASNOS, and KSMS) did demonstrate good evidence of the areas of validity assessed, these can be used in practice, **dependent** on the setting, the type of aggression and other factors of interest, and the preferred method of assessment.

The meta-analysis was possible with two measures (ABS and NFI), with the remaining measures assessed for each psychometric property with a single study. After pooling data from multiple high quality studies in meta-analysis, the results confirmed findings of the systematic review for the NFI demonstrating sufficient psychometric properties, which would be recommended for use in practice. Discrepancies arose after pooling data for the ABS, with pooled data obtaining good psychometric properties, which the systematic review had identified as "indeterminate" or "insufficient". As study quality from the ABS was low, further validity studies would be required.

The limitations led to the recommendation for further research to be conducted in assessing the psychometric properties of these current measures of aggression in an ABI sample, so that clinicians may use these measures with increased confidence that they are assessing aggression in a reliable and valid way.

In chapter three, one of the measures identified in the systematic review was evaluated in further detail. The OAS-MNR (Alderman, Knight, & Morgan, 1997) was selected to evaluate as an aggression-specific measure, which was the only identified measure assessing antecedents to aggression. Findings of the critique supported conclusions from the systematic review, in which the development of the measure was unclear, and was missing a number of relevant antecedents such as triggers relating to mental health (see: Alderman, Knight, & Morgan, 1997, and chapter two). Despite this limitation, the OAS-MNR demonstrated its use within two different clinical settings in the UK and

US. The OAS-MNR demonstrated to be helpful in monitoring aggression during treatment (Alderman, Knight, & Brooks, 2013), planning behavioural interventions for individual cases (Alderman, Davies, Jones, & McDonnell, 1999), and has been used in quantitative research to increase understanding of aggression and antecedents in ABI settings (Alderman, Knight, & Morgan, 1997; Alderman, Knight, & Henman, 2002; Alderman, 2007; Dickens, Alderman, & Bowers, 2011).

In chapter four, a new questionnaire based on the antecedent section of the OAS-MNR with additional triggers included, was used to investigate triggers to aggression in a forensic ABI hospital setting. Eighty-two incidents of aggression were reported by staff over a two-month period. Aggression was mostly triggered by the patient being agitated or distressed, being frustrated at not being able to get what they want, having to comply with instructions, being over-stimulated, having requests denied, and the environment being noisy. The new antecedents which were added were frequently endorsed, particularly environmental antecedents such as being overstimulated, and antecedents which related to mental health such as presenting with paranoia or relating to a delusion. These additional items were therefore a helpful addition to the antecedent list in the OAS-MNR. A higher number of triggers were selected in the more severe incidents of aggression. The triggers for different types of aggression remained similar, however four triggers were found to differ between aggression types (in response to other patient's verbal behaviour, during restraint, agitated/distressed, and over-stimulated). Staff characteristics (experience and job role) did not impact the type of aggressive incident reported or number of triggers,

suggesting staff factors did not bias reporting more severe incidents. This chapter identified the most common triggers to aggression in patients who have an ABI in a forensic hospital setting which will help to increase awareness in this setting and help to prevent triggers where possible.

Whilst the quantitative chapter could tell us about the most common triggers to aggression, the qualitative research in chapter five provided exploration of these triggers and how they relate to aggression in people with ABI in a forensic setting. Eight themes were identified from interviews with staff on the ward, relating to the way aggression presents after ABI, and the types of internal and external triggers that can lead to aggressive incidents. Further detail was elicited about triggers within the environment such as the restrictions in the secure setting, noise levels on the ward, and the impact of positive and negative relationships with other patients and staff.

There was a high level of consistency in the findings of chapters four and five. Many themes shared similarities with the most frequent triggers identified in chapter four such as frustrations, a noisy environment, and triggers reflecting the restrictive environment. Chapter five was, however, able to explain why staff thought these triggered aggression, finding frustration in response to these triggers was the main reason why staff perceived patients displayed aggression, along with a reduced ability to control frustrations following ABI, leading to aggression. Symptoms of mental health problems such as hallucinations and having paranoid symptoms were often reported as triggers in chapter four. These were, again, expanded in chapter five, with staff suggesting that

having an ABI made controlling responses to these symptoms more difficult. This mixed-methods approach was therefore advantageous in allowing for the in-depth exploration of triggers identified in chapter four, and how these led to aggressive incidents.

Ways of managing and de-escalating incidents were also described, such as distracting away from, or removing, the trigger. This is consistent with other ABI quantitative research in which less intrusive verbal interventions were more often used to manage incidents (Alderman, Knight, & Henman, 2002; Giles & Mohr, 2007). This chapter highlighted how, by having an understanding of the triggers and the ways in which frustration can escalate into aggression, staff can manage incidents better. These findings can be considered within their clinical work, to better understand individual patients and manage incidents.

The findings of this thesis add to the current literature by reviewing the current measures of aggression, expanding on a previous review (Cusimano, Holmes, Sawicki, & Topolovec-Vranic, 2014). This included examining measures suited for use in different types of brain injury, and reviewing both study quality and psychometric result quality, in order to make recommendations for use in practice. The empirical research chapters contributed originally to the field by investigating aggression, its triggers, and management, in a forensic setting, a setting in which this topic has not been investigated in previously. The quantitative research, with inclusion of additional internal and environmental triggers, allowed for the frequency of triggers to be explored, and the qualitative research allowed for greater exploration of staffs perception on the impact of the

forensic environment on these triggers, using thematic analysis as an exploratory method of understanding an under researched area. Some findings in the forensic setting confirmed previous findings of rehabilitation settings, such as frustration in response to environmental triggers being perceived as the main cause of aggression (Beaulieu, 2007; Giles, Scott, & Manchester, 2013; Pryor, 2004). Novel findings relating to the forensic environment included the restrictions as a result of the secure setting being a more frequent trigger to aggression, as well as reminders of detention, a prison-like culture, and patients' pre-injury characteristics (e.g., history of aggression) being perceived to influence aggression.

### ***How aggression is defined***

People often have different ideas on what behaviours are considered as aggression, these differences can impact on reporting of aggressive behaviours. The definition used in this thesis reflected the definition used in the OAS-MNR, as well as the most often used definition in inpatient settings in the literature (Bowers et al, 2011) and **it** included verbal and physical acts that cause physical or psychological harm directed at others, self, or objects.

The systematic literature review in chapter two identified that the most common definitions used when assessing aggression in people with ABI were verbal aggression, physical aggression towards objects, aggression towards other people, and **aggression** towards self. This is consistent with the definition used in this thesis and reflects that a number of these measures based their criteria on the definition used in the OAS, and the

OAS-MNR. Some measures also included sexual aggression and anger as aggression. Some included verbal and physical aggression to others and objects but not aggression directed at self.

The definitions used within these measures of aggression are comparable to that of staff member's perceptions of aggression identified in chapter five when asked how they would define aggression. The majority of staff defined aggression as verbal and physical aggression towards other people, with some also considering physical aggression towards objects. A smaller number also considered sexual aggression and traits of anger in their definition, similar to the definitions used in the identified measures. Anger and sexual aggression were not part of the definition used in this thesis, the finding that these were only considered as aggression in a minority of cases in both chapters, suggests that they reflect a separate but similar concept which is appropriate to exclude for this research.

Only one participant in chapter five considered aggression towards self within their definition. Whilst aggression towards self was considered less frequently than other types of aggression in the measures in the systematic review, and in previous literature on aggression (Bowers et al, 2011), this finding is considerably lower and reflects the views of aggression in this participant group which do not include aggression towards self. This is likely to influence the types of aggression reported on in this thesis. For example, 8.5% of incidents reported in chapter four involved physical aggression towards self. As only a minority of participants considered this behaviour to be aggression, this is likely to



underestimate the frequency of this type of aggression. This therefore misses a category of aggressive behaviour as staff often do not consider these self-directed aggressive incidents to be aggression, or perhaps do not class these incidents as self-harm consistent with under-reporting of self-harm in males in the literature (Kimbrel, Calhoun, & Beckham, 2017). The types of aggression and antecedents reported in chapters four and five are more reflective of verbal aggression, physical aggression towards others and physical towards objects.

### ***Challenges of assessing aggression in people with ABI***

A theme across the thesis was how aggression in individuals with ABI can be assessed in a number of different ways. The systematic literature review in chapter two outlines each type of measure along with advantages and disadvantages of each. Chapters three, four, and five focus on observational recording of incidents. The main disadvantage of observational measures is the underreporting of incidents as staff may struggle to document all incidents observed. Chapter three evaluated one such observational measure, the OAS-MNR which highlighted the difficulty with **standardised** use of observational measures to assess aggression in people with ABI. One setting which used the OAS-MNR in practice would record all incidents of verbal and physical aggression (Alderman, Knight, & Morgan, 1997; Alderman, Knight, & Henman, 2002; Alderman, 2007; Dickens, Alderman, & Bowers, 2011), whereas another setting tended to neglect to record less severe incidents including verbal aggression and aggression towards objects (Giles, Wager, Fong, & Waraich, 2005; Narevic et al, 2011) resulting in underreporting of

aggression. Through reviewing literature, Rippon (2000) described a number of causes for such underreporting of aggression in healthcare settings. These include; the stigma of victimisation, becoming “numbed” by the frequency of assaults, lack of support from administration, poor reporting mechanisms, and excessive paperwork required.

The underreporting of aggression is reflected in the qualitative and quantitative research in chapters four and five. The quantitative study using observational methods to record aggression found that whilst verbal aggression was the most frequently recorded aggression type, this was most often reported in incidents which also included at least one type of physical aggression. Verbal aggression on its own was only reported in 20.3% of incidents. This was in contrast with the qualitative study in chapter five in which staff would describe that aggression was most often verbal. As data were collected in the same site over the same time period it is likely that the aggression reported in chapter four was impacted by the same reporting biases as described in chapters two and three. This underreporting of verbal aggression was seen despite participants describing verbal aggression within their definition of aggression. This reflects a tendency for underreporting of verbal aggression when using observational measures of aggression in both forensic and non-forensic settings.

One limitation of the work in this thesis was that the severity of aggression was not recorded in the questionnaires, **nor were participants specifically asked** to talk about most severe incidents, therefore it is difficult to determine whether the aggression which was documented was

more severe. In chapter five, staff described feeling normalized to the experience of aggression on the ward, and this perhaps explains why staff did not record as many lower level incidents. This appears to reflect views towards aggression where less severe incidents, particularly verbal aggression, are often normalized and viewed as expected in inpatient settings (Jackowski, 2013) and not considered relevant to report.

This thesis highlights that when assessing aggression in ABI using observational measures such as the OAS-MNR, underreporting of less severe types of aggression is likely, dependent on a staff member's views and expectations of aggression. This underreporting has implications for forensic psychology research and clinical work, demonstrating the importance of careful selection of appropriate measures which assess relevant types of aggression, and interpreting results with these reporting biases in mind. We learnt from the systematic review that a clinically useful measure of aggression should be able to monitor changes over time and show sensitivity in changes to aggression following treatment. Observational measures can be used to assess aggression such as the OAS-MNR/OAS-MNR-E and the BARS. If it is not practical to record all incidents of verbal aggression which occur, a more accurate assessment of aggression would be to incorporate the use of an informant questionnaire such as the MBPC-1990R, or an informant/self-report measure such as the NPI, or the KSMS, in which a patient's aggression can be assessed at a particular time point, which can be monitored over time.

### ***The relationship between ABI and aggression***

As described in chapter one, a link can be seen between brain injury and aggression. For example, aggressive behaviours are more common in people with ABI compared to those without ABI in a variety of settings (e.g., Fazel, Lichtenstein, Grann, & Langstrom, 2011; Rao et al, 2009). Although a link can be seen between ABI and aggression, only a minority of those with brain injury commit an offence or act aggressively following ABI (Elbogen, Wolfe, Cueva, Sullivan, & Johnson, 2015; Fazel, Lichtenstein, Grann, & Langstrom, 2011). This demonstrates sustaining an ABI in itself does not lead to aggression, individual differences interact, making certain people more likely to engage in aggressive behaviour.

Many of the factors which relate to an increased risk for aggression following ABI, are known risk factors to aggression without sustaining an ABI. Having a history of violence and aggression is one of the strongest predictors of future aggression (Iozzino, Ferrari, Large, Nielsen, & de Girolamo, 2015), similarly pre-injury levels of aggression are one of the strongest predictors of post-injury aggression following ABI (Cole et al, 2008; Kerr, Oram, Tinson, & Shum, 2011). History of alcohol abuse is a known risk factor of violence and aggression (Elbogen & Johnson, 2009; Fazel, Gulati, Linsell, Geddes, & Grann, 2009), similarly a history of alcohol use is associated with violence and aggression following ABI (Kenny & Lennings, 2007; Tateno, Jorge, & Robinson, 2003). Demographic variables which are considered a risk of offending are also considered a risk for sustaining certain types of brain injury, specifically

TBI. For example, being of low socioeconomic status, low education, and engaging in risk taking behaviour (McCrea, 2007). In this study, staff described that pre-injury characteristics, such as aggressive behaviour prior to their injury, and pre-injury aggressive personality traits related to aggression, and felt that difficulties in control following ABI exacerbated these behaviours. It is likely that the sub-group of people with ABI who present with aggression and offending behaviour also present with general risk factors for offending and aggression/violence independent of brain injury.

It was also highlighted in chapter one, that aggression is associated with higher rates of other physical and psychological difficulties post-ABI. Personality changes are often reported following brain injury. For example, the onset of antisocial traits such as impulsivity and a lack of interpersonal sensitivity have been reported following ABI (Brower & Price, 2001), these are traits which have been associated with aggression (Greve et al, 2001). In chapter five, staff felt that impulsivity increased following ABI, leading to difficulty in controlling an aggressive response. Other symptoms following ABI, for example, deficits in communication abilities and neurobehavioural disability have been found to be significant predictors of aggressive behaviour post ABI, with those experiencing higher levels of disability associated with more frequent aggression (Alderman, 2007). Psychosocial impairment, and dependence on others for activities of daily living, has also been found to significantly increase the likelihood of verbal aggression following ABI (Rao et al, 2009). In chapter five, staff described that they perceived impairments as a result of brain injury made aggression more likely, specifically difficulties in

communicating frustrations, memory loss, and difficulties in problem solving abilities. This evidence suggests that an increase in impairments as a result of ABI is associated with aggression.

The presence of mental health problems, such as major depression, has also been associated with aggression following ABI (Rao et al, 2009; Tateno, Jorge, & Robinson, 2003). Other symptoms of mental illness, such as hallucinations, delusions, psychosis, mania and depression have been found to trigger incidents of aggression following ABI (Giles, Scott, & Manchester, 2013). Similarly in chapters four and five, staff reported mental health problems would co-occur in patients with ABI, and certain symptoms would trigger aggressive incidents, particularly delusions and paranoia. The literature on mental health symptoms and aggression in psychiatric settings finds symptoms typically precede a lower proportion of incidents when compared with triggers relating to restrictions, or other staff or patient interactions (Bowers et al, 2011). This is consistent with the pattern of triggers reported in chapter four, in which other triggers, particularly those which involved enforcing restrictions, were more frequently reported than mental health related triggers. Certain symptoms, particularly persecutory delusions or paranoid ideation, in which a person perceives others intend to cause them harm, have been more closely associated with violence and aggression in psychiatric settings (Coid, Ullrich, Bebbington, Fazel, & Keers, 2016; Keers, Ullrich, DeStavola, & Coid, 2014). This is consistent with the findings of chapter four, in which delusions and paranoia were the most frequent mental health related triggers. In chapter five, staff felt that having difficulties as a result of brain injury could interact with these symptoms in that

someone may struggle to control their behaviour, making an aggressive response more likely.

Overall this would suggest that a sub-group of individuals with ABI present with more frequent aggression. Those who are at an increased risk of aggression post-ABI are more likely to have presence of other known risk factors of aggression, and/or more severe deficits resulting from the injury. This makes it more likely that a person may not be able to control or communicate their frustration or anger effectively, resulting in aggression.

### ***Triggers to aggressive incidents in forensic settings***

Triggers to aggressive incidents were explored in chapter four through staff completing questionnaires assessing the frequency of triggers after incidents, and these were explored in more detail in chapter five through staff interviews. A number of patient factors, staff factors, and environmental factors were identified which could trigger aggression in patients with ABI, consistent with Nijman's (2002) model of understanding ward aggression.

The most frequent patient factors identified in chapter four were being agitated or distressed, being frustrated at not being able to get what they want, and individual symptoms of brain injury or co-morbid mental health problems such as presenting with paranoia, experiencing delusions, or difficulty communicating. The qualitative study identified that staff believed frustration was the main reason for patient aggression, which was central to understanding why other staff or environmental factors

could cause aggression and is consistent with other findings (Beaulieu, 2007; Giles, Scott, & Manchester, 2013; Pryor, 2004). The reasons why frustrations could escalate into aggression were attributed to other internal patient factors such as the patient's inability to control or communicate frustrations due to their brain injury, or due to other personality factors such as a patients' attitudes towards aggression. In the context of the frustration-aggression hypothesis (Dollard et al, 1939; Miller, 1941) these environmental triggers, or interferences with goal achievement, outlined in chapters four and five, would create frustration. The updated hypothesis (Berkowitz, 1989) describes that these frustrations give rise to negative affect, which creates the instigation to aggression. Whether a person acts on this instigation depends on a number of factors such as the strength of frustration, social norms, and prior experiences, which usually inhibit the aggressive response. In this case, staff reported patients often had a history of aggression, aggressive personality traits, and as a result of their injuries had difficulty in controlling frustration, all of which are likely to reduce the mechanisms inhibiting the aggressive inclination. The reduced ability to inhibit the instigation to aggression, may explain why these triggers led to aggressive behaviour.

Symptoms of mental health problems were frequently attributed as triggers to aggression in chapter four, in chapter five, staff described their experiences of patients in their care responding to voices, or feeling paranoid about others, which resulted in verbal aggression directed towards the voices they heard or towards other people. Symptoms of mental health problems have been associated with aggression in previous



studies in both ABI settings (Kalapatapu & Giles, 2016) and general psychiatric settings (Fazel et al, 2009; Fazel et al, 2010). In this ABI patient group, it was felt by staff that the brain injury would interact with experiences of mental health symptoms through the patients' reduced ability to control an aggressive response.

Staff factors in this setting in chapter four, included the verbal and physical interactions with patients, particularly being asked to comply with instructions or denying patient's requests. In chapter five, staff described that they felt aggression was targeted at those who had the job of enforcing rules and security. Some staff felt personally targeted by aggression whereas others felt it was not personal, and many staff empathized with the patient's situation and difficulties. Many staff felt the relationship they have with patients was important in determining whether a patient would be aggressive. If a staff member had a good relationship with the patients and knew their triggers well, it was felt that incidents would be less likely to occur as they could use presumptive de-escalation techniques to reduce patients' frustration and subsequent aggression. Peer-related factors were also identified by participants, with other patients' verbal or physical behaviour triggering aggressive incidents. Accounts from staff in chapter five identified that this was usually when the patient did not get on with other patients, or when the other patient's behaviour caused a trigger such as loud noise.

Environmental factors were identified in chapter four as frequent triggers in this setting, such as noise levels and being over-stimulated. Specifically, the restrictions in the secure environment would often

trigger aggression. In chapter five, staff explained this was due to an increase in frustrations when patients were unable to have **what they want** immediately, or reminders of being detained and **of** their lack of freedom. Environmental restrictions are often described as triggers to aggression in other ABI non-forensic settings, such **as** denial of things they want, or locked doors (Giles, Scott, & Manchester, 2013; Pryor, 2004). Triggers which relate to environmental restrictions **were** reported more frequently in this forensic setting compared to a non-forensic setting (Alderman, 2007; Alderman, Knight, & Henman, 2002; Alderman, Knight, & Morgan, 1997; Dickens, Alderman, & Bowers, 2011). It may be that the presence of any restrictions which result in **the denial of things they want** has the potential to trigger aggression regardless of the setting, however, **as** restrictions are present more often in a forensic setting this is a more frequent trigger. Although environmental restrictions are an inevitable part of forensic settings, these findings have implications for forensic psychology practice. This includes training staff to respond in a supportive and understanding way when enforcing restrictions, in order to reduce frustrations where possible.

Some of the triggers such as patients having to wait, or being unable to have **what they want**, related to a lack of staff to facilitate tasks. Conversely, having too many staff responding to incidents, or overcrowding, contributed to triggering aggressive incidents. The presence of staff, or lack **thereof**, can therefore play a role in triggering incidents. **It** is important to be aware of **this** in forensic settings, where the restrictions in place require patients to rely on staff in order to **have the things they want**.

The triggers identified in chapters four and five reflect an impulsive reaction to a trigger which caused frustration to the patient, which they were unable to effectively control. The type of aggression described is consistent with hostile aggression, which is often characterized as impulsive and driven by anger (Bushman & Anderson, 2001). Instrumental aggression, which refers to a planned act as a means of achieving a goal, was rarely described by staff in this study. This is based on staff's perception of events and interpretations of patient's behaviours and intentions. This reflects that staff perceived hostile aggression as the main type of aggression observed in patients with ABI, characterized by rapid escalation following a trigger, resulting in increased frustration which the patient is unable to effectively control.

Difficulty in communication was frequently identified as a trigger in chapter four, and similarly, the inability to communicate frustration was attributed by staff as an explanation for patients' aggressive behaviour. The aggression which is reported appears to be a way of communicating to others about their internal state, or as an impulsive act as a way of releasing frustration, rather than an act with the intention to harm others. This is consistent with literature which recognises aggression as a form of communication (Durand & Carr, 1991; Doss & Reichle, 1989). This finding is comparable to that of other conditions which involve communication difficulties. For example, researchers in dementia view aggression as a poorly communicated need (Stokes, 2000) and describe the frustration patients feel when unable to communicate their needs, or feelings of threat (Duxbury, Pulford, & Sykes, 2013). Similarly, individuals who have autistic spectrum disorders with verbal

communication difficulty have been found to display aggression as a form of expressive communication (Chiang, 2008). Difficulty in expressive communication is associated with aggressive behaviour in individuals in psychiatric settings (Dura, 1997). It is likely that individuals who have an ABI, along with experiencing challenges in cognitive abilities, and communication difficulties, display aggressive behaviour as a way of communicating their needs, and inner feelings of frustration or distress.

The accounts staff members gave relate to biological explanations of aggression following ABI in the literature as described in chapter one (Miller, 1994). Staff described a reduced ability to control frustrations, leading to aggression, consistent with frontal lobe disinhibition (Miller, 1994). As frontal cortices play a large part in modulating aggressive behaviour (Siever, 2008), damage to the frontal lobes may lead to patients having a lower threshold for aggression when frustration is experienced, making an aggressive response more likely. The typical pattern of aggression described by staff is consistent with episodic aggression post-brain injury (Miller, 1994; Wood & Thomas, 2013). This can be described as having an abrupt onset in response to minor frustrations, consistent with the rapid escalation of aggression which was reported. Finally, the aggression reported by staff also reflects an exacerbation of pre-morbid personality traits (Miller, 1994). Staff reported that patients often had histories of violence or aggression prior to sustaining their brain injury and often had beliefs supporting or normalising violence. The aggression described in this study has a variety of triggers and may have different underlying contributing factors as a

result of different types of injury and different experiences pre- and post-injury, which reflects the complexity of ABI.

The findings of this research have implications for forensic psychology practice. Aggression following ABI was found to reflect hostile or impulsive aggression, which would escalate quickly in response to an internal or environmental trigger. Knowing individual patients' triggers plays an integral part of being able to reduce triggers, or respond early when triggers are present. Measures of assessing aggression and triggers, such as the OAS-MNR, or the adapted questionnaire used in chapter four, are highly important for psychologists working in forensic settings with patients who have ABI to be able to identify triggers to aggression.

### ***Limitations and further research***

The original research in this thesis is limited by lack of co-operation from other sources besides staff working in the hospital. Information such as incident frequency, perceived triggers, and co-occurring mental health problems were reported by staff only, as there was no access to patient data. This prevented comparisons for accuracy. Patient demographic data was not obtained, and is limited to a general description of the types of ABI in the service. It is not known which types of ABI were more prevalent, or the average age of patients in this study. Whilst efforts were made to access patient data, this was not possible, reducing the ability to apply the findings of this study to other ABI settings.

It is notable, and a pause for reflection, that research up to this point has focused on staff perception of aggressive incidents (Beaulieu, 2007;

Giles, Scott, & Manchester, 2013; Pryor, 2004). It may be that patients have a different perspective, or different explanations for why certain triggers can lead to aggression. As identified in chapter two, eliciting patients' accounts to assess aggression can be unreliable, as patient reports can sometimes be impacted by lack of awareness into their own behaviours and impairments depending on the severity of the injury (Hart, Seignourel, & Sherer, 2009; Sherer, et al, 2003). There has been mixed evidence regarding the consistency of staff and patient accounts. For example, Whittington and Wykes, (1996) found accounts were reliable with only a minority of cases of disagreement, in which there was no tendency for staff to underreport their own roles in the incident. Research in psychiatric settings has found high levels of concordance between staff and patient's views on aggression (Pulsford et al, 2013), whereas others found that some of the views of staff and patients differed, for example nurses being more likely to attribute internal patient factors to aggression (Duxbury & Whittington, 2005). Future work should include multiple informants, which could also include patient perspectives depending on the severity of the injury and level of insight into their own behaviour. Patients' accounts along with the accounts from staff could be used in further research as a way of increasing reliability, or of further understanding the effect of lack of insight on aggression. This would display the full picture of aggressive incidents from the perspective of all individuals involved, and of why aggressive incidents occur and how they can be best managed.

A limitation of this research, is the use of a non-standardised questionnaire in chapter four. It was decided not to use the standardised

OAS-MNR, due to **the** limitations outlined in the critique in chapter three in which it was **suggested** that important information on triggers **could** be missed, and as identified in chapter two, no further validated measures assessing triggers to aggression in people with ABI **were** available. This limits the ability to determine whether the results are a true reflection of the most frequent triggers, and makes it difficult to compare this research to other findings. This limitation was reduced where possible. The questionnaire was developed in line with guidance on developing research questionnaires (Boynton & Greenhalgh, 2004), and by basing the questionnaire on the validated OAS-MNR, with additional items added from findings of previous qualitative research. However, it is acknowledged that further testing of this questionnaire is needed before firm conclusions can be made about triggers.

This questionnaire was part of a mixed-methods study. This methodology has the advantage of **enabling** objective analysis of quantitative data, with qualitative data to provide further context (Libarkin & Kurdziel, 2002). When both methods are combined, limitations of each are reduced, **achieving** greater insights that cannot be obtained **with each method** individually (Venkatesh, Brown, & Bala, 2013). In this study, participants typically completed the questionnaire part from chapter four prior to completing interviews. It is possible that the order in which they were completed may **have biased the results**, by having thought about, or using language of triggers stated in the questionnaire. **However** the questionnaire items were based on the OAS-MNR, a routinely used measure in the service, and other ABI services in the UK, **therefore reducing the likelihood of this bias**.

Whilst the expected recruitment rates were achieved (57 participants in chapter four, 15 participants in chapter five), with interviews conducted until data saturation was achieved, this is a limitation as this only represents a small amount of the total number of staff (60% in chapter four, 16% in chapter five). It is possible that the staff who agreed to complete questionnaires or take part in an interview may have been motivated to participate due to having had more frequent or severe experiences of aggression, or strongly held beliefs about the triggers and management of aggression, in comparison to the staff who chose not to take part. This potentially biases results to the perceptions of only specific staff members which may not reflect the full range of experiences and perceptions.

### ***Conclusions***

Incidents of aggression in a forensic ABI setting are frequent, complex and often include multiple types of aggression and triggers to aggression within one single event. Methods of assessing aggressive incidents in patients with ABI are lacking in adequate validation studies, with only one validated measure (OAS-MNR) including assessment of antecedents to aggression. This measure can be helpful in assessing triggers to aggression, however would benefit from an update to include further antecedents identified in this research and that by Giles, Scott, and Manchester (2013). In this setting, frustration was identified as the main cause of aggression in both questionnaires and interviews. This can lead to aggression if the patient is unable to control or effectively communicate their frustration. Impairment as a result of the brain injury



can make this more difficult. The secure environment was a trigger to aggression via restrictions, noise, crowding, and variable relationships with staff. Symptoms of mental health problems such as paranoia added to the mixture of triggers.

The identification of clear patterns of aggression (quick escalation, followed by rapid de-escalation) in patients with an ABI **is** helpful when training new staff or managing incidents. Effective management and de-escalation techniques included: reducing frustration by removing the trigger to the incident, distracting or empathising with the patient. Getting to know a new patient, including their history and triggers, **was identified as** an effective long-term strategy when considering how to reduce aggression.

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## List of Appendices

### Appendix 1 – PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	25
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	26
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	28-32
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	32
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	33
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	35
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	33-36
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	34



Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	35-36
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	36-38
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	33
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	38-40
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	N/A
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$ ) for each meta-analysis.	37-38
Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	38-39
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
<b>RESULTS</b>			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	40-43
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	44-57
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	63-68
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	69-76

Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	69-76
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	63-64
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	77-84
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	84-85
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	85-87
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	N/A

## Appendix 2. Example of data extraction form

<b>Basic Study Information</b>	
<b>Study Title</b>	Use of a modified version of the overt aggression scale in the measurement and assessment of aggressive behaviours following brain injury
<b>Authors (Year)</b>	Alderman, Knight & Morgan (1997)
<b>Country</b>	UK
<b>Study setting</b>	Inpatient high dependency ward
<b>Sample used</b>	
<b>Population</b>	Severe brain injury with challenging behaviours
<b>N =</b>	18
<b>Age (mean, SD, range)</b>	Not stated
<b>% male/female</b>	Not stated
<b>Any other diagnosis within this population</b>	None stated
<b>Other populations within study (eg controls)</b>	No
<b>Age (mean, SD, range)</b>	N/A
<b>% male/female</b>	N/A
<b>Sampling method</b>	N/A
<b>Intervention – (Measure)</b>	
<b>Measurement tool used</b>	Overt Aggression Scale- Modified for Neurorehabilitation

<b>Length of measure</b>	Rates type of aggression, severity (1-4), antecedents, and intervention used.
<b>Description of measure</b>	Revision of the Overt Aggression Scale devised by Yudofsky et al. Four categories of aggressive behaviour (verbal, aggression against objects, against self and against others) with severity rated from 1-4. Added a range of 18 categories describing antecedents observed to precede aggressive behaviour which has a numbered code. The range of possible interventions was extended from 11 to 14 to reflect types of strategies used in neurorehabilitation.
<b>Other factors within measure?</b>	None
<b>Who delivered the measure? (self/staff/family etc)</b>	Staff rated
<b>Any other measures used within the study?</b>	None
<b>Outcome and results</b>	
<b>How is aggression defined/described in the measure?</b>	verbal, aggression against objects, against self and against others

<b>Is reliability assessed?</b>	Inter rater reliability: 76 behaviours by 18 subjects recorded by both observers
<b>Reliability results</b>	<p>Kappa values calculated for each part:</p> <p>Type of aggression (kappa = 1.0, 100% agreement, z score= 5.18)</p> <p>Rating of severity (Kappa = 0.936, 97.4% agreement, z score = 6.99)</p> <p>Antecedents (kappa = 0.742, 76.3% agreement, z score =22.48)</p> <p>Single (kappa = 0.944, 95.5% agreement, z score =8.99)</p> <p>Multiple (kappa 0.638, 68.5% agreement, z score =12.04)</p> <p>Intervention (kappa = 0.952, 98.7% agreement, z score =5.06)</p>
<b>Is validity assessed?</b>	No
<b>Validity results</b>	N/A
<b>Interpretation</b>	Authors report Kappa less than 0.50 indicates poor reliability, 0.50 – 0.75 indicates fair, and 0.75+ is good. All values fair to good reliability.
<b>Other comments?</b>	Raters used in the study were the authors of the study who developed the measure – likely had specialist knowledge and not representative of staff who would use the measure.

### Appendix 3. Example of COSMIN risk of bias assessment

<b>Authors</b>	Alderman, Knight & Morgan (1997)	
<b>Measure name</b>	Overt Aggression Scale - Modified for Neurorehabilitation (OAS-MNR)	
<b>COSMIN Box 1. PROM development</b>		
<b>Question</b>	<b>Rating (very good, adequate, doubtful, inadequate, N/A)</b>	
1. Is a clear description provided of the construct to be measured?	Very good	
2. Is the origin of the construct clear: was a theory, conceptual framework or disease model used or clear rationale provided to define the construct to be measured?	Very good	
3. Is a clear description provided of the target population for which the PROM was developed?	Very good	
4. Is a clear description provided of the context of use (i.e. discriminative, evaluative purpose, and/or predictive)	Very good	
5. Was the PROM development study performed in a sample representing the target population for which the PROM was developed?	Very good	

6. Was an appropriate qualitative data collection method used to identify relevant items for a new PROM?	Inadequate
7. Were skilled group moderators/ interviewers used?	N/A
8. Were the group meetings or interviews based on an appropriate topic or interview guide?	N/A
9. Were the group meetings or interviews recorded and transcribed verbatim?	N/A
10. Was an appropriate approach used to analyse the data?	Doubtful
11. Was at least part of the data coded independently?	N/A
12. Was data collection continued until saturation was reached?	N/A
13. For quantitative studies: was the sample size appropriate?	Inadequate
14. Was a cognitive interview study or other pilot test performed? If NO skip items 15-35	Very good
15. Was the cognitive interview study or other pilot test performed in a sample representing the target population?	Very good
16. Were patients asked about the	No- inadequate

comprehensibility of the PROM? If NO or not clear, skip items 17-25	
17. Were all items tested in their final form?	N/A
18. Was an appropriate qualitative method used to assess the comprehensibility of the PROM instructions, items, response options, and recall period?	N/A
19. Was each item tested in an appropriate number of patients?	N/A
20. Were skilled interviewers used?	N/A
21. Were the interviews based on an appropriate interview guide?	N/A
22. Were the interviews recorded and transcribed verbatim?	N/A
23. Was an appropriate approach used to analyse the data?	N/A
24. Were at least two researchers involved in the analysis?	N/A
25. Were problems regarding the comprehensibility of the PROM instructions, items, response options, and recall period appropriately addressed by adapting the PROM?	N/A
26. Were patients asked about the comprehensiveness of the PROM?	No – doubtful (Skip items 27-35)



27. Was the final set of items tested?	N/A
28. Was an appropriate method used for assessing the comprehensiveness of the PROM?	N/A
29. Was each item tested in an appropriate number of patients?	N/A
30. Were skilled interviewers used?	N/A
31. Were the interviews based on an appropriate interview guide?	N/A
32. Were the interviews recorded and transcribed verbatim?	N/A
33. Was an appropriate approach used to analyse the data?	N/A
34. Were at least two researchers involved in the analysis?	N/A
35. Were problems regarding comprehensiveness of the PROM appropriately addressed by adapting the PROM?	N/A
<b>OVERALL PROM DEVELOPMENT RATING</b>	<b>INADEQUATE</b>
COSMIN box 6. Reliability	
1. Were patients stable in the interim period on the construct to be measured?	Very good (assessed at same time)
2. Was the time interval appropriate?	Very good

3. Were the test conditions similar for the measurements? E.g. type of administration, environment, instructions	Very good
4. For continuous scores: Was an intraclass correlation coefficient (ICC) calculated?	N/A
5. For dichotomous/nominal/ordinal scores: Was kappa calculated?	Very good
6. For ordinal scores: Was a weighted kappa calculated?	N/A
7. For ordinal scores: Was the weighting scheme described? E.g. linear, quadratic	N/A
8. Were there any other important flaws in the design or statistical methods of the study?	Doubtful – methods did not fully reflect use in practice
<b>OVERALL RELIABILITY RATING</b>	<b>DOUBTFUL</b>

**Appendix 4. Table of excluded papers (n=53) and reasons for exclusion**

<b>Author</b>	<b>Measure</b>	<b>Reason for exclusion</b>
Alderman, Knight & Henman (2002)	OAS-MNR	Does not validate measure
Alderman, Bentley & Dawson (1999)	OAS-MNR	Does not validate measure
Alderman, Davis, Jones & McDonnel (1999)	OAS-MNR	Does not validate measure
Alderman, Major & Brooks (2018)	START	Items do not reflect aggression
Alderman, Knight, Stewart, & Gayton (2011)	OAS-MNR	Does not validate measure
Andrews, Kaye, Aitken, Parr, Bates & Murphy (2003)	ESDQ	Items do not reflect aggression: only one question in anger scale
Azouvi (2015)	Dysexecutive Questionnaire	Items do not reflect aggression – one question
Bateman, Teasdale, & Willmes (2009)	Self-rating European Brain Injury Questionnaire	Items do not reflect aggression: impulsivity not aggression
Belanger, Brown, Crowell, & Vanderploeg	Key Behaviors Change Inventory	Sample not brain injury

(2002)		
Beni, et al (2017)	The Geneva Scale of Socio-emotional Behavior Change	Measure not in english
Bodenburg	Dysexecutive Questionnaire	Items do not reflect aggression – one question
Bogner & Corrigan (2009)	Ohio State University TBI identification method	Items do not reflect aggression: TBI screening method
Bohac, Malec & Moessner (1997)	Mayo-Portland Adaptability Inventory	Items do not reflect aggression – one question
Boosman et al (2016)	Motivation for Traumatic Brain Injury Rehabilitation Questionnaire	Items do not reflect aggression: Anger
Ca Silver, Cattran & Oddy (2014)	The BIRT Neuro-Behavioural Scales	Items do not reflect aggression
Cattran, Oddy & Wood (2011)	BIRT regulation of emotions questionnaire	Items do not reflect aggression: Emotion regulation

Cattran, Oddy, Wood & Moir (2011)	five measures of non-cognitive neurobehavioural (NCNB) change	Items do not reflect aggression and not validated in this article
Chervinsky et al (1998)	Motivation for traumatic brain injury rehabilitation questionnaire	Items do not reflect aggression: Anger
Corrigan & Bogner (1995)	Agitated Behavior Scale	Review article
Corrigan, Smith-Knapp & Granger (1997)	Functional Independence Measure	Items do not reflect aggression
Cusimano, Holmes, Sawicki & Topolovec-Vranic, (2014)	Review	Review article
Diamond & Magaletta (2006)	Short-form Buss-Perry Aggression Questionnaire	Sample not brain injury
Egeland & Kovalic-Gran (2010)	Conners' Continuous Performance Test	Items do not reflect aggression
Gagnon (2016)	A French adaptation of the Overt Behaviour Scale	Measure not in English
Galski, Palatz, Bruno & Walker (1994)	Cognitive Behavioral Rating Scale	Validation not described in detail

		and not main purpose of study
Hall et al (2001)	Review	Review article
Heilbronner & Henry (2013)	Review	Review book
Horton & Tommons (1982)	Wiggins MMPI content scales	Items do not reflect aggression and does not validate measure
Johansson, Jamora, Ruff & Pack (2008)	Ruff Neurobehavioural Inventory anger scale	Aggression scale not described
Kolitz et al (2003)	Key Behaviors Change Inventory	Items do not reflect aggression: interpersonal difficulties
Kurtz & Blais (2007)	Personality Assessment Inventory	Review article
Leon-Carrion (1998)	Neurologically-related Changes in Personality Inventory	Sample not brain injury
Malec (2000)	Mayo-Portland Adaptability Inventory	Items do not reflect aggression – one question
Malec, Kean, Altman & Swick (2012)	Mayo-Portland adaptability	Items do not reflect aggression:

	inventory	one question in adjustment index
Malec & Hammond (2018)	Neuropsychiatric Inventory	Does not validate measure
Malloy & Grace (2005)	Review	Review article
Max et al (1998)	The Neuropsychiatric Rating Schedule	Child/adolescent sample
Meachen (2008)	Brief Symptom Inventory - 18	Items do not reflect aggression
Monsalve et al (2012)	Neuropsychiatric Inventory	Does not validate measure
Mooney, Walmsley & McFarland (2006)	self-report Dysexecutive Questionnaire	Participants not brain injury and items do not reflect aggression- one question
Mosalve et al (2014)	Review article	Review article
Palev et al (2001)	MMPI-2 Content Scales	Items do not reflect aggression - unclear
Pender & Fleminger (1999)	Review	Review article
Rochat (2018)	UPPS model of impulsivity	Items do not reflect aggression - impulsivity

Shukla, Devi & Agrawal (2011)	Review	Review article
Suris et al (2004)	Review	Review article
Swan & Alderman (2004)	Neurobehavioural Expectations Scale	Items do not reflect aggression and does not validate measure
Tate (2013)	Review	Review article
Till, Christensen & Green (2009)	Personality Assessment Inventory	Aggression scale not described
Tulsky, Kisala, Holdnack, & Cohen (2016)	Traumatic Brain Injury-Quality-of-Life measurement system	Items do not reflect aggression - anger
Vallat-Azouvi et al (2018)	Brain Injury Complaint Questionnaire	Items do not reflect aggression - one question
Woessner & Caplan (1995)	Symptom Checklist-90-Revised	Items do not reflect aggression and does not validate measure
Yamasato (2007)	Questionnaire for Neurobehavioral Disability	Items do not reflect aggression



## Appendix 5. University of Nottingham Faculty of Medicine and Health Sciences Research Ethics Committee approval form



**University of Nottingham**

UK | CHINA | MALAYSIA

Email: [FMHS-ResearchEthics@nottingham.ac.uk](mailto:FMHS-ResearchEthics@nottingham.ac.uk)

**Faculty of Medicine & Health Sciences  
Research Ethics Committee**

c/o Faculty PVC Office  
School of Medicine Education Centre  
B Floor, Medical School  
Queen's Medical Centre Campus  
Nottingham University Hospitals  
Nottingham, NG7 2UH

24<sup>th</sup> July 2017

**Stephanie Lawton**

Trainee Forensic Psychologist/Doctorate student in Forensic Psychology

**c/o Dr Katy Jones**

Assistant Professor of Applied Psychology

B10, B Floor Institute of Mental Health

Division of Psychiatry and Applied Psychology

University of Nottingham Jubilee Campus

Triumph Road Nottingham

NG7 2TU

Dear Ms Lawton

<b>Ethics Reference No:</b> 104-1707 – please always quote	
<b>IRAS ID:</b> 229693 <b>Sponsor Ref:</b> 17042	
<b>Study Title:</b> How do staff members at a forensic hospital describe and categorise triggers to aggression in patients with a brain injury: A mixed methods study.	
<b>Short Title:</b> Triggers to Aggression after Brain Injury.	
<b>Chief Investigator/Supervisor:</b> Dr Katy Jones, Assistant Professor of Applied Psychology, Institute of Mental Health, Division of Psychiatry and Applied Psychology.	
<b>Lead Investigators/student:</b> Stephanie Lawton, Trainee Forensic Psychologist/Doctorate Student in Forensic Psychology.	
<b>Type of Study:</b> qualitative, NHS staff, PG project	
<b>Proposed Start Date:</b> 04.09.17	<b>Proposed End Date:</b> 04.09.2018 12 mths
<b>No of Subjects:</b> 20+	<b>Age:</b> 18+years
<b>School:</b> Medicine	

Thank you for submitting the above application which has been considered by the Committee at its meeting on 18<sup>th</sup> July 2017 and the following documents were received:

- FMHS Research Ethics Application Form version 1.0: 13.06.2017
- Protocol version 1.0: 13.06.2017
- Participant Information Sheet (with IRAS reference number included) version 1.0: 13.06.2017
- Consent Form (with IRAS reference number included) version 1.0: 13.06.2017
- Proposed Questionnaire and Interview Schedule version 1.0: 13.06.2017
- Preliminary Approval from Hospital version 1.0: 13.06.2017
- Example E-mail of Approach version 1.0: 13.06.2017
- Poster Advertisement version 1.0: 13.06.2017
- Debrief Form version 1.0: 13.06.2017
- Sponsor letter and liability form dated 15.06.2017
- CV for CI (Dr Katy Jones) version 1.0: 13.06.2017

These have been reviewed and are satisfactory and the study has been given a favourable opinion.

A favourable opinion is given on the understanding that the conditions set out below are followed:

1. You should follow the protocol agreed and inform the Committee of any changes using a notification of amendment form (please request a form).



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2. You must notify the Chair of any serious or unexpected event.
3. An End of Project Progress Report is completed and returned when the study has finished (please request a form).

Yours sincerely

A handwritten signature in black ink, appearing to read 'Ravi Mahajan', with a large flourish at the end.

**Professor Ravi Mahajan**  
Chair, Faculty of Medicine & Health Sciences Research Ethics Committee

## Appendix 6. University of Nottingham sponsorship statement



UNITED KINGDOM · CHINA · MALAYSIA

Research, Enterprise and Graduate Services  
**University of Nottingham**  
King's Meadow Campus  
Lenton Lane Nottingham  
NG7 2NR

Our reference: RGS 17042

0115 8467906  
[sponsor@nottingham.ac.uk](mailto:sponsor@nottingham.ac.uk)

**Health Research Authority  
Research Ethics Committee**

Dr Katy Jones  
Assistant Professor of Applied Psychology  
Room B10, B Floor  
Institute of Mental Health  
University of Nottingham Innovation Park  
Triumph Road  
Nottingham  
NG7 2TU

15.06.2017

Dear Sir or Madam,

### Sponsorship Statement

**Re: How do staff members at a forensic hospital describe and categorise triggers to aggression in patients with a brain injury: A mixed methods study**

I can confirm that this research proposal has been discussed with the Chief Investigator and agreement to sponsor the research is in place.

An appropriate process of scientific critique has demonstrated that this research proposal is worthwhile and of high scientific quality.\*

Any necessary indemnity or insurance arrangements will be in place before this research starts. Arrangements will be in place before the study starts for the research team to access resources and support to deliver the research as proposed.

Arrangements to allocate responsibilities for the management, monitoring and reporting of the research will be in place before the research starts.

The duties of sponsors set out in the NHS Research Governance Framework for Health and Social Care will be undertaken in relation to this research.\*\*

\* Not applicable to student research (except doctoral research).

\*\* Not applicable to research outside the scope of the Research Governance Framework.

Yours faithfully

Angela Shone

Head of Research Governance  
University of Nottingham



## Appendix 7. Letter of Health Research Authority approval



Health Research Authority

Dr Katy Jones  
Room C24, Institute of Mental Health  
University of Nottingham Innovation Park, Triumph Road  
Nottingham  
NG7 2TU

Email: [hra.approval@nhs.net](mailto:hra.approval@nhs.net)

26 July 2017

Dear Dr Jones,

### Letter of **HRA Approval**

<b>Study title:</b>	<b>How do staff members at a forensic hospital describe and categorise triggers to aggression in patients with a brain injury: A mixed methods study.</b>
<b>IRAS project ID:</b>	<b>229693</b>
<b>Protocol number:</b>	<b>17042</b>
<b>Sponsor</b>	<b>University of Nottingham</b>

I am pleased to confirm that **HRA Approval** has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications noted in this letter.

#### **Participation of NHS Organisations in England**

The sponsor should now provide a copy of this letter to all participating NHS organisations in England.

*Appendix B* provides important information for sponsors and participating NHS organisations in England for arranging and confirming capacity and capability. **Please read *Appendix B* carefully**, in particular the following sections:

- *Participating NHS organisations in England* – this clarifies the types of participating organisations in the study and whether or not all organisations will be undertaking the same activities
- *Confirmation of capacity and capability* - this confirms whether or not each type of participating NHS organisation in England is expected to give formal confirmation of capacity and capability. Where formal confirmation is not expected, the section also provides details on the time limit given to participating organisations to opt out of the study, or request additional time, before their participation is assumed.
- *Allocation of responsibilities and rights are agreed and documented (4.1 of HRA assessment criteria)* - this provides detail on the form of agreement to be used in the study to confirm capacity and capability, where applicable.

Further information on funding, HR processes, and compliance with HRA criteria and standards is also provided.

It is critical that you involve both the research management function (e.g. R&D office) supporting each organisation and the local research team (where there is one) in setting up your study. Contact details and further information about working with the research management function for each organisation can be accessed from [www.hra.nhs.uk/hra-approval](http://www.hra.nhs.uk/hra-approval).

### Appendices

The HRA Approval letter contains the following appendices:

- A – List of documents reviewed during HRA assessment
- B – Summary of HRA assessment

### After HRA Approval

The attached document "*After HRA Approval – guidance for sponsors and investigators*" gives detailed guidance on reporting expectations for studies with HRA Approval, including:

- Working with organisations hosting the research
- Registration of Research
- Notifying amendments
- Notifying the end of the study

The HRA website also provides guidance on these topics and is updated in the light of changes in reporting expectations or procedures.

### Scope

HRA Approval provides an approval for research involving patients or staff in NHS organisations in England.

If your study involves NHS organisations in other countries in the UK, please contact the relevant national coordinating functions for support and advice. Further information can be found at <http://www.hra.nhs.uk/resources/applying-for-reviews/nhs-hsc-rd-review/>.

If there are participating non-NHS organisations, local agreement should be obtained in accordance with the procedures of the local participating non-NHS organisation.

### User Feedback

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website: <http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/>.

### HRA Training

We are pleased to welcome researchers and research management staff at our training days – see details at <http://www.hra.nhs.uk/hra-training/>

Your IRAS project ID is **229693**. Please quote this on all correspondence.

Yours sincerely

Rekha Keshvara  
Senior Assessor

Email: [hra.approval@nhs.net](mailto:hra.approval@nhs.net)

Copy to: *Ms Angela Shone*  
*Ms Beverley Lowe, Lancashire Care NHS Foundation Trust*



## Appendix 8. Triggers to aggression questionnaire

University of Nottingham, School of Medicine, Division of Psychiatry and Applied Psychology



### Triggers to Aggression after Acquired Brain Injury

Participant information;

1. What is your age? .....
2. What is your gender?.....
3. What is your job role? .....
4. How long have you worked with patients with a brain injury? (in years and months).....

Questionnaire;

1. When did the incident occur? .....
2. Was the incident either- Directed towards you
- Directed towards someone else
3. Were you either - Directly involved in the incident
- A witness to the incident
4. Do you know if the Patient has a brain injury? Yes  No  Don't know
5. Do you know if the patient has any other diagnosis? Yes  No  Don't know
6. If yes, what is the diagnosis? (list more than one if applicable)  
.....
7. Incident type (please tick as many apply)
 

Physical aggression against others	<input type="checkbox"/>
Physical aggression against self	<input type="checkbox"/>
Physical aggression against objects	<input type="checkbox"/>
Verbal aggression	<input type="checkbox"/>

8. What happened before the incident? (please tick as many as are relevant)

#### **Verbal interactions**

- |  |                          |
|--|--------------------------|
| Asked to comply with instructions                | <input type="checkbox"/> |
| Given verbal guidance with a task                | <input type="checkbox"/> |
| Given feedback about performance                 | <input type="checkbox"/> |
| In response to other patients verbal behaviour   | <input type="checkbox"/> |
| A request is denied                              | <input type="checkbox"/> |
| Any other verbal interaction (please state)..... | <input type="checkbox"/> |

#### **Physical interactions**

- |  |                          |
|--|--------------------------|
| Physical guidance to complete a task               | <input type="checkbox"/> |
| In response to other patients aggressive behaviour | <input type="checkbox"/> |
| During restraint                                   | <input type="checkbox"/> |
| Given an item                                      | <input type="checkbox"/> |
| Behaviour is played down or ignored by others      | <input type="checkbox"/> |
| Other physical interaction (please state).....     | <input type="checkbox"/> |

#### **Internal difficulties**

- |   |                          |
|---|--------------------------|
| Agitated or distressed                      | <input type="checkbox"/> |
| Frustration with not getting what they want | <input type="checkbox"/> |
| Frustration with rules                      | <input type="checkbox"/> |
| Communication difficulty                    | <input type="checkbox"/> |
| Physical pain/medical problems              | <input type="checkbox"/> |
| Hallucinating                               | <input type="checkbox"/> |
| Paranoid                                    | <input type="checkbox"/> |
| Delusion                                    | <input type="checkbox"/> |
| Mania                                       | <input type="checkbox"/> |
| Depression                                  | <input type="checkbox"/> |
| Other internal (please state).....          | <input type="checkbox"/> |

#### **Environmental difficulties**

- |  |                          |
|--|--------------------------|
| Structured activity                                | <input type="checkbox"/> |
| Noisy environment                                  | <input type="checkbox"/> |
| Change in routine                                  | <input type="checkbox"/> |
| Over stimulated                                    | <input type="checkbox"/> |
| Under stimulated                                   | <input type="checkbox"/> |
| Other environmental difficulty (please state)..... | <input type="checkbox"/> |

#### **Other**

- |                           |                          |
|---------------------------|--------------------------|
| No obvious antecedent     | <input type="checkbox"/> |
| Other (please state)..... | <input type="checkbox"/> |

Triggers to aggression after brain injury - Questionnaire and interview. Final Version 1.0. Date 13.06.17

## Appendix 9. Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist

### Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

Developed from:

Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

**YOU MUST PROVIDE A RESPONSE FOR ALL ITEMS. ENTER N/A IF NOT APPLICABLE**

No. Item	Guide questions/description	Reported on Page #
<b>Domain 1: Research team and reflexivity</b>		
<i>Personal Characteristics</i>		
1. Inter viewer/facilitator	Which author/s conducted the interview or focus group?	167
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	170
3. Occupation	What was their occupation at the time of the study?	170
4. Gender	Was the researcher male or female?	170
5. Experience and training	What experience or training did the researcher have?	170
<i>Relationship with participants</i>		
6. Relationship established	Was a relationship established prior to study commencement?	170



7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	167
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	170
<b>Domain 2: study design</b>		
<i>Theoretical framework</i>		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	168-169
<i>Participant selection</i>		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	167
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	167
12. Sample size	How many participants were in the study?	170
13. Non-participation	How many people refused to participate or dropped out? Reasons?	170
<i>Setting</i>		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	167-168
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	167

16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	170-171
<i>Data collection</i>		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	167-168
18. Repeat interviews	Were repeat inter views carried out? If yes, how many?	168
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	168
20. Field notes	Were field notes made during and/or after the interview or focus group?	168
21. Duration	What was the duration of the interviews or focus group?	167
22. Data saturation	Was data saturation discussed?	167
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	168
<b>Domain 3: analysis and findings</b>		
<i>Data analysis</i>		
24. Number of data coders	How many data coders coded the data?	169
25. Description of the coding tree	Did authors provide a description of the coding tree?	N/A
26. Derivation of themes	Were themes identified in advance or derived from the data?	169
27. Software	What software, if applicable, was used to manage the data?	169
28. Participant checking	Did participants provide feedback on the	N/A

	findings?	
<i>Reporting</i>		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	171-186
30. Data and findings consistent	Was there consistency between the data presented and the findings?	171-186
31. Clarity of major themes	Were major themes clearly presented in the findings?	171-186
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	186

## **Appendix 10. Interview schedule**

### **Interview guide**

- Go over the study information with the participant:
  - Thank you for coming to the interview today.
  - Explain what will happen in the interview: you will be asked questions relating to your experiences of aggression by patients on the ward.
  - Explain there are no 'right' or 'wrong' answers – I am here to listen to your experiences.
  - You can disclose as little or as much information as you want to during this interview, if you mention any people's names, I will anonymise them when I type up the interview. I would advise that if you do give me specific examples, you try and come up with other names for patients or staff members to maintain anonymity. Likewise you (the participant) will also be anonymised during the write-up and be given a false name in any write-up and reports resulting from this study.
  - You can pause the interview at any time if you want a break or if you feel uncomfortable.
- Are you okay with all this? Do you have any questions?
  - Answer any questions they have
  - If they do not want to participate, thank them for their time.
- If you are satisfied with this, then please read and sign the consent form.

### **Beginning the interview**

*Start recording the interview on the Dictaphone.*

As you know we are going to be talking about aggression on the ward. We all have different ideas about what aggression means. Can you first tell me what aggression means to you (ask them to define aggression).

### **Interview questions;**

1. How often do you experience aggression on the ward?
  - Includes verbal, physical, towards objects, towards self
  - Is it usually directly towards you or to someone else?
2. Can you describe briefly one of these incidents
  - E.g. It could be verbal aggression or physical aggression, towards others, objects or self

3. What do you think triggered this incident? (if more than one trigger then probe further)
  - E.g. what happened before the incident, what do you think might have led the person to act aggressively?
  - Are there any other triggers you can think of for other incidents you may have experienced or observed?
4. What do you think helped to resolve the incident?
  - E.g. was there anything that helped reduce the aggression?
5. Do you think the patient's mental health had any impact on the incident?
6. In general, why do **you think** patients behave aggressively on the ward?
7. Is there anything about this environment that affects aggressive incidents?
8. Do you think the patient's brain injury has an impact on aggressive incidents?
  - How? [e.g. the initiation of the incident, the escalation?]
9. Are there any other patient factors that might result in aggression?
10. Do you find there is anything that helps to deescalate incidents or better manage incidents when they happen?
11. Is there anything else you think could be done to help us to understand the behaviour of people with brain injury on the ward?

## **Appendix 11. Development and piloting of interview**

The interview was divided into three parts: (See Appendix 10 for full interview schedule)

Part one aimed to ground the participant in the topic by asking the participant to come up with their own definition of aggression, and to think about a specific incident of aggression they have experienced on the ward.

Part two aimed to gain a more detailed descriptive analysis on specific incidents on the ward and the perceived triggers, by asking the participant what they think triggered the incident, asking if they think the patients symptoms or brain injury had an impact on the incident and what helped to manage the incident. E.g., "What do you think triggered this incident?"

Part three aimed to explore more general thoughts around aggression by asking the participant to think more generally about aggression that is experienced, and why they think patients behave aggressively on the ward. The participant was asked about the impact of the environment, the brain injury, other symptoms or patient factors as well as what helps to manage incidents. Open questions were utilised if possible to give staff a chance to share their thoughts (e.g., "In general, why do you think patients behave aggressively on the ward?").

### *Piloting*

The interview schedule was piloted by two staff members (both male ward-based support staff) who worked on the ward. In a mock interview

conducted by the researcher, staff members were asked to provide feedback on the content, structure and wording of the questions. No significant changes to the interview schedule were required following the piloting of the interview, although useful feedback was provided to the researcher regarding practicalities of conducting the interview and suggestions of further prompts that may be needed.

**Appendix 12. Participants' definitions of aggression**

<b>Participant</b>	<b>This definition of aggression was given by a person</b>	<b>Who does this job</b>	<b>And had this many months' experience with ABI</b>
1	Personally, maybe a patient becoming a bit hostile towards you as a staff...rebellious ...against you	Ward-based support staff	15
2	There's different sorts, so verbal aggression, so shouting, threatening behaviours, threatening to hit you in the face, spit in your face all that sort of stuff. Then there's sexualised verbal aggression which I witness where they say they will grab their erm 'tits and their ass' stuff like that. So that's the verbal side. Then you've got physical aggression when someone tries to assault someone so either slaps, pushes, grabs, head-butts, anything like	Student nurse	1.5



	that. Then you've got sexual assault where its grabbing certain areas of the body and that can lead to worse things but fortunately I've never seen anything like that on the ward.		
3	Aggression means to me erm people shouting and throwing things about, and just generally getting angry and just generally not being there usual self, not their usual behaviours they normally, that's aggression to me	Ward based support staff	48
4	Aggression is a behaviour that can be, minimal or escalating into something that can be physical. So it can be verbal, erm, or physical, those are the main two types of aggression normally shown. So whether they've been swearing at you, raising their voice, erm, at a point where it's not raising a voice to make you aware of them they are raising a voice because, not to get your attention but to actually make you fearful in a way, and I guess it escalates to physical aggression where you can get punched,	Ward based support staff	

	kicked. That would be what I think aggression is.		
5	In the moment, heated up, erm, angry, emotional, depression, and anxiety I think all that swings into it. Yeah that's how id describe it.	Ward based support staff	20
6	I suppose aggression takes many forms doesn't it, it can be verbal or it can be physical. So for myself, I understand how it can be a wide range of things and it depends on how the person receives it so what's aggressive for me you might not, or another person might not necessarily find to be aggressive. Erm but threats, shouting in your face, pointing in your face, and then rising up to physical aggression, like actually physically hurting or pushing, or sexually, you can get sexual aggression as well that we see on this ward as well so for me that can cross over into aggression as well.	Ward based support staff	24
7	No definition provided		
8	Erm aggression to me, is more physical to me ... so it would be	Ward based	96

	<p>things like – stamping, shouting, pushing things over, throwing things, kicking being verbally aggressive towards someone, you know seeing lots of angry faces, all the expressions and things, body language etc like, that’s aggression to me. Or someone getting physically, you know violent with you, so yeah, pushing you, punching you kicking and stuff like that.</p>	support staff	
9	<p>I suppose it’s if you feel threatened by someone’s behaviour, it can be sexual, physical, verbal, erm, it just depends how it makes you feel I think and what the situation is. So to someone for example if a service user I know and have a good relationship with came up to me and swore at me, I wouldn’t necessarily see it straight away as aggression. I think you need to have a good knowledge of what that service users intentions are, so if there saying it in a certain way where they’ve come over and said ‘oh fuck off’ sort of thing it’s not the same as if someone starts</p>	Multi-disciplinary office based	72

	coming over and starts screaming and shouting in your face. So I think it depends on the situation, it depends on the service user and I think it depends on how well you know them and how you interpret that.		
10	Aggression is any verbal or physical act of violence or abuse really towards self or others would be my definition of aggression	Ward based qualified	72
11	An act of verbal or physical assault on someone else, at different levels	Student nurse	2.3
12	Violence, maybe shouting, some people can just slam things, stomp their feet that kind of thing, displays of frustrations, that's probably about it.	Ward based qualified	3
13	so aggression can be something which is both verbal and non verbal. So somebody can exhibit it and show it within themselves or they can be verbally aggressive with their voice they can be physically aggressive towards somebody or the environment,	Student nurse	2.3

	things around them.		
14	Aggression can be erm, sometimes clients may not be aggressive to one person, but maybe to another person, maybe because of their erm, you know even though if it's not a patient, its human nature that we like some people we dislike some people	Ward based support staff	4
15	To me is when a patient shouts, call other people names, punches, erm, and when they their facial features when they change and when they also, when they are punching property, throwing around things, that's all aggression, aggression can be physical as well to the extent that they are assaulting they have contact with other people they are actually punching, hitting other people. So that's all aggression.	Ward based qualified	6