SOUTH AFRICAN OCCUPATIONAL THERAPISTS' UNDERSTANDING OF POST TRAUMATIC AMNESIA FOLLOWING TRAUMATIC BRAIN INJURY

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Occupational Therapy.

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Declaration

I, Paige Maxine Pollard, declare that this research report is my own work. It is being submitted for the degree of Master of Science in Occupational Therapy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

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Dedications

- To my family who have supported every adventure I have ever embarked on, with this Masters being by far the most challenging.
- To my partner, Jesse, thank you for your ongoing love and patience which helped me complete this degree.
- To the Neurosciences Team at Addenbrooke's NHS Trust who inspired this study and sparked my passion for neurorehabilitation – thank you for all you taught me during my year at your hospital.

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- To all the occupational therapists who participated in this study – thank you for taking the time to share your experiences. I hope that the findings of this study will inspire us to collectively improve and better our clinical practice for the good of our patients.

Abstract

Background:

Post traumatic amnesia (PTA) is a transient state following traumatic brain injury (TBI) and is characterized by cognitive and behavioural deficits which have a profound impact on individuals' functional ability. The duration of PTA is considered the "gold standard" indicator for the severity of TBI and predictor of long term functional and cognitive outcomes. Despite this, there appears to be a lack of South African research on the condition from all healthcare disciplines. Given that occupational therapists are key role players in TBI rehabilitation, it is important to establish what they understand about the condition and how it informs their clinical practice.

Aim:

This study aimed to determine South African occupational therapists' knowledge of post traumatic amnesia following traumatic brain injury.

Methods:

This study utilised a descriptive quantitative, cross sectional research design with the use of a web-based questionnaire. The questionnaire was distributed to participants via the Occupational Therapy Association of South Africa (OTASA) as well as by means of convenience snow ball sampling. Fifty eight responses were recorded but only 53 were used in the data analysis due to incomplete surveys and participants who did not meet the inclusion criteria.

Results:

Forty three percent of participants do not assess for PTA at the time of initial consultation, thus, intervention selection for patients in PTA may be in inappropriate. The most common means of assessment was reported as clinical observation (52%) despite international TBI guidelines and literature recommending the use of a validated assessment tool. The most common interventions used by this group of occupational therapists in the treatment of PTA included family or caregiver education (62%), occupational performance interventions (68%), reorientation (66%) and cognitive skills retraining (60%).

Conclusion:

It appears that this group of South African occupational therapists has a limited understanding of PTA. The use of reorientation and cognitive skills retraining with patients in PTA is discouraged by international TBI guidelines and literature based on the associated risk for increased agitation which is known to worsen long term functional outcomes. It would beneficial to address this gap in knowledge through certified training and an introduction to TBI rehabilitation provided at an undergraduate level given its significant contribution to the global burden of disease.

Key words:

Post traumatic amnesia, traumatic brain injury, occupational therapy, South Africa

Table of Contents

List of Tables

Glossary

Traumatic brain injury: an impact to the head or other mechanisms of rapid movement or displacement of the brain within the skull, with one or more of the following: loss of consciousness, post traumatic amnesia (PTA), disorientation and confusion, neurological signs (American Psychiatric Association, 2013)

Post traumatic amnesia: a temporary state which is common following TBI and was first described by Symonds (1940) to explain the period between injury and the return of continuous memory. It is illustrated by confusion, disorientation and anterograde amnesia (inability to form new memories) and is associated with reduced arousal, sleep disturbances, agitation and psychotic symptoms such as hallucinations, delusions increased psychomotor behaviour and labile affect (Sherer et al., 2005; Trevena-Peters et al., 2018). Individuals suffering from the condition are considered to be 'in a state of PTA' and 'emergence' from this state is characterized by the return of continuous memory (Symonds & Ritchie Russell, 1943; Russell & Smith, 1961).

Occupational therapy: 'the therapeutic use of everyday life occupations with persons, groups, or populations (i.e., the client) for the purpose of enhancing or enabling participation' (American Association of Occupational Therapy, 2020).

Global North: 'does not refer to a geographic region in any traditional sense but rather to the relative power and wealth of countries in distinct parts of the world. The Global North encompasses the rich and powerful regions such as North America, Europe, and Australia' (Nelson & Braff, 2021).

Global South: 'does not refer to a geographic region in any traditional sense but rather to the relative power and wealth of countries in distinct parts of the world. The Global South encompasses the poor and less powerful countries in areas such as Latin America, Africa and Asia' (Nelson & Braff, 2021).

Social determinants of health: 'the non-medical factors that influence health outcomes. They are the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life. These forces and systems include economic policies and systems, development agendas, social norms, social policies and political systems' (World Health Organization, 2008).

Clinical practice guidelines: ‘clinical practice guidelines are systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances’ (Field & Lohr, 1992).

INCOG panel: an international group of researchers and clinicians who developed recommendations for assessment and intervention for TBI rehabilitation (Bayley et al., 2014).

List of abbreviations

ADL: Activities of Daily Living

A-WPTAS: Abbreviated Westmead Post Traumatic Amnesia Scale

CAP: Confusional Assessment Protocol

DSM-V: Diagnostic and Statistical Manual of Mental Disorders, 5th Edition

GCS: Glasgow Coma Scale

GOAT: Galveston Orientation and Amnesia Test

HPCSA: Health Professions Council of South Africa

ICF: International Classification of Functioning, Disability and Health

NHLS: National Health Laboratory Service

O-Log: Orientation Log

PTA: Post Traumatic Amnesia

PTCS: Post Traumatic Confusional State

PTD: Post Traumatic Delirium

TBI: Traumatic Brain Injury

WHO: World Health Organization

WPTAS: Westmead Post Traumatic Amnesia Scale

1. CHAPTER 1: INTRODUCTION AND BACKGROUND TO RESEARCH

1.1. Introduction

The purpose of this chapter is to provide the reader with an overview of the study. It contextualises the research and introduces the reader to its background and problem statement. It then goes on to explain the research question, the aim and objectives of the study as well as the significance of the research to the occupational therapy profession and the South African healthcare force alike. It concludes with a brief explanation of chapters which follow.

1.2. Background to research

Traumatic brain Injury (TBI) is the leading cause of mortality and morbidity amongst all trauma-related injuries worldwide (Rubiano et al., 2015). Post traumatic amnesia is a temporary state which is common following TBI and was first described by Symonds (1940) to explain the period between injury and the return of continuous memory. The condition can last for minutes following mild TBI and up to months following more severe injury (American Psychiatric Association, 2013; Marshman et al., 2013; Ponsford et al., 2014). The duration of PTA is used as a prognostic indicator for the severity of brain injury (Brown et al., 2010; Ponsford et al., 2016; Tate et al., 2005), cognitive recovery (de Guise et al., 2005a; Draper and Ponsford, 2008) and long term functional outcomes (Dahdah et al., 2016; Draper et al., 2007; Sigurdardottir et al., 2009; van der Naalt et al., 1999). Individuals suffering from the condition are considered to be 'in a state of PTA' and 'emergence' from this state is characterized by the return of continuous memory (Russell and Smith, 1961; Symonds and Ritchie Russell, 1943). Even after emergence from PTA, individuals with moderate to severe TBI are expected to present with chronic cognitive impairments which may affect return to important premorbid activities such as social participation, work and family responsibilities (Spiteri et al., 2021; Webster et al., 2015). For this reason, occupational therapists are key role players in the rehabilitation of individuals who have suffered TBI and provide specialised functional and cognitive rehabilitation to

promote independence in pre-morbid activities such as personal care, productivity and leisure pursuits (de Guise, LeBlanc, et al., 2005; Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019). Where the pre-morbid level of independence cannot be regained, occupational therapists provide education on adapted techniques, equipment or assistive devices to accommodate for residual impairments. The role of occupational therapists in the period of post traumatic amnesia (PTA) following TBI has been gaining recognition in recent years (Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019). These studies found that by implementing structured and routine ADL retraining, patients presented with improved functional outcomes in comparison to those patients where ADL retraining was only implemented after emergence from PTA (Trevena-Peters et al., 2018a).The assessment of PTA during the acute phase of recovery following TBI is common practice internationally and is used to guide the timing and suitability of various interventions, including therapies, resource allocation, family counselling and discharge planning (Novack et al., 2001; Tate et al., 2005). To the researcher's knowledge, and supported by other forms of South African literature, the presence of PTA is not considered in daily practice by South African medical personnel dealing with TBI (Jerome et al., 2017; Naidoo, 2013). Furthermore, it appears that South Africa does not have clinical practice guidelines to guide TBI rehabilitation (Patel et al., 2016) and there is a lack of South African literature to evidence whether healthcare professionals know about the condition or treat it. The purpose of this study is to establish what knowledge of PTA exists amongst occupational therapists working with traumatic brain injuries in South African healthcare settings.

1.3. Problem statement

Post traumatic amnesia is a common condition following TBI and is characterized by disorientation, confusion and anterograde amnesia and is associated with an impaired sleep-wake cycle, reduced arousal, agitation, and psychotic symptoms (Sherer et al., 2005; Trevena-Peters, Ponsford & McKay, 2018). South African healthcare guidelines list the presence of PTA as one of the "gold standard" indicators for TBI (National Institute for Occupational Health, 2013). Despite this, there appears to be a lack of

South African literature exploring PTA as a condition or the management thereof from any healthcare discipline. Functional cognitive retraining is a common intervention used by occupational therapists working with traumatic brain injuries and targets cognitive skills such as executive function, memory, attention and many others (Barman et al., 2016). Medical guidelines, however, suggests that overstimulation of patients in PTA (e.g. through therapy interventions) can lead to increased agitation and reduced functional outcomes (McNett et al., 2012). Recent research conducted by occupational therapists in Australia suggests that the use of structured retraining of activities of daily living (ADLs) does not exacerbate symptoms of PTA, and participating occupational therapists felt that it helped mediate agitation through the use of a habituated and purposeful daily routine (Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019). These points highlight the need for South African healthcare professionals to develop a sound understanding of PTA and, more importantly, for occupational therapists to be able to identify the presence of PTA and select appropriate interventions for patients in this state.

1.4. Research question

What understanding of post traumatic amnesia exists amongst occupational therapists working with traumatic brain injury in South Africa?

1.5. Research aim

To determine South African occupational therapists' understanding of post traumatic amnesia following traumatic brain injury.

1.6. Research objectives

The objectives of this study are to:

1. Describe the demographics of South African occupational therapists working with traumatic brain injuries
2. Determine occupational therapists' knowledge and understanding of post traumatic amnesia

3. Determine at what point following traumatic brain injury occupational therapists begin intervention
4. Describe the interventions used by occupational therapists working with individuals in PTA

1.7. Justification for the study

Occupational therapists have been identified as key players in the treatment of individuals in PTA as well as neurocognitive rehabilitation, however, the researcher found that there is a lack of literature on PTA in Africa as a whole (Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019). It is common knowledge that the South African public healthcare sector is under resourced. Consequently, patients who present in trauma units with possible TBI may be discharged home without comprehensive assessment such as neuroimaging or an assessment of PTA (Alexander et al., 2009). Therefore, individuals are at risk of being discharged home with an undiagnosed TBI and without follow-up referral to occupational therapy for assessment of possible cognitive deficits. It is worth noting that an assessment of PTA can be performed in the trauma unit with minimal training, few to no resources and can be performed within a few minutes at the time of initial assessment. This type of assessment could be of enormous benefit within public healthcare settings and assist medical personnel in detecting early cognitive deficits following TBI and referring patients to occupational therapy for comprehensive neurocognitive assessment and treatment.

This study hopes to identify a gap in knowledge amongst South African occupational therapists in the field of neurorehabilitation. Occupational therapists have been identified in international studies as potentially vital players in the management of patients in PTA (Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019). These studies found that carefully selected occupational therapy interventions contributed to positive functional outcomes following emergence from PTA. This is significant given the lack of access to public rehabilitation centres in South Africa resulting in many individuals being discharged into their family's care without sufficient post-injury rehabilitation (Webster

et al., 2015). By providing the appropriate intervention for individuals in PTA in the acute hospital setting, occupational therapists may be able to support the long term recovery of functional and cognitive skills. This has the potential to reduce the burden of care placed on families caring for individuals with TBI. Before this practice can be implemented by South African occupational therapists, it is imperative to establish whether our profession has the skills to identify, monitor and select appropriate treatments for patients who are in PTA.

1.8. Chapter outline

This research report consists of five subsequent chapters. **Chapter 2** consists of the literature review performed in the context of this study. **Chapter 3** describes the methodology of the study including an explanation of the research design, participants, instrument, procedure, ethical considerations, data analysis, time frame and budget for the study. **Chapter 4** will describe the study's results in the form of tables to summarise important findings while **Chapter 5** will discuss these findings in the context of recent literature. Finally, **Chapter 6** will describe significant findings and conclusions of the study as well as recommendations for future research and training for the South African occupational therapy profession.

2. CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter will introduce the key terms and concepts relating to this study, particularly, traumatic brain injury (TBI) on both a global and local scale, TBI rehabilitation, post traumatic amnesia (PTA) and the assessment and treatment of PTA. Through the dissection of national and international literature, the reader will gain insight into the relevance of this study to the South African healthcare system and how this study may identify a crucial gap in knowledge amongst South African occupational therapists working with traumatic brain injuries.

Journal articles and literature reviewed in this chapter were sourced from major databases including PubMed, Cochrane Library as well as Google scholar. The terms used in the search engine included ‘posttraumatic amnesia’, ‘post-traumatic amnesia’, ‘post traumatic amnesia’, ‘PTA’, ‘post concussion syndrome’, ‘occupational therapy’, ‘neurocognitive’, ‘head injury’ and ‘traumatic brain injury’.

2.2 Traumatic Brain Injury

A traumatic brain injury (TBI) is ‘an impact to the head or other mechanisms of rapid movement or displacement of the brain within the skull, with one or more of the following: loss of consciousness, post traumatic amnesia (PTA), disorientation and confusion, neurological signs’ (American Psychiatric Association, 2013). TBI is further defined as mild, moderate or severe depending on the period of unconsciousness, the duration of post traumatic amnesia, and Glasgow Coma Scale (GCS) score at the time of initial assessment (National Institute for Occupational Health, 2013). Mild TBI is characterized by a GCS score of 13-15 and in most cases is represented by a concussion which is followed by a full neurological recovery. However, some individuals may experience problems with short term memory and concentration (Rimel et al., 1981; Ghajar, 2000; Jerome et al., 2017). Moderate TBI is characterized by a GCS score of 9-13 and the individual may be sluggish, while severe TBI is characterized by a GCS score of 3-8 and the individual will likely have an altered level of arousal, unable to open their eyes or follow commands (Ghajar, 2000; Jerome et

al., 2017). In the case of severe TBI, individuals are at significant risk of medical complications such as hypotension, hypoxia and increased intercranial pressure (Ghajar, 2000). If not managed appropriately, this may contribute to secondary injury: a cascade of cellular events causing damage to surrounding cerebral tissue which is a common cause of in-hospital death of individuals with TBI (Ghajar, 2000).

There are a variety of risk factors associated with TBI and these include, but are not limited to, black ethnicity, male gender, low socio-economic status, inmates living in correctional facilities and individuals living in rural areas (Webster, Taylor & Balchin, 2015; Centers for Disease Control and Prevention, 2021). In countries of the Global North, TBI is most commonly associated with falls, attempted suicide by means of firearm and motor vehicle accidents (Centers for Disease Control and Prevention, 2021). In countries of the Global South, however, TBI is commonly associated with road traffic accidents, particularly where victims are pedestrians, as well as inter-personal violence (Naidoo, 2013). The leading causes of TBI in the Global North versus South illustrates the important contribution of the social determinants of health, specifically that of economic instability, insufficient infrastructure and the impact of the social context (World Health Organization, 2008).

Traumatic brain injury is the leading cause of death and disability in children and persons under the age of 45 in the Global North and it is suspected that in countries of the Global South this rate is even higher given the incidence of road traffic accidents, motor vehicle accidents and intentional trauma-related crimes (Naidoo, 2013). Countries of the Global North, such as the United States of America, have implemented ‘TBI surveillance’ to track the number of hospital admissions related to TBI (Naidoo, 2013). South Africa does not have an equivalent service and funding for epidemiology services in the country is scarce. Consequently, there is a lack of recent literature to reflect the epidemiology of TBI in the country, despite it being a major contributor to the burden of disease (Naidoo, 2013; Webster, Taylor & Balchin, 2015; Jerome et al., 2017).

The long term effects of TBI can include physical, cognitive, behavioural and emotional impairments which can have a profound influence on activities of daily living and return to work and, thus, is considered as one of the most disabling health conditions (Corrigan & Hammond, 2013). This is an important consideration for the occupational

therapy profession whose primary role is to facilitate functional participation on an individual, community and societal level (American Occupational Therapy Association, 2020).

Post traumatic amnesia is a common condition following TBI (Marshman et al., 2013) and can last for minutes following mild TBI and up to months following more severe injury (American Psychiatric Association, 2013; Marshman et al., 2013; Ponsford et al., 2014). The duration of PTA is used as a prognostic indicator for the severity of brain injury (Brown et al., 2010; Ponsford et al., 2016; Tate et al., 2005), cognitive recovery (de Guise, LeBlanc, et al., 2005; Draper & Ponsford, 2008) and long term functional outcomes (van der Naalt et al., 1999; Draper, Ponsford & Schönberger, 2007; Sigurdardottir et al., 2009; Dahdah et al., 2016).

The National Health Laboratory Service (NHLS) of South Africa which guides national and provincial healthcare service delivery describes PTA as one of the "gold standard" diagnostic features and severity indicators for TBI (National Institute for Occupational Health, 2013). Similarly, the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-V) is a common tool used in the South African healthcare sector (Barman et al., 2016) by doctors, nurses, psychologists and occupational therapists. It describes the presence of the PTA as a diagnostic factor in TBI as discussed earlier in this literature review.

Both the DSM-V and the NHLS are highly regarded sources of information within the South African healthcare sector. They specify PTA as either a diagnostic feature or severity indicator for TBI and yet there is no literature available to reflect South African healthcare professionals' understanding of the condition. This highlights the need for research to be conducted on PTA in a South African context.

2.2.1 Traumatic Brain Injury (TBI) in a South African Context

TBI is the leading cause of mortality and morbidity amongst all trauma-related injuries worldwide with approximately 69 million people sustaining TBIs each year (Bruns and Hauser, 2003; Hyder et al., 2007; Rubiano et al., 2015). In countries of the Global South such as South Africa, the incidence of TBI is significantly higher when compared to the Global North with South Africa reporting approximately 89 000 TBIs annually (World Health Organization, 2013; Patel et al., 2016). This, however, is likely under-

reported given that this may not consider individuals who have suffered mild TBI and do not seek medical care or those who have suffered severe TBI which has resulted in death at the time of injury (Arnold-Day, Semple & Raine, 2020). As discussed above, South Africa has insufficient epidemiology services to accurately report the number of TBIs which occur annually. Furthermore, due to the lack of regular monitoring at government healthcare facilities, the South African Department of Health does not have access to consistent and reliable statistics to guide prevention and management of TBI (Webster, Taylor & Balchin, 2015). This can be attributed to poor quality hospital records, insufficient funding for research, and overcrowded and under resourced government hospitals (Naidoo, 2013).

In 2013, the World Health Organization (WHO) emphasized the importance of developing well-designed and evidenced programmes for prevention, management and rehabilitation of TBI (World Health Organization, 2013). Although it is important to shed light on TBI and what literature has referred to as the 'hidden pandemic', the WHO's call for guidelines is idealistic at best given the lack of funds and human resources available in countries of the Global South where TBI is most prevalent (Naidoo, 2013; Webster, Taylor & Balchin, 2015). Furthermore, it is difficult for state healthcare sectors to develop and implement such guidelines if TBI statistics are out of date and research has failed to address a common feature of TBI: post traumatic amnesia.

A systematic review of TBI clinical practice guidelines in 2016 evaluated the guidelines from 24 countries, only one of which was developed in an upper-middle income setting (Patel et al., 2016). It determined that clinical practice guidelines for countries of the Global South do not exist (Patel et al., 2016). A limitation identified in this review was that all 24 clinical practice guidelines were specific to the medical management of TBI as opposed to therapeutic management. This fails to address the WHO's recommendation of developing programmes to guide TBI rehabilitation (World Health Organization, 2013). As a result, allied health professionals working with individuals who have suffered TBI in the Global South do not have access to uniform or standardized TBI rehabilitation guidelines. This could contribute to variations in treatment selections for this group of patients and poorer functional outcomes.

Basic knowledge of the medical management of TBI in South Africa appears to be lacking and one identifiable cause for this is the lack of expert supervision and guidance. In Africa, there is an average of one neurosurgeon per 10 000 population and, thus, we can deduce that the majority of medical personnel encountering TBI in their setting do not have the necessary skills or support to effectively treat these patients (Jerome et al., 2017). Furthermore, a study done by Bola et al. (2015) found that 33% of South African intern doctors performed first time surgical procedures unsupervised. This image is likely mirrored amongst allied health care professionals in government facilities where a lack of expert supervision is common. Van Stormbroek et al. (2016) found that 43% of community service occupational therapists felt that they lacked knowledge and skill and needed a mentor while 24% felt unsupported in their community service placements. An audit of TBI care conducted in KwaZulu-Natal in 2009 found that medical professionals had a poor understanding of primary and secondary injury after TBI and, thus, management of secondary injury complications were not prioritised in the treatment protocol (Alexander et al., 2009). This can have serious consequences such as poor medical prognoses or even death (Alexander et al., 2009). Although this source is outdated, it once again highlights the lack of current literature on TBI in South Africa, particularly how it is managed from both a medical and therapeutic perspective. This emphasizes the need for countries like South Africa to develop our own clinical practice guidelines based on our context and resources. However, this requires investigation into the current landscape of TBI in South Africa and, thus, regular research in this field is imperative. South Africa published its own set of stroke guidelines in 2019 (National Department of Health, 2019) which is a promising step towards standardising stroke rehabilitation. We can hope that this will be extended to other conditions, such as TBI, in the near future.

Considering that TBI results in chronic disability, this further emphasizes the need for the development of evidence-based rehabilitation-specific guidelines on a global scale, however, South Africa and other countries within the Global South need to ensure that these are contextually appropriate and practical given the lack of resources in these settings (McNett et al., 2012; Trevena-Peters et al., 2018a). The first step to achieving this is for South Africa to develop improved and current epidemiological data on TBI to inform its protocols (Naidoo, 2013).

Despite South Africa experiencing a significantly higher incidence of TBI in comparison to countries of the Global North, we have disproportionately fewer public rehabilitation facilities (Webster, Taylor & Balchin, 2015). An audit conducted at Groote Schuur Hospital in Cape Town in 2009 found that of 654 TBI survivors, only 16 of these were granted access to a public rehabilitation setting (Webster, Taylor & Balchin, 2015). In 2014, less than 9% of patients admitted to the Western Cape Rehabilitation Centre had suffered a TBI (Webster, Taylor & Balchin, 2015). This data is significant in the context of this study given that the average length of stay at a government hospital following TBI is 10 days and the average length of stay at a government rehabilitation centre is 6-12 weeks (Webster, Taylor & Balchin, 2015). These timelines fail to acknowledge the presence of PTA following TBI which is likely to last for a period of weeks following moderate to severe TBI. As a result, these individuals are missing out on valuable rehabilitation time considering that the potential for neuroplasticity is at its highest during the first 6 months after injury (Maas, Stocchetti & Bullock, 2008). During the period of PTA individuals may experience behavioural and cognitive challenges which affect their ability to engage in basic activities of daily living, let alone actively participate in rehabilitation programmes run by occupational therapists, physiotherapists and speech therapists (Trevena-Peters, Ponsford & McKay, 2018). This will have a profound impact on an individual's ability to benefit from in-patient therapy, thus, further disadvantaging this group of patients (American Psychiatric Association, 2013; Webster, Taylor & Balchin, 2015).

Owing to insufficient access to public rehabilitation services, the majority of TBI survivors are discharged into the care of their families who are often unprepared for the challenges which lie ahead (Webster, Taylor & Balchin, 2015). The long term effects of TBI include behavioural problems (including aggression), impairments in memory, motivation, sleep disturbances, communication problems, sexual disinhibition/disinterest, depression and safety concerns (Webster, Taylor & Balchin, 2015). This can have harmful effects on family members' mental health which may later manifest into caregiver burnout, thus, demonstrating the ripple effect of poorly executed treatment and rehabilitation of individuals with TBI (Webster, Taylor & Balchin, 2015).

2.3 Traumatic Brain Injury rehabilitation

Recovery from traumatic brain injury occurs during three progressive stages: 1) loss of consciousness (coma), 2) altered consciousness (commonly referred to as post traumatic amnesia [PTA]) and 3) rehabilitation with normal consciousness (during which time physical, cognitive, and behavioural functions stabilize, although permanent deficits may persist) (Levin, O'Donnell & Grossman, 1979).

As discussed above, TBI has many significant long-term effects but one area of particular interest to the occupational therapy profession is that of cognitive impairment. Occupational therapists play a unique role within the multidisciplinary team in neurocognitive rehabilitation. Numerous studies have investigated the positive impact that cognitive rehabilitation has following TBI, however, there is little evidence to suggest that these findings have been converted into clinical practice (Bayley et al., 2014). Due to a historical lack of rehabilitation-specific clinical practice guidelines available on a global scale, an international panel of experts formed the INCOG team which included the relevant professions usually involved in cognitive rehabilitation, specifically neuropsychology, occupational therapy, physiotherapy, speech therapy, and physicians (Bayley et al., 2014). The team aimed to provide guidelines on cognitive assessment and treatment following moderate to severe TBI in all phases of treatment (Bayley et al., 2014). It is significant that this is the first international guideline which provides guidance on the therapeutic role during the period of PTA. The researcher acknowledges that a limitation of these guidelines is that the expert panel was made up of professionals from the United States, Canada and Australia which is a concern given that the majority of TBIs are expected to occur in countries of the Global South (Patel et al., 2016). However, this section of the globe was not represented in the drafting of these guidelines.

Ylvisaker et al. (2002) proposes that there are two paradigms in which cognitive assessment and rehabilitation is provided following TBI. The first is a traditional approach which is heavily aligned with the medical model of health: healthcare professionals aim to address deficits through cognitive retraining and when the previous level of cognitive function cannot be obtained then education on compensatory techniques is provided. The second is a contextual approach which is

aligned with the biopsychosocial model of health and aims to assist TBI survivors to wholly participate in self-identified lived experiences which have been affected by cognitive impairment. This concept is supported by the World Health Organization's International Classification of Functioning, Disability and Health (ICF) Framework (World Health Organization, 2002). The ICF identifies four domains which contribute to disability: namely body structures, body functions, activity and participation and environmental factors. The occupational therapy profession is particularly concerned with the "participation" domain of the ICF which refers specifically to 'involvement in a life situation'. As a profession, our overarching goal is to facilitate the ability to engage in occupations in a variety of contexts on an individual, community, and societal level (American Occupational Therapy Association, 2020). This engagement is often compromised following a life-changing incident such as TBI. Therefore, it is imperative for occupational therapists to have an appreciation of the context in which our clients will live when they are discharged from our care.

INCOG guidelines (2014) are based on the contextual approach and emphasize the importance of a holistic understanding of an individual's context during both assessment and treatment (Bayley et al., 2014).

INCOG guidelines (2014) outline the principles which should be applied when providing cognitive rehabilitation and these principles are supported by varying levels of evidence. The level of evidence grading system and treatment principles are represented in the tables below:

INCOG Level of Evidence Grading System

Level of evidence	Description
A	recommendation supported by at least 1 meta-analysis, systematic review, or randomized controlled trial of appropriate size with relevant control group
B	recommendation supported by cohort studies that, at minimum, have a comparison group, well-designed single subject experimental designs, or small sample size randomized controlled trials
C	recommendation supported primarily by expert opinion based on their experience although uncontrolled case series without comparison groups that are supported by the recommendations are also classified here

Principles of Cognitive Rehabilitation recommended by INCOG

Treatment Principle	Level of Evidence
People with cognitive deficits following TBI should be offered cognitive rehabilitation	B
Cognitive rehabilitation should be tailored to the patient's neuropsychological profile, premorbid cognitive characteristics, and goals for life activities and participation	C
Cognitive rehabilitation may include restorative treatments, training in compensatory strategies, caregiver training, education about cognitive consequences of TBI, functional adaptation and environmental manipulations	C
Cognitive rehabilitation should focus on activities that are meaningful to the patient and relevant stakeholders, include therapy interventions in the affected individual's own environment and/or applicable to the individual's own life and incorporate strategies for generalization	C
Group based interventions may be considered as part of cognitive rehabilitation to address social skills, memory, emotional-regulation, goal attainment, problem solving, communication, attention and concentration and sleep hygiene	B
Reassessment of cognition should be performed on a regular basis using standardized, functional outcome measures to determine the effectiveness of interventions	C

The INCOG team had planned to update these guidelines every two years, however, an updated version of the guidelines has not been published since the initial draft in 2014 (Bayley et al., 2014). Once again, current international literature has failed to address the WHO's call for evidence-based rehabilitation-specific guidelines on the management of TBI.

2.4 Post Traumatic Amnesia (PTA)

Post traumatic amnesia is a temporary state which is common following TBI and was first described by Symonds (1940) to explain the period between injury and the return of continuous memory. The condition can last for minutes following mild TBI and up to months following more severe injury (American Psychiatric Association, 2013; Marshman et al., 2013; Ponsford et al., 2014). The duration of PTA is used as a prognostic indicator for the severity of brain injury (Brown et al., 2010; Ponsford et al., 2016; Tate et al., 2005), cognitive recovery (de Guise, LeBlanc, et al., 2005; Draper & Ponsford, 2008) and long term functional outcomes (van der Naalt et al., 1999; Draper, Ponsford & Schönberger, 2007; Sigurdardottir et al., 2009; Dahdah et al., 2016).

Post traumatic amnesia is illustrated by confusion, disorientation and anterograde amnesia (inability to form new memories) and is associated with reduced arousal, sleep disturbances, agitation and psychotic symptoms such as hallucinations, delusions, increased psychomotor behaviour and labile affect (Sherer et al., 2005; Trevena-Peters et al., 2018). Individuals suffering from the condition are considered to be 'in a state of PTA' and 'emergence' from this state is characterized by the return of continuous memory (Symonds & Ritchie Russell, 1943; Russell & Smith, 1961). Even after emergence from PTA, individuals with moderate to severe TBI are expected to present with chronic cognitive impairments which may affect return to important premorbid activities such as social participation, work and family responsibilities (Webster, Taylor & Balchin, 2015; Spiteri et al., 2021).

Individuals in PTA may present with cognitive and behavioural impairments which impede independence and functioning in daily activities (Trevena-Peters et al., 2018). Examples of behavioural challenges include "agitation, irritability, aggression, disinhibition (including social and sexual behaviour), perseveration, apathy, wandering or abscondment" (McNett et al., 2012). Due to the range of symptoms associated with PTA and similarities seen between it and delirium, it has also been termed "post traumatic confusional state" (PTCS) (Wolf, Gleckman & Ginsburg, 1996; Stuss et al., 1999; de Guise, Leblanc, et al., 2005; Sherer et al., 2005; Nott, Chapparo & Baguley, 2006).

A study conducted in 2012 found that 41% of patients in a 219-bed acute TBI unit demonstrated agitated behaviours which contributed to poorer functional outcomes

specifically related to motor and cognitive skills as well as functional independence (McNett et al., 2012). This notion is echoed in guidelines formed by the INCOG panel which recommend that challenging behaviours associated with PTA should be managed appropriately and skilfully in the acute setting in order to facilitate effective rehabilitation of TBI (Bayley et al., 2014).

The assessment of PTA during the acute phase of recovery following TBI has become common practice internationally and is used to guide the timing and suitability of various interventions including therapies, resource allocation, family counselling and discharge planning (Novack et al., 2001; Tate et al., 2005). This literature review has already evaluated South African research which found that the presence of PTA is not considered in daily practice by South African medical personnel dealing with TBI (Naidoo, 2013; Jerome et al., 2017). International literature indicates that the long-term cognitive outcomes following TBI are very much dependent on the severity of the injury and associated complications as well as the neurocognitive rehabilitation strategies employed during recovery (Rao & Lyketsos, 2000; Rabinowitz & Levin, 2014). This highlights the need for South African occupational therapists to have the necessary knowledge and skills to support survivors of TBI, particularly those in PTA, as this will ultimately affect their functional prognosis.

2.5 Assessment of Post Traumatic Amnesia

The duration of PTA is known as the most significant predictor of not only brain injury severity, but also future cognitive function and return to pre-morbid functioning (Brown et al., 2010; Dahdah et al., 2016; de Guise et al., 2005a; Draper et al., 2007; Draper and Ponsford, 2008; Ponsford et al., 2016; Sigurdardottir et al., 2009; Tate et al., 2005; van der Naalt et al., 1999). Individuals are deemed “out of PTA” when anterograde amnesia resolves and the individual presents with new continuous memory (Symonds & Ritchie Russell, 1943; Russell & Nathan, 1946). This emphasizes the importance for healthcare professionals to consider the presence of PTA in their initial assessment of an individual with TBI and to have the knowledge and skills to assess for the condition. INCOG guidelines, as discussed above, suggest that before commencing any clinical interventions, a comprehensive assessment of the individual must be completed, bearing in mind that individuals will progress through a variable period of

unconsciousness, low level arousal, and then of PTA and delirium (Bayley et al., 2014). The guidelines further explain that due to the unpredictable nature of recovery following TBI, PTA should be assessed daily with the use of the Galveston Orientation and Amnesia Test (GOAT), Westmead PTA scale, The Orientation Log (O-Log) or similar to assess for changes in PTA status.

Post traumatic amnesia is generally assessed using a standardized assessment: the Galveston Orientation and Amnesia Test (GOAT) has been regarded as the most valid and reliable test historically (Levin, O'Donnell & Grossman, 1979; Spiteri et al., 2021). The assessment has, however, been criticized for failing to assess sufficiently anterograde amnesia in comparison to other assessments such as the Westmead Post Traumatic Amnesia Scale (WPTAS) and Confusion Assessment Protocol (CAP) (Tate, 2006). The GOAT and CAP are effective in assessing for characteristic disorientation features of PTA, however, these symptoms often resolve early on, while anterograde amnesia may persist and continue to impede function as an individual progresses through PTA (Spiteri et al., 2021). The Westmead Post Traumatic Amnesia Scale is considered more sensitive and effective in identifying "longer term" memory impairments associated with PTA (Spiteri et al., 2021).

The Galveston Orientation and Amnesia Test (GOAT) aims to assess orientation, anterograde memory, and retrograde memory in patients in PTA (Levin, O'Donnell & Grossman, 1979). The assessment allocates points for each incorrect item which are then subtracted from 100, giving the total GOAT score. A higher score indicates better performance. Emergence from PTA is characterized by a score of 75 or higher on two consecutive days (Levin, O'Donnell & Grossman, 1979).

The Westmead Post Traumatic Amnesia Scale (WPTAS) aims to assess orientation and anterograde amnesia only (Shores et al., 1986). The tool includes seven orientation items and five anterograde memory items whereby the patient is expected to recall the tester's face and name and three picture cards presented on the previous day. One point is awarded for each correct item and the tool is scored out of 12. When the patient achieves a score of 12, the three picture cards are replaced to be recalled the following day. Emergence from PTA is characterized by a score of 12 for three consecutive days (Shores et al., 1986).

The Confusional Assessment Protocol (CAP) was designed to assess post traumatic confusional state (PTCS) specifically. It assesses seven symptoms common following TBI, namely: disorientation, cognitive impairment, fluctuations in symptom presentation, agitation, nighttime sleep disturbance, reduced day time arousal and psychotic symptoms (Sherer et al., 2005). The CAP is a combination of tests, including the GOAT, and scores range from 0 (no confusion symptoms) to 7 (all confusion symptoms present). Patients are considered to be in PTCS if they have 4 or more symptoms, or 3 if one of those is disorientation (Sherer et al., 2005).

Spiteri et al. (2021) differentiated between PTA and PTCS when comparing the use of the above measures. The study found that the CAP, which assesses for PTCS specifically, was more sensitive to a broader range of symptoms which are present early on in PTA and may represent a 'transient substage' within the broader scope of PTA known as 'deep PTA' (Spiteri et al., 2021). These patients present with severe confusion, disorientation and present with a variety of behavioural disturbances in comparison to later stages of PTA. Furthermore, patients deemed out of PTCS using the CAP continued to present with symptoms such as agitation, impaired cognition and anterograde amnesia which suggests that patients remain in PTA even after the acute symptoms of PTCS have resolved (Spiteri et al., 2021). The Westmead Post Traumatic Amnesia scale was found to be more sensitive to the later stages of PTA which is characterized by anterograde amnesia and agitation. This sensitivity is important when managing patients in PTA and should be used to guide clinical decisions such as the patient's readiness for neuropsychological assessments, neurocognitive rehabilitation, or home leave (Spiteri et al., 2021).

After their initial publication of guidelines for cognitive rehabilitation following TBI, the INCOG team published a separate set of guidelines with recommendations specific to the assessment and treatment of patients in PTA (Ponsford et al., 2014). The principles of PTA assessment, based on the INCOG level of evidence grading system as discussed previously are: i) posttraumatic amnesia (PTA)/Posttraumatic delirium (PTD) assessment should be performed on a daily basis using a validated tool until resolution of PTA/PTD (C) ii) consider assessing the individual in PTA with a delirium assessment tool as an adjunct to better characterize the patient's status (C) (Ponsford et al., 2014).

2.6 Interventions for Post Traumatic Amnesia

Various pharmacological and behavioural interventions have been explored in the management of agitation experienced by patients in PTA, however, it has been found that certain approaches may prolong recovery, exacerbate symptoms of PTA and contribute to poor functional outcomes (McNett et al., 2012). These approaches include the use of reorientation, supervision, redirection, restraints, environmental adaptations and the prescription of benzodiazepines (McNett et al., 2012). It is important to consider that this research was conducted by medical doctors and did not consider the contribution of allied health professionals, such as occupational therapists, in the provision of treatment. INCOG guidelines suggest the following principles for the management of individuals in PTA: avoid restraints and allow the patient to move around freely, maintain a quiet and consistent environment on the ward, avoid over stimulation, evaluate the impact of visitors, assessment and therapy, and limit if causing agitation or excessive fatigue, allow rest as needed, have consistent staff dealing with the patient, establish the most reliable means of communication, provide frequent reassurance, present familiar information as tolerated by the person, help family members understand PTA and how to minimize triggering agitation, if funding allows it is favourable for the person to remain in hospital until emergence from PTA or ensure patients in PTA are managed in a secure and consistent environment by people who understand their needs (Ponsford et al., 2014). These principles were based on evidence available at the time of publication, 2014, and since then research in the occupational therapy profession has identified the unique role that these professionals can play in the treatment of patients in PTA (Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019).

2.7 Occupational therapy's role in the management of Post Traumatic Amnesia

This literature review revealed that there is limited evidence on the therapeutic management of individuals in PTA. Most studies have evaluated the pharmacological

interventions used to manage PTA. However, between 2018 and 2019, a group of Australian occupational therapists conducted several studies on the use of activities of daily living retraining with patients in PTA (Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019). These studies found that by implementing structured and routine ADL retraining, patients did not experience increased levels of agitation but rather presented with improved functional outcomes in comparison to those patients where ADL retraining was only implemented after emergence from PTA (Trevena-Peters et al., 2018). This intervention was delivered in a routine manner and used an errorless learning approach to avoid increased agitation (Trevena-Peters et al., 2018). Errorless learning is a rehabilitation technique typically used by neuropsychologists and occupational therapists and has been used historically in the treatment of learning disabilities and acquired memory deficits (Evans et al., 2000). The basic concept is to prevent patients from making mistakes while learning new skills, the opposite of the 'trial and error' approach. This treatment technique is suited to individuals in PTA and based on the findings of Ewert (1989) which suggest that individuals in PTA often present with impaired explicit memory (knowing 'what') while implicit memory (knowing 'how') is generally intact. This enables occupational therapists to enhance learning potential for individuals who are in PTA. Examples of occupation-based treatments included personal care such as bathing, grooming, dressing, self-feeding as well as basic meal preparation (Trevena-Peters et al., 2018). Occupational therapists who participated in the studies felt that this type of therapeutic intervention helped reduce agitation as patients were able to participate in habituated occupations which provided meaning and reduced periods of boredom (Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019). These studies emphasize the importance of appropriate selection of occupational therapy interventions for use with patients in PTA (Ponsford et al., 2014; Trevena-Peters et al., 2019).

While research has established that occupational therapists are able to make a positive contribution to the recovery of individuals in PTA, these studies are limited in number and only represent a small population of the globe. Given that at least 70% of patients admitted to hospital with TBI experience PTA while progressing to the

rehabilitation phase of recovery (Tate et al., 2001; Nakase-Thompson et al., 2004), it is vital to understand what South African health care professionals, particularly occupational therapists, know about this condition and what interventions are used in its treatment.

Therefore, the question arises: what knowledge of post traumatic amnesia exists amongst occupational therapists working with traumatic brain injury in South Africa?

2.8 Summary

This literature has set the scene for the rest of this study by introducing key concepts such as traumatic brain injury, post traumatic amnesia and the unique contribution that occupational therapists can make in the period of PTA. It has revealed that there is a significant gap in South African literature on PTA, in both the form of research or clinical practice guidelines (Naidoo, 2013; Patel et al., 2016). Although clinical practice guidelines exist for countries of the Global North, these are difficult to contextualise to South African healthcare setting where there is often insufficient resources and supervision from experienced clinicians (Bola, Trollip & Parkinson, 2015; Webster, Taylor & Balchin, 2015; van Stormbroek & Buchanan, 2016; Jerome et al., 2017). Occupational therapists have the potential to improve functional outcomes following emergence from PTA when interventions are carefully selected and presented in a procedural manner (Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019), however, the efficacy of these interventions can only be monitored through regular assessment of PTA with the use of standardised tools as described by the INCOG panel(Bayley et al., 2014).

3. CHAPTER 3: METHODOLOGY

3.1. Introduction

The purpose of this study was to establish what South African occupational therapists know about PTA as a condition. Due to the absence of research on PTA in South Africa, the researcher endeavoured to describe what proportion of occupational therapists working in healthcare settings have an understanding of PTA, what occupational therapy interventions (assessments and treatments) are being utilized with patients with acute TBI and whether the presence of PTA is being taken into consideration when making these selections. This section will describe the chosen research design, description of participants, instrument, procedure for data collection and ethical considerations which were relevant to this study.

3.2. Quantitative descriptive research design

A quantitative, cross sectional research design was used for this study. A cross-sectional study was chosen as a means to prove or disprove assumptions about this group of occupational therapists, with particular reference to their understanding of post traumatic amnesia. study sampled a group of occupational therapists to gather information on their understanding on PTA. A quantitative research design is a numerical representation of the responses from a particular population. This allowed the researcher to make assumptions about the population based on sample results (Creswell, 2017). The researcher elected to utilize a quantitative descriptive survey to represent these findings numerically (Creswell, 2017). To the researcher's knowledge, this is the first study conducted on PTA in South Africa, therefore, the use of a quantitative study was an appropriate starting point for this particular area and could be expanded on in future studies with the use of a qualitative research design.

3.3. Participants

3.3.1. Sampling method

This study made use of convenience and snowball sampling (Everitt & Skronal, 2010). It focused on occupational therapists who work with adult client groups, in either

physical rehabilitation or psychiatry, and one can assume that this group accounts for at least half of the number of occupational therapists registered with the Health Professions Council of South Africa (HPCSA). In 2020, 5 638 occupational therapists were registered with the HPCSA (Health Professions Council of South Africa, 2020). Based on this, the population size for this study was 2 819. Statisticians recommend a 5% sampling rate (Bartlett, Kotrlik & Higgins, 2001), therefore, the sample size for this study was 141 participants. The acceptable response rate for quantitative surveys is 33%, thus, the anticipated number of responses for a sample size of 141 was 46 (Lindemann, 2019). Fifty eight surveys were returned, however, due to 5 surveys being incomplete only 53 were considered in the data analysis. This will be discussed in detail in Chapter 4.

3.3.2. Source and sample selection

The survey was distributed to members of the Occupational Therapy Association of South Africa (OTASA). Although convenience and snowball sampling may have resulted in biased results, the researcher posited that this risk outweighed the bias of excluding participants based on OTASA membership which requires an annual membership fee.

Participants needed to meet the following inclusion criteria:

i. Occupational therapists who were:
    a. registered with the Health Professions Council of South Africa (HPCSA), including those registered in the category of community service
    b. working in a setting where individuals with traumatic brain injuries may be treated (adult physical or psychiatric units)
    c. employed in a South African healthcare setting

Exclusion criteria included:

i. Occupational therapy students
ii. Occupational therapists employed in the corporate/medico-legal field (vocational rehabilitation in a clinical setting is acceptable)

3.4. Research Instrument

Fan and Yan (2010) described the development process of web-based surveys under 4 distinct steps: survey development, survey delivery, survey completion and survey return.

The web survey was a researcher-developed questionnaire and addressed the themes of: knowledge of PTA amongst occupational therapists, time between injury and occupational therapy intervention, assessment of PTA and occupational therapy interventions for individuals with TBI and those in PTA. These themes were aligned with the research objectives.

The survey used close-ended questions which enabled participants to answer questions easily, allowed for straightforward data analysis and prompted the participants so that they were able to answer the questions without over relying on their memory and is more suitable for the collection of quantitative data (Guo, Proctor & Salvendy, 2009). The researcher predicted that there was a general lack of understanding of PTA based on the literature review performed, thus, open-ended questions were not used in the survey to avoid superficial and inappropriate answers to questions which may have made it difficult to achieve the objectives of the research project (Guo, Proctor & Salvendy, 2009). Because this is a researcher-developed questionnaire, it was piloted to three expert occupational therapists known to the researcher to assess for content validity. These experts work in different settings and/or with different client groups, namely acute neuroscience, hand therapy and occupational science. This enabled them to assess for contextual ambiguity and contributes to rigour of the study. The questionnaire was then revised and amended based on feedback received after piloting. These amendments are listed in Appendix B.

The questionnaire contained two parts and was distributed on the RedCap platform (Appendix A). Part One collected demographic information while Part Two related specifically to PTA.

For ease and convenience, the researcher elected to utilize an electronic survey which could be distributed via an internet link to participants. This instrument enabled the

researcher to distribute the survey to occupational therapists across South Africa rather than limiting the study to a specific geographical area which would have been a significant limitation of the study. Web surveys do, however, have disadvantages such as limiting participants to those who have internet access (Couper, 2000). The researcher assumed that potential participants were practicing occupational therapists who fall within a socioeconomic bracket where internet is fairly accessible. Furthermore, the benefits of the use of a web-based survey outweighed the potential disadvantages by reaching a larger population which enabled the researcher to successfully answer the research question: What knowledge of post traumatic amnesia exists amongst occupational therapists working with traumatic brain injury in South Africa?

3.5. Research Procedure

During survey delivery, the questionnaire was distributed to OTASA members i.e. potential participants, in an email. At this stage, potential participants received an invitation to participate (Appendix C). Participants had an opportunity to access the survey for a period of two weeks from the date of link distribution. Distribution of the survey to OTASA members did have financial implications which will be discussed.

Through the use of convenience and snowball sampling, the survey was distributed to occupational therapists who met the inclusion criteria and were known to the researcher through professional or personal connections. The survey link was then shared further by these connections.

Once the survey link had been closed, the researcher prepared the data by assessing for missing data and outliers. The analysis of “clean” data was then completed in Microsoft Excel.

3.6. Ethical considerations

The researcher attended the relevant ethics training necessary to conduct this study and this protocol was submitted to the Wits Human Research Ethics Committee or Animal Research Ethics Committee for approval prior to data collection (Appendix E). The ethical clearance number for this study was M210971. The survey was

accompanied by a covering information sheet (Appendix D) which provided all necessary information to participants prior to consent.

Participants gave their consent by completing and submitting the survey and participants had the option to withdraw from the study at any point by not submitting a completed survey. The survey did not request any identifiable information as this information was not relevant to the research question or objectives, therefore, there was no risk to privacy or confidentiality.

There were no potential harms of this study, however, it did hope to identify an area of practice in which occupational therapists can expand their knowledge and skills as well as initiate the process for further research on PTA amongst other health care disciplines.

3.7 Validity and reliability

The survey was piloted to three experienced occupational therapists known to the researcher. These therapists are experienced clinicians but has transferred into the field of academia and were, thus, able to assess for ambiguity and contribute to reliability of the research instrument. As this questionnaire is researcher-developed it has its limitations in terms of validity and reliability, however, there is no existing measurement tool for this research topic. The validity of the questionnaire is a limitation given that it was self-reported. Participants may have not provided accurate feedback in an effort to inflate their knowledge and understanding of PTA as opposed to admitting a lack thereof.

3.8 Data analysis

The research objectives were to collect nominal and ordinal data and, thus, descriptive statistics were used and not statistical tests. Consequently, this project aimed to identify a gap in knowledge amongst South African occupational therapists.

Raw data was transferred to Microsoft Excel as described under data management below. Responses for each question were allocated a numerical value for analysis purposes. Data was categorized according to input variables so that frequencies and percentages could be calculated. These are represented by means of tables under Chapter 4: Results.

3.9 Data management

Data was stored on the Redcap platform, which is secured on the Wits' server, therefore, ensuring security of the data. Data was kept in a secure CSV file to be accessed at a later stage. Data was converted to Microsoft Excel and cleaned. Five surveys were incomplete and, thus, disregarded from the data analysis. The data was secured on the researcher's personal laptop which was password protected. Only the researcher and her supervisor had access to this data. The data will be stored for an additional 3 months after completion of the study.

4. CHAPTER 4: RESULTS

4.1. Introduction

This chapter will present the results of the study in two parts, as per the survey. The first part of this chapter will present the demographics of the study participants with particular focus on their qualifications, years of experience, clinical settings, and fields of practice. The second part of the chapter will represent findings specific to PTA to illustrate what knowledge of post traumatic amnesia following TBI exists amongst study participants, at what point following TBI do participants begin occupational therapy intervention and what interventions are used with individuals with TBI and, specifically, those in a state of PTA.

4.2. Objective 1: Demographics of South African occupational therapists working with traumatic brain injuries

The total number of responses to the survey was 58, however, four participants did not complete all questions in the survey, therefore, their responses were not included. One participant did not meet the inclusion criteria as their main client group was reported as paediatrics and, thus, the survey was terminated automatically. Therefore, 53 responses were considered in these results. This represents a return rate of 37.58% which exceeds the acceptable 33% described by Lindemann (2019). Table 4.1 shows the demographic information of the participants.

Table 4. 1: Participant demographics (N=53)

Highest qualification	Frequency	Percentage (%)
Masters	4	8
Post graduate diploma	5	9
Undergraduate degree	44	83
Total	**53**	**100**
Years of experience	Frequency	Percentage (%)
0-2 years	16	30
3-5 years	20	38

6-8 years	9	17
9-11 years	1	2
12-14 years	3	6
15 or more years	4	8
Total	**53**	**100**
Health care sector	Frequency	Percentage (%)
Private sector	29	55
Public sector	22	42
Both sectors	2	4
Total	**53**	**100**
Additional certified courses	Frequency	Percentage (%)
Yes	19	36
No	34	64
Total	**53**	**100**
Workplace setting	Frequency	Percentage (%) (n=53)
Acute in-patient unit	28	53
Sub-acute/step-down/in-patient rehabilitation facility	27	51
Out-patient department	26	49
Home-based therapy	10	19
Other	3	6
Field of practice	Frequency	Percentage (%) (n=53)
Psychiatry	13	25
Physical rehabilitation (excluding neurorehabilitation)	9	17
Physical rehabilitation (including neurorehabilitation)	37	70
Vocational rehabilitation	13	25

Other	3	6

4.2.1. Educational information of the sample

Table 4.1 reports that 44 participants possess an undergraduate qualification (83%). Only 9 participants held a post graduate qualification, either in the form of a Masters degree (8%; N=4) or post graduate diploma (9%; N=5). No participants held a PhD qualification.

4.2.2. Vocational information of the sample

As seen in Table 4.1, the majority of participants had between 3 and 5 years of experience (38%; N=20) followed by those with 0 to 2 years of experience (30%; N=16). Most participants reported working in the private sector (55%; N=29) while 22 participants reported working in the public sector (42%). Only two participants reported working in the both private and public sectors (4%).

With respect to work place setting, Table 4.1 shows that 28 participants reported working in the acute in-patient setting (53%), followed by 27 participants working in sub-acute, step down or in-patient rehabilitation settings (51%), and 26 participants in out-patient departments (49%). Ten participants reported working in a home-based setting (19%) and 3 participants indicated “other” (6%) and reported “vocational rehabilitation” as their answers

With respect to fields of practice, Table 4.1 indicates that 37 participants reported working in the fields of physical rehabilitation including neurorehabilitation (70%) followed by 13 participants in both psychiatry (25%) and vocational rehabilitation (25%). Nine participants reported working in the field of physical rehabilitation excluding neurorehabilitation (17%) and three participants indicated “other” (6%) and reported vocational rehabilitation as their answers.

Most participants had not completed any additional certified courses (64%; N=34). The 19 respondents (36%) who had completed additional courses reported which courses had been completed. These are represented in Table 4.2.

Table 4. 2: Additional courses attended by participants

Additional course	Frequency	Percentage (%) (n=19)	Percentage (%) (n=53)
Advanced Bobath	3	15	6
APOM	1	5	2
Basic Bobath	6	32	11
CMMS	1	5	2
FCE	3	15	6
Hand therapy	1	5	2
NDT	1	5	2
Pain management	2	11	4
Seating	5	26	9
Sensory integration	2	11	4
Treatment of cerebral palsy	2	11	4
Workwell	2	11	4

The common courses completed amongst the 19 respondents with additional certifications are represented in Table 4.2. The most common courses completed included Basic Bobath (32%; N=6), wheelchair seating (26%; N=5), functional capacity evaluation (FCE) (15%; N=3) and Advanced Bobath (15%; N=3). Less commonly completed additional courses included the Activity Participation Outcome Measure (APOM) (5%; N= 1), CMMs hand therapy qualification (5%; N=1), hand therapy courses (5%; N=1), pain management (11%; N=2), Neurodevelopmental therapy (NDT) (5%; N=1), sensory integration (11%; N=2), cerebral palsy (11%; N=2) and Workwell training (11%; N=2).

4.3. Objective 2: Occupational therapists' understanding of post traumatic amnesia

Table 4. 3: Familiarity with PTA as a condition versus familiarity with its associated symptoms

Familiar with PTA	Frequency	Percentage (%)
Yes	31	58
No	22	42
Total	**53**	**100**
Familiar with symptoms associated with PTA	Frequency	Percentage (%)
Yes	47	89
No	6	11
Total	**53**	**100**

Table 4.3 shows that 58% (N=31) of the participants reported that they were familiar with PTA following TBI while 42% (N=22) indicated that they had not heard of the condition. When participants were prompted with the symptoms of PTA, 89% (N=47) indicated that they had observed patients with acute TBI present with the stated symptoms in their settings. These included agitation, irritability, aggression, disinhibition (including social and sexual behaviour), perseveration, apathy, wandering or abscondment (McNett et al., 2012)

Table 4. 4: Where participants learnt about PTA

Source	Frequency	Percentage (%) (n=53)
Undergraduate studies in South Africa	8	15
Undergraduate studies abroad	1	2
Post graduate studies in South Africa	2	4
Post graduate studies abroad	0	0

Work experience in South Africa	26	49
Work experience aboard	1	2
Journal articles/textbooks/other forms of literature	7	13
Training course	4	8
Other	0	0
Not applicable	20	38

Participants were then requested to identify where they learnt about PTA as indicated in Table 4.4. Forty nine percent of participants (N=26) reported that they learnt about PTA while working as an occupational therapist in South Africa. Fifteen percent (N=8) reported that they learnt about it during their undergraduate studies and 13% (N=7) reported that they learnt about it through journal articles and other forms of literature. Other sources indicated by participants included training courses (8%; N=4), during post graduate studies in South Africa (4%; N=2) and while working abroad (2%; N=1). Thirty eight percent of the participants (N=20) selected “Not appliable” as they were unfamiliar with the condition.

Table 4. 5: Alternative names for PTA

Alternative name for PTA	Frequency	Percentage (%) (n=53)
Post traumatic delirium	11	21
Post traumatic confusional state (PTCS)	7	13
Post concussion syndrome (PCS)	12	23
Other	0	0
None of the above	32	60

Participants were asked whether they knew PTA by any alternative names. Table 4.5 below represents these findings. Sixty percent of participants (N=32) reported they did not know PTA as any of the alternative names provided. Twenty three percent of participants (N=12) reported they were familiar with PTA as “post concussion syndrome”, 21% (N=11) indicated that they knew it as “post traumatic delirium” and 13% (N=7) indicated they knew it as “post traumatic confusional state”. None of the participants indicated that there were any other names for PTA that they knew of.

Table 4. 6 Participants who consider the presence of PTA when selecting interventions for patients with TBI (N=53)

Consider the presence of PTA	Frequency	Percentage (%)
Yes	33	72
No	15	28
Total	**53**	**100**

Participants were asked whether they considered the presence of PTA as a factor when selecting appropriate interventions for use with patients who have suffered TBI; Table 4.6 indicates that 72% of participants (N=33) reported that they do consider the presence of PTA when selecting interventions while 28% (N=15) reported that they did not.

Table 4. 7: Participants who complete an assessment of PTA at the time of initial assessment (N=53)

Regularity	Frequency	Percentage (%)
Never	23	43
Sometimes	20	38
Regularly	10	19
Total	**53**	**100**

Table 4.7 reflects how often participants reported assessing for PTA at the time of initial assessment. Interestingly, only 19% participants (N=10) reported that they regularly complete an assessment of PTA at the time of initial consultation. In contrast,

43% (N=23) reported that they never complete an assessment of PTA while 38% (N=20) reported that they sometimes assess for PTA at the initial consult

Table 4. 8: How often participants assess patients' progression through PTA on a weekly basis (N=53)

Regularity	Frequency	Percentage (%)
Daily	8	15
Five or six times	1	2
Three or four times	7	13
Once or twice	18	34
Never	19	36
Total	**53**	**100**

Following on, respondents were asked to indicate how frequently they assess for PTA after initial consult. These results are reflected in Table 4.8 above. Once again, most of the participants (36%; N=19) reported that they never assess for PTA after the initial consult, 34% (N=18) reported that they assess once or twice a week and 2% (N=1) reported that they assess five or six times a week. Only 15% (N=8) participants reported that they assess a patient's progression through PTA on a daily basis.

Table 4. 9: Preferred assessments of PTA used by participants and their perceived efficacy in the assessment of PTA

Preferred assessment tool	Frequency	Percentage (%) (n=53)
WPTAS	3	6
A-WPTAS	0	0
GOAT	3	6
CAP	1	2
Clinical observation	31	58
Other	1	2
I do not assess for PTA	21	40
Efficacy of assessment tool	Frequency	Percentage (%) (n=53)

WPTAS	2	4
A-WAPTS	3	6
GOAT	0	0
CAP	0	0
Clinical observation	19	36
Other	7	13
I do not assess for PTA	22	42

Participants were asked to indicate which assessments of PTA they utilized in their settings and which of them they found the most effective. These results are represented in Table 4.9. Fifty eight percent of participants (N=31) indicated that they assess for PTA using clinical observation and, likewise, 36% of the participants (N=19) indicated that they find it the most effective assessment tool. Forty percent of participants (N=21) indicated that they do not assess for PTA whereas only a combined 14% of participants (N=7) reported using the standardised assessments listed (WPTAS, GOAT and CAP). Four percent of participants (N=2) reported that they found the WPTAS the most effective while 6% of participants (N=3) preferred the A-WPTAS. This is interesting considering no participants indicated using the A-WPTAS in their settings. Thirteen percent of participants (N=7) indicated “other”, however, it is important to note that these participants justified their choice by reporting that they were unfamiliar with the listed assessments and, thus, could not comment on which they thought the most effective. One participant reported that they found the Glasgow Coma Scale and the Vona du Toit Model of Creative Ability to be the most effective tools to assess for PTA while another respondent reported preference for the Coma Recovery Scale.

4.4. Objective 3: Time frame following traumatic brain injury that occupational therapists begin intervention

Table 4. 10: Typical time frame that participants begin intervention post TBI (N=53)

Time frame post injury	Frequency	Percentage (%)
1 – 7 days	18	34
2 – 4 weeks	19	36
1 – 3 months	10	19
More than 3 months	6	11
Total	**53**	**100**

Table 4.10 represents the typical time frame in which participants began intervention following TBI. Thirty six percent of participants (N=19) reported that they began occupational therapy intervention within the first 2-4 weeks following TBI in their setting followed by 34% (N=18) who commenced intervention within the first 1-7 days post injury. Nineteen percent of participants (N=10) reported that they began intervention within the first 1-3 months following injury and 11% of participants (N=6) reported that they began intervention more than 3 months post injury.

4.5. Objective 4: Interventions used by occupational therapists working with individuals in post traumatic amnesia

Table 4. 11: Interventions used in the treatment of TBI

Intervention	Frequency	Percentage (%) (n=53)
Sensory stimulation/modulation	33	62
Range of motion and positioning	35	66
Hand function	33	62
Splinting	28	52
ADL retraining	41	77
Cognitive targeted interventions	40	75
Physical targeted interventions	37	70
Vocational rehabilitation	10	19
Social skills retraining	22	42
Return to driving	4	8
Family or caregiver education	34	64
Seating	25	47
All of the above	10	19
None of the above	0	0
Other	0	0

Participants were asked to report which interventions were commonly used in the treatment of TBI and this is reflected in Table 4.11. The most reported interventions in the treatment of TBI included ADL retraining (77%; N=41), cognitive targeted interventions (75%; N=40), physical targeted interventions (70%; N=37), passive range of motion and positioning (66%; N=35), family or caregiver education (64%; N=34), sensory stimulation/modulation (62%; N=33) and hand function (62%; N=33).

The less commonly utilized interventions include splinting (52%; N=28), seating (47%; N=25), social skills retraining (42%; N=22), vocational rehabilitation (19%; N=10) and return to driving (8%; N=10). Nineteen percent of participants (N=10) reported that they utilize all of the listed interventions. There were no additional interventions reported by the participants.

Table 4. 12 Interventions used by participants in the treatment of PTA

Intervention	Frequency	Percentage (%)
Reorientation	35	66
PRPP system	5	9
Cognitive skills retraining	32	60
Information processing strategies	15	28
Sensory modulation programmes	22	42
Occupational performance interventions	36	68
Environmental adaptation	20	38
Family or caregiver education	33	62
Other	0	0
I do not treat PTA	4	8
Not applicable	14	26

Participants who worked in a setting where they encountered patients in the acute stage of injury (i.e. within the first 3 months post TBI) were asked to indicate which interventions they utilized in the treatment of patients with PTA. These findings are represented in Table 4.12. The question was not applicable to 26% of participants (N=14) who treated patients after the initial 3 months post-TBI in their settings. The most common interventions reported by respondents included occupational performance interventions (68%; N=36), reorientation (66%; N=35), family or caregiver education (62%; N=33) and cognitive skills retraining (60%; N=32). The less

commonly utilized interventions include sensory modulation programmes (42%; N=22), environmental adaptation (38%; N=20), information processing strategies (28%; N=15) and the perceive, recall, plan perform (PRPP) system (9%; N=5). Eight percent of participants (N=4) reported that they do not treat PTA.

4.6 Summary

From the results it is evident that most of the study participants, 83%, are in possession of an undergraduate qualification. Thirty eight percent of participants have between 3 and 5 years of experience which forms the bulk of the sample group. Fifty-five percent of participants are employed in the private sector and the majority of participants (53%) are employed in the acute-in-patient setting. A large number of participants (70%) work in the field of physical rehabilitation, including neurorehabilitation. Thirty-six percent of participants have completed additional certified qualifications of which Basic Bobath and wheelchair seating were the most common. Fifty-eight percent of participants reported that they were familiar with PTA while eighty-nine percent reported that they were familiar with its symptoms. Forty-nine percent of participants reported that learnt about PTA through their work experience in South Africa. Twenty-six percent of participants reported that they were familiar with post concussion syndrome (PCS) as an alternative name for PTA which is an interesting finding and will be discussed further in the next chapter. Seventy-two percent of participants reported that they considered the presence of PTA in their intervention planning for patients with TBI, however, 43% admitted that they never assess for the condition. Only 15% of participants reported that they perform an assessment of PTA on a daily basis. Fifty-eight percent of participants reported that the use clinical observation to assess for PTA and 36% reported that they found this the most effective means of assessment, even when compared to standardised tools such as the WPTAS, A-WPTAS, GOAT and CAP. A combined 70% of participants report that they commence intervention in the first month of recovery following TBI, the period in which PTA would be most apparent. Activities of daily living retraining was the most common intervention used in the treatment of both TBI (77%) and PTA (68%).

5. CHAPTER 5: DISCUSSION

5.1. Introduction

This chapter will discuss the findings of the study and how the aims of the study were met. The researcher set out to describe South African occupational therapists' understanding of post traumatic amnesia following traumatic brain injury. The four objectives which formed part of this aim were to describe the demographics of South African occupational therapists working with TBI, to determine occupational therapists' understanding of PTA, at what point following TBI do occupational therapists begin intervention and lastly, to describe the interventions used by occupational therapists working with individuals in PTA.

The survey used allowed occupational therapists to explain their understanding of PTA and describe the interventions that they use in the treatment of TBI as well as PTA. Fifty-three responses were analysed, and this data has shed light on an important yet what appears to be an under researched condition in the context of the South African occupational therapy profession. This data will be discussed with reference to relevant literature on TBI and the assessment and treatment of PTA.

5.2. Objective 1: Demographics of South African occupational therapists working with traumatic brain injuries

5.2.1. Work experience of occupational therapists

As seen in Table 4.1., most participants hold an undergraduate degree (83%) and are relatively inexperienced therapists with less than 6 years of clinical experience (68%). As this sample is a representation of occupational therapists working with TBI in South Africa, this finding suggests that this group is comprised of generally novice therapists. Furthermore, combined with the finding that only 8% of participants had post graduate training, this suggests that the average occupational therapist working with TBI would not be considered as an expert in the field of neurorehabilitation. South African literature has shown us that it is not uncommon for newly qualified healthcare professionals to work unsupervised (Bola, Trollip & Parkinson, 2015; Jerome et al.,

2017). van Stormbroek and Buchanan (2016) found that 43% of community service occupational therapists felt that they lacked knowledge and skill for the assessment and treatment of specific conditions. Adult neurology, including TBI, ranked third on the scale of common referrals received by community service occupational therapists in this study (van Stormbroek & Buchanan, 2016).

Although 36% of participants had completed additional certified qualifications, only 9 respondents (17%) had attended adult neurology-specific courses, namely Bobath. Bobath was the most reported course amongst participants with additional certifications (Table 4.2). However, Bobath is a technique focused on the treatment of physical impairments after neurological injury (Díaz-Arribas et al., 2020). This forms only one component of occupational therapy's role in neurorehabilitation and does not relate to neurocognitive interventions. The sole completion of this course should, again, not lead us to classify these therapists as experts in the field of neurorehabilitation.

Other common certified courses reported included wheelchair seating and functional capacity evaluation (FCE). Although the additional courses reported may contribute a superior level of skill amongst this group of participants, it is unlikely that PTA would be addressed as a key topic in any of these courses given that none speak directly to neurocognitive rehabilitation or TBI. Therefore, the above-mentioned courses should not be considered as important contributions to participants' understanding of PTA. This is supported by the finding that only 8% of participants reported learning about the condition during training courses (Table 4.4). It is important to note that participants were asked to indicate whether they had completed additional certified courses – this does not relate to informal or unaccredited training courses which participants may also have attended.

van Stormbroek and Buchanan (2016) found that 43% of community service occupational therapists reported the need for a mentor and 24% felt unsupported in their community service placements. This reinforces the notion that there is insufficient support and supervision for novice occupational therapists in South Africa. Moreover, literature indicates that there is a complete lack of rehabilitation specific guidelines for

TBI in countries of the Global South, South Africa included (Patel et al., 2016). Not only is this group of occupational therapists relatively inexperienced, without specialised neurorehabilitation training, working with insufficient supervision but they also do not have access to contextually appropriate evidence-based TBI rehabilitation guidelines to inform their practice. Thus, we can see that South African occupational therapists' understanding of PTA is affected by multiple factors.

With respect to the average years of experience amongst participants, less than 6 years, two arguments can be posed in the context of this study: firstly, one may assume that novice and recently graduated occupational therapists should possess more recent on knowledge on topics as university curriculum is, or should be, based on recent developments in research. On the other hand, one may assume that novice therapists are inexperienced and have not completed sufficient "on the job training" where they may gain knowledge while learning from more senior and experienced members of staff. The findings of this study support the second argument as 49% of participants reported that they learnt about PTA while working in South Africa while only 15% reported that they learnt about it during undergraduate studies (Table 4.4). This is supported by literature which found that community service occupational therapists felt that university curriculum was lacking depth and detail needed for their first year of work experience (van Stormbroek & Buchanan, 2016). This poses the question of whether South African universities are preparing novice therapists to treat the acute TBI patient sufficiently, bearing in mind that it is a major contributor to the global burden of disease (Dewan et al., 2019). It is important to acknowledge that the jump from student to clinician is challenging and it is unlikely that any undergraduate programme can fully prepare students for the working world. However, this gap could be bridged by sufficient supervision from senior therapists which we have already seen to be lacking (van Stormbroek & Buchanan, 2016).

5.2.2. Fields of practice, healthcare sectors and workplace setting

Table 4.1. shows that most participants were employed in the private sector, in either an acute in-patient unit or rehabilitation facility and work in the field of physical rehabilitation with a neurorehabilitation component. This should be considered as a

strength of the study given that the bulk of participants encounter TBI patients in the acute stage of recovery (i.e. within the first three months post injury) where PTA would be evident (American Psychiatric Association, 2013; Marshman et al., 2013; Ponsford et al., 2014). However, this finding is not inclusive of the entire occupational therapy population which may be a limitation of the study.

The findings of objective 1 are significant in the context of this research project which set out to understand what South African occupational therapists know about PTA.
As discussed in Chapter 4, the sample size for this study was 141 and the survey yielded a return rate of 37.58%. This exceeds the acceptable 33% described by Lindemann (2019) and allows us to draw generalisations about South African occupational therapists working with adult client groups.

Objective 1 has set the scene for the rest of this discussion: We have established that a combined 70% of participants begin intervention within the first month following TBI, thus, will likely encounter patients in PTA given its high level of occurrence in the acute phase of head injury (McNett et al., 2012). Based on this finding alone, we would anticipate that this group of occupational therapists has a sound understanding of TBI rehabilitation, including the acute phase of injury characterized by PTA (American Psychiatric Association, 2013; Marshman et al., 2013; Ponsford et al., 2014).

5.3. Objective 2: Occupational therapists' understanding of post traumatic amnesia

5.3.1. Knowledge of post traumatic amnesia and its alternative names

Fifty eight percent of participants indicated that they were familiar with PTA while 89% reported that they had noted patients with TBI in their settings presented with the symptoms of PTA (Table 4.3). These symptoms were listed in the questionnaire as "agitation, irritability, aggression, disinhibition (including social and sexual behaviour), perseveration, apathy, wandering or abscondment" (McNett et al., 2012). Most participants (60%) admitted that they were not familiar with any alternative names of PTA as described in the literature, such as post traumatic confusional state or post

traumatic delirium (Wolf, Gleckman & Ginsburg, 1996; Stuss et al., 1999; de Guise, Leblanc, et al., 2005; Sherer et al., 2005; Nott, Chapparo & Baguley, 2006). It is important to note that 23% of participants reported that they were familiar with post concussion syndrome (PCS) as an alternative name for PTA. Post concussion syndrome, however, is not a term that may be used interchangeably with PTA as it represents a completely separate set of symptoms associated with mild TBI (Rimel et al., 1981; Ghajar, 2000; Jerome et al., 2017). Post concussion syndrome is a term used to describe a combination of nonspecific symptoms such as headaches, fatigue, vertigo, irritability, anxiety and impaired concentration, amongst others (Leddy, Baker & Willer, 2016). Post concussion syndrome is not necessarily associated with ongoing physiological brain injury or long term cognitive impairment (Leddy, Baker & Willer, 2016). Post traumatic amnesia on the other hand is consistent with white matter changes on neuroimaging (Cho & Jang, 2021) and is a significant prognostic indicator for the severity of brain damage and future functional outcomes (Brown et al., 2010; Dahdah et al., 2016). It is at this point that we should already be identifying a gap in knowledge amongst participating occupational therapists.

5.3.2. Significance of post traumatic amnesia in intervention planning

A total of 72% percent of participants reported that they considered the presence of PTA when selecting interventions for use with patients with TBI (Table 4.6). This is an interesting finding considering only 58% of participants reported that they were familiar with the condition and should lead us to question whether 72% is an honest representation based on the previous finding. Most respondents (43%) reported that they never complete an assessment of PTA at the time of initial consultation and 38% reported that they never complete an assessment of PTA following the initial consultation (Table 4.6 and 4.7). This is a direct contradiction of global TBI guidelines which advise that before commencing any clinical interventions, a comprehensive assessment of the individual, including an assessment of PTA, must be completed (Bayley et al., 2014). Furthermore, it is advised that due to the unpredictable nature of recovery following TBI, PTA should be assessed daily with the use of a standardized assessment (Bayley et al., 2014). Naturally, this should lead us to the following

question: how do occupational therapists consider the presence of PTA in treatment planning if they are not assessing for the condition?

5.3.3. Assessment of post traumatic amnesia

The most reported means of assessment of PTA amongst participants was clinical observation (58%) and similarly, 36% of participants reported that they found clinical observation the most effective tool for assessing PTA (Table 4.9). The literature review conducted did not uncover any source which supported the use of clinical observation in the assessment of PTA. On the contrary, global TBI guidelines strongly recommend the use of a validated and standardised assessment tool such as the Galveston Orientation and Amnesia Test (GOAT), Westmead PTA scale, O-Log or similar, to assess for changes in PTA status (Bayley et al., 2014). These assessments are paper based, administered in an interview format, require minimal to no resources, and can be administered in a matter of minutes at the patient's bedside. Thus, it is interesting that such assessments are not utilized in South African healthcare settings despite the significant contribution that their findings can make to prognostication (Brown et al., 2010; Ponsford et al., 2016; Tate et al., 2005). Only 4% of participants supported the efficacy of the Westmead PTA scale while 0% supported the use of the GOAT. International literature tells us that the GOAT has been regarded as the most valid and reliable test historically (Levin, O'Donnell & Grossman, 1979; Spiteri et al., 2021), however, the Westmead PTA scale has been considered more sensitive and effective in identifying "longer term" memory impairments associated with PTA (Spiteri et al., 2021). This study found that only a combined 14% of participants use a standardized assessment of PTA and only 6% showed preference for the Westmead PTA scale or GOAT (Table 4.9).

The combination of the above factors, namely, understanding of PCS versus PTA, lack of regular assessment of PTA and insufficient use of validated tools in the assessment of PTA strongly suggests a lack of understanding of PTA amongst participants. Firstly, South African healthcare guidelines clearly stipulate that the presence of PTA is the "gold standard" indicator for TBI (National Institute for Occupational Health, 2013) and literature indicates that the length of PTA is a strong

indicator for future cognitive and functional outcomes (van der Naalt et al., 1999; Draper, Ponsford & Schönberger, 2007; Sigurdardottir et al., 2009; Dahdah et al., 2016). As occupational therapists are the primary healthcare professionals who provide neurocognitive and functional rehabilitation it is imperative for us to monitor a patient's progression through PTA in order to set realistic and client-centred goals (Novack et al., 2001; Tate et al., 2005). Naturally, this cannot be achieved if the initial and follow up consultations do not include an assessment of PTA. Moreover, the presence of PTA should inform clinical reasoning around intervention planning for clients with TBI as the selection of inappropriate intervention techniques may actually worsen the symptoms of PTA as well as the patients' long term functional prognosis (McNett et al., 2012; Ponsford et al., 2014; Trevena-Peters et al., 2019, 2018b, 2018a).

The above findings indicate that although participants reported considering the presence of PTA in intervention planning, they do not conduct a regular assessment of PTA nor do they utilize the appropriate tools to assess for the condition as recommended by literature and international TBI guidelines (Bayley et al., 2014; Spiteri et al., 2021). A lack of routine assessment of PTA suggests that South African occupational therapists do not consider the presence of PTA as a significant contributor to TBI recovery and rehabilitation despite this being clearly described in various forms of national and international literature over a period of more than 20 years (Bayley et al., 2014; Brown et al., 2010; Dahdah et al., 2016; de Guise et al., 2005a; Draper et al., 2007; Draper and Ponsford, 2008; National Institute for Occupational Health, 2013; Ponsford et al., 2016; Sigurdardottir et al., 2009; Tate et al., 2005; van der Naalt et al., 1999). This will have a direct impact on South African occupational therapists' intervention planning for patients with TBI which could have a damaging effect on patients' future functional and cognitive functioning (McNett et al., 2012; Ponsford et al., 2014; Trevena-Peters et al., 2019, 2018b, 2018a). An important consideration is at what point South African occupational therapists begin said intervention with patients with TBI and whether these patients are even in the acute phase of recovery where PTA would be evident. This issue will be discussed further under Objective 3.

5.4. Objective 3: Time frame following traumatic brain injury that occupational therapists begin intervention

A combined 70% of participants reported that they begin intervention with individuals with TBI within the first month post-injury (Table 4.10). Thirty four percent of these begin intervention within the first 7 days. Based on this, we can once again see that the bulk of participants work with patients with acute TBI who are likely to be in PTA (American Psychiatric Association, 2013; Marshman et al., 2013; Ponsford et al., 2014) and, thus, should possess a sound understanding of PTA. Despite this, we have already found that 43% of participants do not perform an assessment of PTA at the time of initial assessment as suggested by international TBI guidelines (Bayley et al., 2014). Therefore, it is only natural for us to question what interventions are being used with patients in PTA if regular and standardized testing is not being performed. The next objective will describe what interventions South African occupational therapists use with patients in PTA.

5.5. Objective 4: Interventions used by occupational therapists working with individuals in post traumatic amnesia

Objective 4 evaluated the interventions used by occupational therapists in the treatment of TBI as well as PTA specifically. Based on the fact that PTA cannot occur without the presence of TBI, it is important to consider the intervention planning for both conditions and whether there is any difference in the selected interventions. This would reflect an understanding of the nature of PTA and appropriate interventions amongst participants. The most common interventions used in the treatment of TBI included ADL retraining (77%), cognitive targeted interventions (75%), physical targeted interventions (70%), range of motion and positioning (66%), family or caregiver education (64%), sensory stimulation and modulation (62%) and hand function (62%). The most common interventions used in the treatment of PTA, however, included occupational performance interventions (68%), reorientation (66%), cognitive skills retraining (60%) and family or caregiver education (62%) (Table 4.11). These will be the focus of the discussion on this objective as they have the most

relevance to the study. Interventions aimed at cognitive function are common, and advised, in the treatment of TBI (Bayley et al., 2014), however, according to literature, its appropriateness during the period of PTA is questionable (Trevena-Peters et al., 2018). Other interventions reported by participants included the use of the PRPP system (9%), sensory modulation programmes (42%) and information processing strategies (28%). These interventions are common in the treatment of TBI, however, their use in the treatment of PTA require further investigation.

5.5.1. Family education

It was promising to see that family or caregiver education featured both in the treatment of TBI and PTA (Tables 4.11 and 4.12.) as this was previously found to be a point of disappointment amongst family members of patients with TBI treated in South African government healthcare facilities (Webster, Taylor & Balchin, 2015). Families reported feeling unprepared for the challenges associated with TBI, specifically behavioural and cognitive impairments (Webster, Taylor & Balchin, 2015). This study specifically refers to a lack of appropriate family counselling in government settings, however, this picture may be mirrored in private healthcare settings. The findings of the current study thus far suggest a limited understanding of PTA amongst participating occupational therapists. It is, therefore, fair to assume that information provided to families of individuals with acute TBI in these settings may not be entirely accurate.

INCOG guidelines strongly recommend the use of family counselling to help family members understand PTA and how to avoid triggering agitation (Ponsford et al., 2014). This link to literature is significant: the process of family education should be started in the early stages of recovery if regular assessment of PTA is conducted to track recovery and identify the point emergence from PTA (Bayley et al., 2014). Therefore, we should be wondering why low-cost assessment tools such as the GOAT or WPTAS are not being used by South African occupational therapists to guide intervention selection, discharge planning and family counselling (Novack et al., 2001; Tate et al., 2005).

Given the chronic disability associated with TBI we need to establish what interventions South African occupational therapists are using in the treatment of TBI to support future functional outcomes of patients and reduce the burden of care on their families. This leads us to critically evaluate the other common interventions used by occupational therapists in the treatment of PTA (Table 4.12.), namely, occupational performance interventions, reorientation and cognitive skills retraining.

5.5.2. Occupational performance interventions

Occupational performance intervention was the most common tool used by participants in the treatment of PTA (68%). This should not come as a surprise given the nature of our practice which is largely focused on facilitating independence in activities of daily living and lived situations on an individual, community and societal level (American Occupational Therapy Association, 2020). Occupational performance interventions have been found to be effective in the treatment of agitation associated with PTA, contributing towards positive functional outcomes following emergence from PTA and reducing the duration of PTA (Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019). Given that the duration of PTA is a strong indicator for cognitive recovery, this unique contribution from occupational therapists has the potential to be life changing for individuals with TBI and their families (Brown et al., 2010; Ponsford et al., 2016; Tate et al., 2005). A limitation of this study is that participants were not prompted to explain how occupational performance interventions were administered: research has indicated that in order to support individuals in PTA this form of intervention should be administered using a procedural and errorless learning frame of reference (Trevena-Peters, Ponsford & McKay, 2018). A further limitation is that participants were not prompted to explain what activities of daily living were addressed as part of treatment. Trevena-Peters et al. (2018) made specific reference to the treatment of personal care tasks and, when appropriate, light meal prep in the treatment of PTA which contributed to the positive effects seen in the study. Their study acknowledged that the use of task-focused intervention combined with balancing “challenge and a sense of mastery” was not overstimulating but that more complex therapy interventions may cause agitation and may not necessarily be effective. This suggests that higher order

activities such as domestic tasks or financial management may not have had the same effect as these typically demand a higher level of cognitive skill.

5.5.3. Reorientation

Reorientation was the second most common intervention used by occupational therapists in the treatment of PTA (66%) in this study. McNett et al. (2012) found that reorientation, amongst other treatments, such as physical restraints, redirection, environmental modifications and constant supervision, were inappropriate in the treatment of PTA as these interventions contributed to increased levels of agitation amongst patients. The adverse effects of agitation include prolonged hospital stay and poorer functional outcomes (McNett et al., 2012). This sentiment is echoed by INCOG guidelines which do not list reorientation as a recommended treatment for PTA (Ponsford et al., 2014). This is likely attributed the common feature of PTA, anterograde amnesia, in which patients are unable to lay down new memories, thus affecting their ability to recall orientation items (Sherer et al., 2005).

5.5.4. Cognitive skills retraining

The last, yet possibly the most significant intervention reported by occupational therapists in the treatment of PTA, was cognitive skills retraining. A large portion of participants reported using cognitive skills retraining as a method of intervention with patients in PTA (60%). This is a significant finding given that the use of cognitive skills retraining is not appropriate until a client has emerged from PTA. Prior to the series of studies published by Trevena-Peters et al. (2018a, 2018b, 2019) it was common practice to withhold all forms of therapy from patients until emergence from PTA to avoid overstimulation and increased levels of agitation (McNett et al., 2012; Ponsford et al., 2014). Trevena-Peters et al. (2018), however, found that structured and procedural ADL retraining was effective in the treatment of PTA to reduce agitation and provide meaning to patients' lives. Furthermore, they found that it was possible to facilitate procedural learning in this phase of recovery through patients' implicit learning system. Activities of daily living retraining is a specific form of intervention aimed at assisting the patient to engage in ADLs following TBI (Trevena-Peters, McKay & Ponsford, 2019) and not to improve cognitive skills such as attention,

processing speed, social cognition and executive function which are common cognitive impairments associated with TBI (Ponsford, Sloane & Snow, 2012). The studies published by Trevena-Peters et al. between 2018 and 2019 at no point refer to neurocognitive rehabilitation or cognitive skills retraining as an intervention tool during PTA and the study focused solely on the use of ADL retraining. In fact, given that PTA is classified as a transient cognitive deficit (Symonds & Ritchie Russell, 1943) we need to consider whether it is even possible to gain an accurate picture of an individual's cognitive functioning on which to base interventions while they are still in a state of PTA. This is supported by INCOG guidelines which recommend that only after a patient has emerged from PTA should a formal assessment of cognition be performed followed by the implementation of neurocognitive rehabilitation strategies (Ponsford et al., 2014). Based on this, we should question why 60% of participants reported the use of cognitive skills retraining as a method of intervention with patients in PTA. A limitation of the study is that participants were not asked to provide information on other assessments used with patients with acute TBI, such a cognitive assessment tools. Given the number of participants who utilize cognitive skills retraining, it is expected that this form of intervention would be based on findings from a formal cognitive assessment tool. An example of this is the Montreal Cognitive Assessment (MoCA) which is a common cognitive screening tool used by occupational therapists. This may suggest that occupational therapists are assessing for cognitive deficits prematurely in patients with acute TBI who have not yet emerged from PTA. These patients will present with extreme cognitive and behavioural deficits which cannot yet be classified as residual impairments following the injury but instead are simply symptoms of PTA (McNett et al., 2012). Premature assessment of cognitive function in PTA will, thus, not only yield unreliable assessment findings but will result in inappropriate treatment planning, resource allocation, discharge planning and intervention selection.

Trevena-Peters et al., (2018) suggests that tasks which have increased cognitive demands have the potential to increase agitation but this was not a finding of the study. Despite this, it is important to consider the potential impact that this form of intervention may have on individuals in PTA: previous literature has already indicated that agitation

amongst individuals in PTA can have damaging consequences such as extended length of stay and reduced functional outcomes (McNett et al., 2012). Therefore we need to consider that although the use of cognitive skills retraining has not been found to be ineffective in the treatment of PTA, it has not been found to be effective either. One must also consider whether conducting a study investigating the potential impact of cognitive skills retraining on individuals in PTA is ethical given the potentially harmful effects which may ensue. Experts in this field of study have provided anecdotal evidence to support this notion (McNett et al., 2012; Ponsford et al., 2014; Trevena-Peters et al., 2018b).

5.6. Conclusion

This study set out to establish what understanding of PTA exists amongst South African occupational therapists. This question is multifaceted as it refers to not only the understanding of the condition from a medical perspective, but also an understanding of its significance in TBI rehabilitation. A conclusion can be reached by exploring the various elements reflective of this understanding. This includes occupational therapists' knowledge of the condition and its associated symptoms, as well as knowledge of assessment, the impact of PTA on treatment planning and the selection of appropriate interventions for use with patients in PTA.

The findings of this study show that participants do not have a sound understanding of the nature of PTA. Furthermore, they do not conduct regular assessment of PTA at the time of initial consultation (43%) or thereafter (36%). Fifty-eight percent of participants do not utilize a validated tool to assess for PTA despite recommendations from literature and TBI guidelines. This suggests that they do not perceive value in assessing for the condition despite it being the most significant prognostic indicator of injury severity (Brown et al., 2010; Ponsford et al., 2016; Tate et al., 2005), cognitive recovery (de Guise, LeBlanc, et al., 2005; Draper & Ponsford, 2008) and long term functional outcomes (van der Naalt et al., 1999; Draper, Ponsford & Schönberger, 2007; Sigurdardottir et al., 2009; Dahdah et al., 2016).

It appears that participants' limited understanding of the nature of PTA, compounded by a lack of regular and appropriate assessment, may lead to inappropriate intervention selection for patients in PTA. The use of reorientation and cognitive skills retraining are both discouraged by literature and TBI guidelines (Bayley et al., 2014; McNett et al., 2012; Trevena-Peters et al., 2018b). Despite this, they were both reported as common means of intervention for patients in PTA amongst participants.

6. CHAPTER 6: CONCLUSION

This chapter will provide a summary of the main research findings and establish whether the research question can be answered based on said findings. It will then discuss the limitations of the study before finally providing recommendations for future occupational therapy practice and research.

6.1. Summary of main research findings

This study utilized a quantitative cross-sectional approach to answer the following research question: what knowledge of post traumatic amnesia exists amongst occupational therapists working with traumatic brain injury in South Africa?
To the researcher's knowledge, this is the first South African study to explore PTA as a whole, but also specifically in relation to the occupational therapy profession. Consequently, this study hopes to open a door to research opportunities for not only occupational therapists but for the multitude of healthcare professions working with TBI in South Africa.

The main finding of this study is that there appears to be an extremely limited understanding of PTA amongst South African occupational therapists. This includes understanding of the condition's transient nature and characteristic features, the appropriate assessment tools and assessment protocol, as well as its significance in TBI prognostication and occupational therapy treatment planning. A large portion of participants (58%) appear to be familiar with PTA as a condition, that being they know that it exists and have heard about it. This, however, appears to be the sole extent of participants' understanding of PTA. Given that TBI is a major contributor to the burden of disease globally, and particularly to countries of the Global South (Naidoo, 2013; Webster, Taylor & Balchin, 2015; Jerome et al., 2017) it is imperative to equip occupational therapists with the skills and knowledge to manage patients in PTA.

It was found that 36% of participating occupational therapists do not regularly assess for PTA in patients with acute TBI. Those who do assess for the condition (19%) do so predominantly by means of clinical observation and report that they find this the

most effective tool for assessment. The use of clinical observation to assess for PTA is not featured in any piece of literature reviewed during this study, nor is it regarded as a reputable assessment tool. INCOG guidelines clearly stipulate the use of a validated tool to assess for PTA, preferably the GOAT, Westmead PTA Scale, O-Log or similar (Ponsford et al., 2014). Furthermore, they recommend that an assessment of PTA be carried out to daily to track progression and identify emergence from PTA, at which point patients can be formally assessed for cognitive impairments (Bayley et al., 2014). From this it appears that these occupational therapists lack an understanding of the assessment of PTA as well as the significance of these findings to treatment planning.

The most common interventions used by occupational therapists in this study in the treatment of PTA include family or caregiver education, occupational performance intervention, reorientation and cognitive skills retraining. By not conducting an assessment of PTA, these occupational therapists are ignoring a simple yet informative tool to guide family counselling and discharge planning (Novack et al., 2001; Tate et al., 2005). This is an area that has already been criticised in other South African studies where families felt unprepared for the chronic cognitive and behavioural impairments associated with TBI (Webster, Taylor & Balchin, 2015). Although the use of occupational performance interventions in the treatment of PTA is supported by literature (Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019) we can hypothesize that South African occupational therapists' use of this intervention does not reflect an appreciation of its use in the treatment of PTA. This is based on other findings of this study which suggest an overall lack of understanding of the condition. On the contrary, we can hypothesize that their use of this intervention is based on the fact that functional rehabilitation is the bread and butter of the occupational therapy profession and would, naturally, form part of the rehabilitation process for any and all conditions, not PTA specifically (American Occupational Therapy Association, 2020).

The use of reorientation and cognitive skills retraining were other common interventions used by occupational therapists in this study. They are both discouraged

by literature and TBI guidelines in the treatment of PTA (Bayley et al., 2014; McNett et al., 2012; Trevena-Peters et al., 2018b). Reorientation is ineffective given the characteristic feature of anterograde amnesia and patients' inability to new retain information (Sherer et al., 2005). It could be hypothesized that the continued use of this intervention with a patient in PTA may have the potential to increase levels of agitation as the patient becomes frustrated by their inability to correctly recall orientation items. Furthermore, the use of cognitive skills retraining in the treatment of PTA suggests that occupational therapists in this study may not understand the transient nature of PTA or that permanent deficits can only be ascertained once cognitive and behavioural functions stabilize following emergence from PTA (Levin, O'Donnell & Grossman, 1979). This finding implies that participating occupational therapists are potentially assessing for and treating cognitive dysfunction prematurely in patients with acute TBI. This not only results in inaccurate assessment findings and subsequent treatment planning, but this also has the potential to prolong the duration of PTA, thus, worsening patients' functional prognoses (McNett et al., 2012; Trevena-Peters et al., 2018a).

It is important for us to appreciate that TBI does not occur in a vacuum and its effects are not limited to the individual: the burden placed on families, communities and the economy to support and care for TBI survivors is enormous. Occupational therapists have been identified as critical role players in TBI rehabilitation and we have the potential to lessen this burden through the use of early, appropriately-selected interventions for patients in PTA (Trevena-Peters et al., 2018; Trevena-Peters, Ponsford & McKay, 2018; Trevena-Peters, McKay & Ponsford, 2019). But this can only be achieved by addressing the findings of this study through education, supervision and training of all occupational therapists, both novice and experienced.

6.2. Limitations of this study

The use of close-ended questions in the study questionnaire limited participants' freedom to explain and justify their understanding of PTA. That being said, the purpose of this study was to establish whether occupational therapists understand PTA, not to dissect the factors contributing to or hindering this understanding. Therefore, the use

of close ended questions gave the researcher the opportunity to objectively compare occupational therapists' answers to trends in the literature which is an appropriate starting point given that this is a new area of research for South African healthcare. It would be beneficial for future studies to explore and expand on the findings of this study through the use of a qualitative research design.

Some questions in the study questionnaire could have been expanded on, such as exploring the use of general assessment tools in acute TBI, differentiating between various activities of daily living (e.g. personal care, meal preparation, domestic chores, financial management etc.) and dissecting the treatment approaches (e.g. errorless learning, memory strategies etc.) used by occupational therapists. A question on interventions used by occupational therapists who were knowledgeable of PTA would have been an advantage. This would have provided more insight into occupational therapists' understanding of assessment and treatment of PTA.

This study only represents a portion of South African occupational therapists and, thus, these findings cannot be generalised to the entire South African occupational therapy profession.

6.3. Recommendations for future practices and research directions

The following recommendations are made to inform future research practices and occupational therapy clinicians working with TBI:

6.3.1. Profession

- Occupational therapists working with TBI should partake in regular journal clubs to evaluate the most recent research to ensure that practice is evidence-based.
- Occupational therapists should advocate for our unique role in the treatment of TBI and educate the multidisciplinary team on the specific contribution our profession makes in the early stages of rehabilitation, particularly in the context of PTA.
- Novice occupational therapists should be offered regular supervision and mentorship from senior therapists in both the public and private sectors. Due to

staff shortages in the government sector, this could be offered in the form of monthly group supervision with senior therapists from large provincial hospitals to support community service and production level occupational therapists at smaller district hospitals or clinics. The use of online meeting platforms, such as Microsoft Teams and Zoom, have become increasingly popular since the covid-19 pandemic and would be a useful tool in facilitating these supervision sessions.

- Occupational therapists should conduct a daily assessment of PTA using a validated tool when working with patients with acute TBI. These findings should be shared with the multidisciplinary team to inform prognoses, joint goal-setting, family education and discharge planning.
- Occupational therapists should avoid the use of reorientation with patients in PTA to avoid increasing levels of agitation.
- Occupational therapists are encouraged to implement a light and habituated ADL routine with patients who are in PTA. This includes the use of personal care, grooming and basic meal prep, as appropriate. This should be delivered using a procedural and errorless learning approach. Patients should be monitored for signs of increased agitation during treatments and interventions should be adapted accordingly.
- Occupational therapists should only complete a cognitive assessment with patients who have emerged from PTA. It is only at this point that they will be able to identify residual cognitive deficits caused by the TBI. Furthermore, cognitive retraining should only be implemented with patients who have emerged from PTA and should be based on the findings of a formal cognitive assessment.

6.3.2. Education

- Given the epidemiology of TBI in South Africa it would be beneficial for undergraduate university curriculum to have a module on TBI rehabilitation given the likelihood that novice therapists will encounter patients with this type of injury in their community service year and may not have the supervision from senior therapists to guide their practice.

- Training courses on the significance of PTA to TBI rehabilitation should be provided to all healthcare professionals who work with this group of patients. Occupational therapists should be offered in-depth training on the nature of PTA, how to assess the condition and appropriate treatment interventions.

6.3.3. Research

- To the researcher's knowledge, this study is the first of its kind in South Africa and has evaluated occupational therapists' knowledge of PTA. Given TBI rehabilitation requires multidisciplinary intervention it would be beneficial to repeat this study with nurses, physicians in the fields of neurosurgery, neurology and trauma, psychologists, speech therapists and physiotherapists.
- "TBI surveillance" (Naidoo, 2013) should be implemented to track epidemiology statistics which are used to inform decisions on staffing, resource allocation, access to rehabilitation services and community reintegration efforts to assist TBI survivors.
- A qualitative study on occupational therapists' understanding of PTA would help to expand on the findings, may improve quality of the study and aid understanding of the of the results.
- Further studies should investigate where this gap in knowledge amongst South African occupational therapists originated from to ensure corrective action takes place. This may be due to insufficient undergraduate and postgraduate training, lack of evidence-based practice or insufficient supervision for both junior and senior therapists.
- Studies on the use of ADL retraining during PTA were conducted in Australia. It would be beneficial to repeat this study in countries of the Global South and compare the use of this intervention method with our population.
- Further research should be conducted on whether undergraduate university curriculum is aligned with the commonly encountered conditions amongst community service occupational therapists.

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Appendix A: Survey Questionnaire

Part 1: Demographic information

1. Are you a qualified occupational therapist, registered with the HPCSA (either in community service or as independent practitioners)?
    - Yes
    - No
2. Do you currently practice in a clinical healthcare setting (part-time or full time)in South Africa?
    - Yes
    - No
3. What is the predominant age group of clients that you treat?
    - Adult (physical or psychiatry)
    - Paediatrics (physical or psychiatry)
    - Other
4. What is your highest occupational therapy qualification?
    - Undergraduate Degree
    - Post graduate Diploma
    - Masters
    - PhD
5. Have you completed any certified courses? For example, neurodevelopmental therapy (NDT)
    - Yes
    - No
6. If you answered yes to the previous question, please provide detail.
7. How many years of experience post undergraduate qualification as an occupational therapist do you have (including community service)?
    - 0 – 2 years
    - 3 – 5 years
    - 6 – 8 years
    - 9-11 years
    - 12 – 14 years
    - 15 or more years
8. Are you employed in the public or private sector?
    - Public

- Private
- Both public and private
- Other (please explain)

9. In which type of setting do you work? (select those that apply)
    - Acute in-patient unit
    - Sub-acute/step down facility/in-patient rehabilitation facility
    - Out-patient department
    - Home-based therapy
    - Other (please explain)
10. In which field of practice do you work?
    - Psychiatry
    - Physical rehabilitation (excluding neurorehabilitation)
    - Physical rehabilitation (including neurorehabilitation)
    - Vocational rehabilitation
    - Other (please explain)

Part 2: Post Traumatic Amnesia (PTA)

1. Have you ever heard of post traumatic amnesia (PTA) following TBI?
    - Yes
    - No
2. If you answered "Yes" to the above question, please indicate where you first learnt about PTA. If you answered "No", please select "Not applicable"
    - During undergraduate studies completed in South Africa
    - During undergraduate studies completed abroad
    - During post graduate studies completed in South Africa
    - During post graduate studies completed abroad
    - While working in South Africa
    - While working abroad
    - Journal articles/textbooks/other forms of literature
    - Training course
    - Other (please explain)
    - Not applicable
3. Do you know PTA as any of the following terms? (select those that apply)

- Post traumatic delirium
- Post traumatic confusional state (PTCS)
- Post concussion syndrome (PCS)
- None of the above
- Other (please explain)

4. Recovery from TBI occurs during three progressive stages: 1) loss of consciousness (coma), 2) altered consciousness (commonly referred to as post traumatic amnesia [PTA]) and 3) rehabilitation with normal consciousness (during which time physical, cognitive and behavioural functions stabilize, although permanent deficits may persist) (Levin, O'Donnell & Grossman, 1979)

   Do you consider the presence of PTA when selecting interventions for use with individuals with TBI?
   - Yes
   - No
5. PTA is characterized by symptoms such as confusion, disorientation, reduced arousal, anterograde amnesia (inability to form new memories), sleep disturbances, perceptual disturbances, irritability, abscondment, aggression and disinhibition (McNett et al., 2012; Nakase-Thompson et al., 2004). Have you noted that individuals with acute TBI (first 3 months after injury) present with these symptoms?
   - Yes
   - No
6. Do you ever complete a standardized assessment of PTA in your initial assessment of an individual with acute TBI?
   - Yes
   - No
7. After the initial assessment, how regularly do you assess a patient's progression through PTA?
   - Daily
   - Five or six times a week
   - Three or four times a week
   - Once or twice a week
   - Never
8. Which of the following assessments do you use to assess for PTA? Select those that apply
   - Westmead Post Traumatic Amnesia Scale (WPTAS)

- Abbreviated Westmead Post Traumatic Amnesia Scale (A-WPTAS)
- Galveston Orientation and Amnesia Test (GOAT)
- Confusion Assessment Protocol (CAP)
- Clinical observation
- Other (please explain)
- I do not assess for PTA

9. Which of the following assessments do you deem the most effective in assessing PTA? Select one only
    - Westmead Post Traumatic Amnesia Scale (WPTAS)
    - Abbreviated Westmead Post Traumatic Amnesia Scale (A-WPTAS)
    - Galveston Orientation and Amnesia Test (GOAT)
    - Confusion Assessment Protocol (CAP)
    - Clinical observation
    - Other (please explain)
    - I do not assess for PTA
10. What is the typical time frame that you begin intervention with an individual post TBI in your setting?
    - Within the first 1 – 7 days post injury
    - Within 2 – 4 weeks post injury
    - Within 1 – 3 months post injury
    - More than 3 months post injury
11. What is the typical type of treatment that you utilize with individuals with TBI in your setting? Select those that apply.
    - Sensory stimulation/modulation
    - Passive range of motion and positioning
    - Hand function
    - Splinting
    - ADL retraining (personal care, domestic tasks)
    - Cognitive targeted interventions
    - Physical targeted interventions
    - Vocational rehabilitation
    - Social skills retraining
    - Return to driving
    - Family or caregiver education

- Seating
- Home adaptation
- All of the above
- None of the above
- Other (please explain)

If you work in a setting where you treat individuals with acute TBI (i.e. within the first three months post-injury) then please answer the following question. If you do not treat individuals in the acute stage of injury then please select “Not applicable”.

12. Which of the following treatment modalities do you use to treat individuals in PTA?
    - Reorientation
    - Perceive, Recall, Plan and Perform (PRPP) System
    - Cognitive skills re-training
    - Information processing strategies
    - Sensory modulation programmes
    - Occupational performance interventions (e.g. activities of daily living)
    - Environmental adaptation (e.g. reduction in auditory and visual stimuli)
    - Family or caregiver education
    - Other (please explain)
    - I don’t treat PTA
    - Not applicable

Appendix B: Amendments to questionnaire after piloting

Original question	Feedback from pilot study	Updated question published in survey
Part 1: Demographic Information		
	Additional question recommended	Are you a qualified occupational therapist, registered with the HPCSA (either in community service or as independent practitioners)? • Yes • No
	Additional question recommended	Do you currently practice in a clinical healthcare setting (part-time or full time)in South Africa? • Yes • No
	Additional question recommended	What is the predominant age group of clients that you treat? • Adult (physical or psychiatry) • Paediatrics (physical or psychiatry) • Other

What is your highest occupational therapy qualification? • Undergraduate Degree • Post graduate Diploma • Masters • PhD		
	Additional question recommended	Have you completed any certified courses? For example, neurodevelopmental therapy (NDT) • Yes • No If yes, please provide detail
How many years of experience post undergraduate qualification as an occupational therapist do you have (including community service)? • 0 – 2 years • 3 – 5 years • 6 – 10 years • 11 – 15 years • More than 15 years	Adjust distribution of years so as not to skew results	How many years of experience post undergraduate qualification as an occupational therapist do you have (including community service)? • 0 – 2 years • 3 – 5 years • 6 – 8 years • 9-11 years • 12 – 14 years • 15 or more years

Are you employed in the public or private sector? • Public • Private • Both public and private		
In which type of setting do you work? (select those that apply) • Acute in-patient unit • Sub-acute/step down facility • In-patient rehabilitation facility • Out-patient department • Home-based therapy • Other (please explain)	"Rehab" and "step down facility" may be used interchangeably. It is better to differentiate between the two or combine into one option	In which type of setting do you work? (select those that apply) • Acute in-patient unit • Sub-acute/step down facility/ In-patient rehabilitation facility • Out-patient department • Home-based therapy • Other (please explain)
In which field of practice do you work? • Psychiatry • Physical rehabilitation (excluding neurorehabilitation) • Physical rehabilitation (including neurorehabilitation) • Vocational rehabilitation		
Part 2: Post traumatic amnesia		

Have you ever heard of post traumatic amnesia (PTA) following TBI? • Yes • No		
If you answered "Yes" to the above question, please indicate where you first learnt about PTA. If you answered "No", please select "Not applicable" • During undergraduate studies completed in South Africa • During undergraduate studies completed abroad • During post graduate studies completed in South Africa • During post graduate studies completed abroad • While working in South Africa • While working abroad • Journal articles/textbooks/other forms of literature • Training course • Other (please explain) • Not applicable		

Do you know PTA as any of the following terms? (select those that apply) • Post traumatic delirium • Post traumatic confusional state (PTCS) • Post concussion syndrome (PCS) • None of the above • Other (please explain)		
Do you consider the presence of PTA when selecting interventions for use with individuals with TBI? • Yes • No		
PTA is characterized by symptoms such as confusion, disorientation, reduced arousal, anterograde amnesia (inability to form new memories), sleep disturbances, perceptual disturbances, irritability, abscondment, aggression and disinhibition (McNett et al., 2012; Nakase-Thompson et al., 2004). Have you noted that individuals with acute TBI		

(first 3 months after injury) present with these symptoms • Yes • No		
Do you ever complete a standardized assessment of PTA in your initial assessment of an individual with acute TBI? • Never • Sometimes • Regularly		
Which of the following assessments do you use to assess for PTA? Select those that apply • Westmead Post Traumatic Amnesia Scale (WPTAS) • Galveston Orientation and Amnesia Test (GOAT) • Confusion Assessment Protocol (CAP) • Clinical observation • Other (please explain)	Add the A-WPTAS	Which of the following assessments do you use to assess for PTA? Select those that apply • Westmead Post Traumatic Amnesia Scale (WPTAS) • Abbreviated-Westmead Post Traumatic Amnesia Scale (WPTAS) • • Galveston Orientation and Amnesia Test (GOAT)

		• Confusion Assessment Protocol (CAP) • Clinical observation • Other (please explain)
	Additional question recommended	Which of the following assessments do you deem the most effective in assessing PTA? Select one only • Westmead Post Traumatic Amnesia Scale (WPTAS) • Abbreviated Westmead Post Traumatic Amnesia Scale (A-WPTAS) • Galveston Orientation and Amnesia Test (GOAT) • Confusion Assessment Protocol (CAP) • Clinical observation • Other (please explain) • I do not assess for PTA
What is the typical time frame that you begin intervention		

with an individual post TBI in your setting? • Within the first 1 – 7 days post injury • Within 2 – 4 weeks post injury • Within 1 – 3 months post injury • More than 3 months post injury		
What is the typical treatment that you utilize with individuals with TBI in your setting? Select those than apply • Sensory stimulation/modulation • Passive range of motion and positioning • Hand function • Splinting • ADL retraining (personal care, domestic tasks) • Cognitive targeted interventions • Physical targeted interventions • Vocational rehabilitation • Social skills retraining • Return to driving • All of the above	Add "family or care giver education" and "seating" as options	What is the typical treatment that you utilize with individuals with TBI in your setting? Select those than apply • Sensory stimulation/modulation • Passive range of motion and positioning • Hand function • Splinting • ADL retraining (personal care, domestic tasks) • Cognitive targeted interventions • Physical targeted interventions • Vocational rehabilitation • Social skills retraining

• None of the above • Other (please explain)		• Return to driving • Family or caregiver education • Seating • Home adaptation • All of the above • None of the above • Other (please explain)
	Additional question recommended	If you work in a setting where you treat individuals with acute TBI (i.e. within the first three months post-injury) then please answer the following question. If you do not treat individuals in the acute stage of injury then please select “Not applicable”. Which of the following treatment modalities do you use to treat individuals in PTA? • Reorientation • Perceive, Recall, Plan and Perform (PRPP) System • Cognitive skills re-training

		• Information processing strategies • Sensory modulation programmes • Occupational performance interventions (e.g. activities of daily living) • Environmental adaptation (e.g. reduction in auditory and visual stimuli) • Family or caregiver education • Other (please explain) • I don't treat PTA • Not applicable

Appendix C: Invitation to participate

Study title: South African Occupational Therapists' Understanding of Post Traumatic Amnesia Following Traumatic Brain Injury

Dear Occupational Therapist,

My name in Paige Pollard, a Masters student at Wits University. I am investigating South African Occupational Therapists' Understanding of Post Traumatic Amnesia (PTA) Following Traumatic Brain Injury (TBI).
If you are registered with the HPCSA, practicing in a South African healthcare setting and you work in a setting with traumatic brain injuries (adult physical or psychiatry), I would like to invite you to participate in this study (Clearance certificate no. M210971)
Please follow this link to complete the survey: https://redcap.core.wits.ac.za/redcap/surveys/?s=P8T88T8KAC4PT7EJ

Participation in the survey is entirely voluntary and by completing the survey you give your consent to participate in the study. You may withdraw from the study at any point prior to submission.

The survey will take a maximum of 10 minutes to complete.
Your participation would be greatly appreciated.

Kind regards,
Paige Pollard
1036225@students.wits.ac.za

Appendix D: Information sheet

Study title: South African Occupational Therapists' Understanding of Post Traumatic Amnesia Following Traumatic Brain Injury

Dear Occupational Therapist

My name is Paige Pollard, a Masters students at Wits University and I am conducting a study on South African Occupational Therapists' Understanding of Post Traumatic Amnesia (PTA) following Traumatic Brain Injury. To the researcher's knowledge, this is the first study conducted on PTA in South Africa, thus, it hopes to highlight a gap in our knowledge as healthcare professionals but, more specifically, occupational therapists who play an invaluable role in the rehabilitation of individuals who have suffered TBI.
The purpose of the study is to establish what occupational therapists know about PTA, at what point following TBI do you begin intervention in your setting and what typical interventions do you utilize with individuals who have sustained TBI. This is a quantitative study which will take place in form of a descriptive survey.

If you are an occupational therapist registered with the HPCSA, practice in a South African healthcare setting and treat predominantly adult client groups (physical or psychiatry), I would like to invite you to complete the survey. Community Service occupational therapists are also invited to participate.

The survey consists of two parts: Part One will collect demographic information while Part Two will relate specifically to PTA. The survey should take no more than 10 minutes to complete.

There are no risks associated with this study, however, participants will require an internet connection or data to complete, therefore, the participant may incur a cost to participate. Please note that participants will not be reimbursed for these potential costs.

Although there are no direct benefits of participating in this study, this is a new area of research in South Africa and it is hoped that this study will initiate the process of further research in this area while identifying a gap in our profession's knowledge which can be addressed through training and education.
Please note that by submitting your completed survey you are voluntarily agreeing to participate in this research study. No personal information will be requested during the course of this study, thus, confidentiality will be maintained at all times. Refusal to

participate will involve no penalty and you are able to withdraw from the study at any point
Thank you once again for your participation.

Contact details of the researcher:
Paige Pollard – 1036225@students.wits.ac.za

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee") (Clearance certificate no. M210971). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.

If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

Appendix E: Ethical clearance

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Miss Paige Pollard

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M210971

NAME: (Principal Investigator)	Miss Paige Pollard
DEPARTMENT:	Therapeutic Sciences
PROJECT TITLE:	South African Occupational Therapists' Understanding of Post Traumatic Amnesia Following Traumatic Brain Injury
DATE CONSIDERED:	01/10/2021
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Miss Faye Sinnett
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	27/10/2021

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the Third Floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions.Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report.** The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in **September** and will therefore be due in the month of **September** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature _____ Date _____

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix F: Turn it in report

ORIGINALITY REPORT

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3	Yalian Pei, Katy H. O'Brien. "Reading Abilities Post Traumatic Brain Injury in Adolescents and Adults: A Systematic Review and Meta-Analysis", American Journal of Speech-Language Pathology, 2021 Publication	<1%
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