(Mild) Traumatic Brain Injury in the British Military: 
Exploring How the Injury is Perceived across Social Groups

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Thesis submitted for the degree of Doctor of Philosophy

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February 2015
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Abstract

The thesis aimed to explore how various social groups perceived mild traumatic brain injury (mTBI) in the British military. A literature review on brain provided insights on what constituted mTBI and the key issues arising from mTBI. Social representations theory was the overarching framework of inquiry. The thesis consists of four empirical studies. Three types of data - an official report on mTBI in the British military, a sample of the British public’s perception of the injury and a former British service personnel’s experience of the injury were subjected to analysis. A pluralistic approach was employed. The first type of data was subjected to two different types of analysis: a preliminary investigation and a deconstruction. In the first study discourse analysis was employed. Authors of the project report constructed mTBI as a phenomenon with a fair amount of uncertainty. Care plans for those with mTBI were constructed as already in place and of superior standards to their American counterpart. In the second study the researcher employed critical discourse analysis to deconstruct how the report’s authors framed the uncertain aspects of the injury in the first study to work up certainty about the controversial aspects of mTBI by discrediting the labelling of mTBI and marginalizing those presenting persistent symptoms. In the third study thematic analysis was employed. The general public constructed mTBI as having varied causes with a spectrum of symptoms and consequences besides being an occupational hazard the government should deal with. In the fourth study interpretative phenomenological analysis was employed. The former serviceman felt divorced from the military post injury. Despite not having his difficulties acknowledged by the military, he coped with the changes brought on by the injury positively framing his experiences. Throughout the empirical studies mTBI was represented as an uncertain phenomenon with many facets.
In loving memory of my late maternal grandfather, V. S. Pitchayan
who gave me the strength to embark on this journey
Acknowledgements

I would like to thank the following individuals/ people without whom this journey would not have been possible:

My mother, whose experience with mild traumatic brain injury was the inspiration for my interest in the area and my father for cultivating my interest in politics and current affairs and in doing so providing the scope for my venturing into exploring the injury in the military,

My supervisors Dora and Adrian who provided encouragement and constructive criticisms in this arduous journey and who were patient while I embarked on a journey of discovery encompassing philosophers, traditions, theories and methods. It was a tedious uphill task which sometimes overwhelmed. I am thankful for your calming presence on this journey as well as the coffee sessions,

Julia for being there: caring and watching over me,

Jay & Vera I am thankful for our coffee sessions and your friendship,

Georgia for being there at every stage of this journey and to whom I am thankful for all the conversations we have shared. I am grateful we were in the same office,

Artemis for all the coffee, gym, lunch, dinner, marathon phone sessions and times at the theatre. They helped recharge my social batteries,

Myrto for being there, providing a listening ear and for understanding whenever I disappeared,

My brother and sister in law for assisting me in the converting of the thesis chapters from word to pdf,
Nor, Teo Bees, Wendy, Jusnani, Iris, Ruth & all my former colleagues from my time at the Singapore Boys’ Home for taking the time to meet with me every time I went back to Singapore for a break. The coffee, steamboat, dim sum, hotpot, movie, bowling, swimming and karaoke sessions energized me and gave me my much needed social fix before my return to days of reading and writing,

Ilia, Abeer, Moira, Chryso & Fatima I am grateful we were in the same office. With fellow sufferers the journey was not a lonely one,

Zoe for sending invites to coffee sessions. Coffee has become my number one beverage on this journey. Ironically it was not used as a prop for all nighters but for socials,

Sivanes for being my temple buddy and for understanding my craving for anything South - East Asian. Lucky for me your office was just next door to mine. I was in it almost every other day, becoming an unofficial member of your office,

Bridget for all the conversations we have shared and for handing out flyers advertising my third study wherever you went,

Mazlina for being a calming influence whose advice and sharing of your experience while writing up boosted my confidence when I was writing up,

Siewli, Dawn, John, Hillary, Kelly and all those lovely people involved in the Publication Boot camp helmed by the Researchers’ Development Programme. I am thankful for the drill sessions and the invaluable input by the team.

The Ministry of Defence for publishing the Final Project Team Report on Mild Traumatic Brain Injury online. This gave me access to a data set for the first two empirical chapters,

Local town councils, community centres and public libraries across the United Kingdom who placed recruitment advertisements for the third study on their online
portals, social networking site accounts (such as Twitter and Facebook), staff forums and newsletters. I am grateful for your quick feedback when the study’s website was down which enabled me to address the issues related to the website’s downtime. All the local branches of Headway who helped me by identifying participants for my last study during the recruitment process as well as providing me access to your support groups.

Veterans UK and AARSE (The Army Rumour Service) for allowing me to place recruitment advertisements for the last study on your websites.

Sharon Patmore at The Royal British Legion Industries (RBLI), for identifying potential participants for the last study.

Kit Malia and his team at Headley Court Military Hospital who identified and contacted former service personnel with mild traumatic brain injuries for the last study.

Last but not least, a big thank you to all the participants who took part in the last two studies. Without your participation, this thesis would not have been possible. Thank you for your time and feedback.
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Chapter 1. Introduction and Overview

1.1. Perceptions and social representations theory

Throughout history how mankind perceives their surroundings has been explored. Beginning with the early records of civilization right up to the current discussions on combating global terrorism, our understanding of issues has been based on the facts presented to us and our experience of these facts (Wartofsky, 1979). Our perception of a topic or issue serves as an indicator or stand on the topic/issue. However, our perception is formed through a series of processes: social interactions, our own experience, taking a stand and changing that stand in the face of new information. Without these processes we are unable to derive at conclusions on our stand on an issue. Our social interaction with others is the epicentre which informs our understanding (Conrad & Barker, 2010; Gergen & Gergen, 1991). Besides one’s own individual account or experience of an issue, people tend to include others’ perspectives before making their own decisions on an issue. For a perception to take shape further one needs to go beyond how issues are constructed, looking at both sides of an issue and how one side carries more weight with those discussing the issue (van Dijk, 1998). During the forming of perceptions and even after, when faced with new information people tend to engage in reevaluating their existing thoughts and understandings of an issue (Callinicos, 2008). Old and new information are processed based on the person’s own experiences and actions towards an issue.

In the thesis, social representations theory is considered as a way to explore perceptions on a phenomenon. Social representations theory looks at how a person makes sense of a phenomenon (Moscovici, 1984). The phenomenon being explored here is mild traumatic brain injury amongst British service personnel. The researcher attempts to explore how social groups perceive mild traumatic brain injury (mTBI) in the British military on various levels: official texts, public perceptions and a former service personnel’s own experience with mTBI. To achieve this purpose, the researcher embraces social representations theory as the overarching framework of the thesis to examine how various social groups perceive mTBI. Social representations theory explores how individuals/ groups react to events or situations
and their responses to external information on the events (Moscovici, 1984). In social representations theory an unfamiliar concept is represented in such a way as to render it familiar to the person reading or hearing about it (Moscovici, 1984; 2000). How this is done is through the attaching of labels, placing the phenomenon in distinct categories and through language use. For example, when rendering a phenomenon familiar, labels are attached to the phenomenon. These labels are either negative or positive and they serve to either render the phenomenon familiar or unfamiliar, depending on the nature of the phenomenon. In addition to this, the features that distinguish the phenomenon as well as those that are familiar to other phenomena are emphasized so as to position the phenomenon as either a cause for concern or a situation under control (Moscovici, 1984; 2000). Besides the features, the language associated with the phenomenon in question, mild traumatic brain injury in this case, is made familiar by removing the medical jargon and replacing it with familiar terms the layperson comprehends. As a first step to exploring representations of traumatic brain injury, more specifically mild traumatic brain injury, the next section offers some facts and figures as well as a brief look at definitions of mild traumatic brain injury in the civilian and military populations. Representations of mTBI typically contain quantification rhetoric stating the number of incidences of people sustaining the injury and the next section explores this briefly.


Mild traumatic brain injury (mTBI) comes under the wider umbrella of brain injury and is occasionally referred to as brain injury, traumatic brain injury, open head injury, closed head injury and head injury (Haydel, Preston, Mills, Luber, Blaudeau, & DeBlieux, 2000; Green, Rohling, Lees – Haley & Allen III, 2001; Morton & Wehman, 1995; Schretlen & Shapiro, 2003; Warden, 2006; William, Levins & Eisenberg, 1990). Amongst the civilian population about 1.7 million people in the United States suffer from TBI every year with more than three quarters of them being diagnosed with mTBI (Bazarian et al. 2005). In the United Kingdom, about 213000 people were admitted to the hospital with TBI between 2011 and 2012 (Headway: The Brain Injury Association, 2012). In the military context, researchers
approximate that more than 300,000 service personnel in the United States have sustained mTBI during tours of duty in Iraq and Afghanistan (Hoge, Goldberg & Castro, 2009). In the United Kingdom, there are no official reports on the number of British service personnel who sustained incidents of mTBI during tours of duty in Iraq and Afghanistan (Fear et al. 2009).

Given that the British and American military were in the same war, the lack of official numbers of British service personnel sustaining mTBI leads the researcher to ponder over what is known of mTBI, its symptoms and effects in the British military. The researcher seeks answers to these questions by looking at existing documentation on mild traumatic brain injury amongst British service personnel to determine how the injury is perceived in official circles. The researcher also explores how members of the public and British service personnel with the injury perceive the injury and the war that served as a catalyst for these injuries: the war on terror.

In conclusion, the number of British service personnel who sustained mTBI while on war on terror operations in Iraq and/or Afghanistan is unknown. This raises questions as to the nature of mTBI, its impact, health care provision for veterans and the war on terror. The next section provides an overview of the research to be discussed in subsequent chapters of the thesis.

1.3. Overview of the Research

The large number of people sustaining the injury in the American military context raises questions as to the incidence of these injuries in the British military, the nature of mTBI, its effects, the long term consequences (if any) of this injury and what is being done in terms of healthcare provision for veterans who sustained mTBI. The researcher ponders the official stance on mild traumatic brain injury and what members of the public and British service personnel (with the injury) make of the injury, veteran health care provision and the war on terror.

The first two empirical chapters in the thesis focus on these questions looking at how project team members commissioned by the Surgeon- General of the United
Kingdom’s Ministry of Defences’ Defence Medical Service’s construct mTBI. Besides the official stance on the injury in the British military context, the third and fourth empirical chapters in the thesis explores how some members of the public and service personnel (in this case a former serviceman since there were difficulties encountered in recruiting active service personnel) with the injury perceive mild traumatic brain injury in the British military. The perceptions of each social group represent how people within these groups make sense of and understand mild traumatic brain injury in the British military. However the views expressed by the participants cannot be taken as the only opinions by people in these social groups. The researcher recognises that other members of these groups who have yet to be interviewed may provide different perceptions. In each empirical chapter of the thesis, different perceptions of mild traumatic brain injury are constructed by the members of the groups and these views are either negated or embraced to varying degrees by other members of the same group/other groups. References are made to the impact of the injury and what it represents (personal, social, health and financial cost to the nation). Each group’s individual or group perception of the injury sheds light as to how the injury is perceived. This is important as it puts forth representations of the official view on the phenomenon, how members of the public and a former serviceman with the injury perceive the injury as well as suggestions they may have that could possibly inform and shape future policies on veteran healthcare or at least provide direction for future research to undertake an in depth exploration on veteran healthcare for service personnel (past and present) with mTBI.

In summary, the subsequent empirical chapters in the thesis explore what mild traumatic brain injury is and how it is perceived across various social groups. The diverse constructions of perceptions of mild traumatic brain injury within and between each group provide a patchwork of representations depicting how mild traumatic brain injury amongst British service personnel is perceived.

The next chapter in the thesis (chapter 2) is a review of the literature on traumatic brain injury. The review explores confounding terms in defining traumatic brain injury, categorizes the different types of traumatic brain injury and reviews
different aspects of brain injury while narrowing its focus to mild traumatic brain injury in the military - the focal point of the thesis. The review ends with a presentation of research questions informed by the literature on brain injury.

The thesis’ third chapter is the first of four empirical chapters. It explores how project team members commissioned by the United Kingdom’s Ministry of Defence’s Defence Medical Services’ Surgeon – General construct mild traumatic brain injury amongst British service personnel. While this chapter explores what discourse are invoked in the constructions the subsequent fourth chapter on the same data set offers a critical discourse analysis of the documents, looking at what the project team members legitimate (what they lend credence to) and marginalize (what they sideline).

The fifth chapter offers perceptions of the injury by some members of the public who had participated in the study. It explores the extent of their knowledge of the injury amongst British service personnel and their views on firstly, the provision of healthcare to veterans of the war on terror and secondly, on Britain’s involvement in the war on terror.

The last empirical chapter in the thesis, chapter six, explores the experience of a former serviceman with mild traumatic brain injury. It looks at what the injury means to him and how the injury impacted (if at all) his decision to leave the military.

Finally, chapter seven offers a discussion of the empirical chapters in the thesis, a final reflection on the thesis and suggestion of directions for future research.
Chapter 2. A Review of the Literature on Traumatic Brain Injury

2.1. What is mTBI?

Before embarking on an exploration of how different social groups in the United Kingdom perceive mild traumatic brain injury in the military, the researcher examines what mTBI is beginning with its history, the causes of mTBI and its symptoms. The researcher then discusses the diagnosis and consequences of mTBI before proceeding to discuss the management of mTBI. Next the researcher ponders on the key issues arising from mTBI before focusing on mTBI in the military context. In the later part of the chapter the researcher looks at the theoretical framework and epistemological position of the thesis. The chapter concludes with the research aims for the thesis.

2.1.1. History

Brain injury is not a newcomer to the medical scene. Researchers have been exploring traumatic brain injury (TBI) for more than two decades (Perlesz, Kinsella, & Crowe, 1999; Worthington, Matthews, Melia & Oddy, 2006). There are three types of traumatic brain injury (TBI): mild, moderate and severe (Uomoto & Esselman, 1993). A number of researchers use the terms head injury interchangeably with brain injury (Cassidy et al., 2004; Haydel et al. 2000; William, Levin and Eisenberg’s research, 1990). Levin, Benton and Grossmann (1982) suggest that research on head injury and head trauma go back further than just a few decades. They trace records of knowledge of head injury to ancient times - to the Greek and Egyptian ancient civilizations where head trauma resulting in disability and memory loss was recorded (Levin, Benton & Grossmann, 1982). Other records of closed head injuries and surgical procedures to alleviate the effects of head injuries date back to the thirteenth century (Chua, Ng, Yap & Bok, 2007; Levin, Benton & Grossmann, 1982).

Every year about 1.5 - 1.7 million American civilians sustain TBI which did not require them to be institutionalized (Bazarian eta al., 2005; Sosin, Sniezek
&Thurman, 1996). Of these about 85% are diagnosed as mTBI (Bazarian et al., 2005; Sosin, Sniezek & Thurman, 1996). In the United Kingdom, about 213000 people were admitted to the hospital with TBI between 2011 and 2012 (Headway: The Brain Injury Association, 2012). Teenagers, young adults, mostly males and those with low income who tended to reside by themselves are most at risk of sustaining a brain injury (Carroll et al., 2004c; Langlois, Rutland-Brown & Wald 2006; Sosin, Sniezek & Thurman, 1996). Furthermore, majority of those who sustain mTBI are young adults below twenty-five years of age (Morton & Wehman, 1995). Given the large number of people who sustain mTBI every year, questions arise as to how they sustain the injury.

### 2.1.2. Causes of mTBI

In a civilian context, falls are accountable for most incidents of mTBI and motor accidents and bicycle injuries accounted for most of the remaining incidences of mTBI (Peloso, von Holst & Borg, 2004). In addition to this, mTBI is also caused by sports injuries in high impact sports such as rugby, American football, soccer, ice hockey and boxing (Cassidy et al., 2004). Another cause of MTBI is incidents of assault (Rosenthal & Ricker, 2000). Beginning with what happens as a result of a fall/ sports injury, the researcher explores how falls, motor accidents, high impact sports and assaults can lead to mTBI.

MTBI is caused by head trauma, head injury and concussion (Gerring et al., 1998; Tate, Lulham, Broe, Strettles, & Pfaff, 1989). Most researchers associate head trauma with head injury as head trauma is essentially a blow or external impact to the head (Jennett, 1998). As a consequence of a fall, sports/ motor injury or assault a person sustains an injury to the head (head injury). There are two types of head injury: closed and open head injury (Gerring et al., 1998). Traumatic brain injury (of which mTBI is a part) is an extension of head injury in that trauma to the head causes an injury to the brain which may or may not result in a fracture (Buck et al. 2012; Kraus & McArthur, 2006). Therefore mTBI may be caused by a closed head injury wherein the brain is not penetrated by an external object or by an open head injury.
wherein a foreign object enters the peripheral of the brain (Gerring et al., 1998). Depending on whether the injury is closed or open, the extent of the impact of the injury varies (Kushner, 1998; Tate, Lulham, Broe, Strettles, & Pfaff, 1989; Warden, 2006). Another cause of mTBI is straight blow(s) to the head and/or neck or a blow to another part of the body (which functions may be linked to the head) resulting in a concussion (McCrory et al., 2009). Moreover, concussion is synonymously used in the literature to describe mild traumatic brain injury (mTBI) (Buck, Laster, Sagrati & Kirzner, 2012; Orman, Kraus, Zaloshnja and Miller, 2011).

In conclusion, brain injury more specifically mTBI is caused by a blow to the head resulting in trauma; blow to another part of the body which has functions that are linked to the head (Cassidy et al., 2004). The injury may or may not have penetrated the brain. What happens after sustaining a brain injury is important as it sheds light on the immediate/delayed effect of the injury.

2.1.3. Symptoms of mTBI

The injury causes an altered mental state resulting in the presentation of a number of symptoms (McCrea et al., 2008). The symptoms are: problems with vision (blurring), becoming sensitive to light and/or noise, experiencing headaches, feeling nauseous, vomiting, neck and/or head pain, having issues with balance, feeling dizzy, experiencing fatigue, insomnia, drowsiness, having difficulties with memory and experiencing a reduction in concentration span (McCrea et al., 2008). Those with mTBI tended to suffer from posttraumatic headaches related to post concussion syndrome (PCS) with many of them experiencing a combination of pain problems (e.g. pain in the neck and back together with headaches) (Uomoto & Esselman, 1993). Most people with mTBI do not have visible symptoms (Bay & McLean, 2007). Moreover there is a wide range of symptoms of mTBI and the injury tends to be ‘individualized’ (p. 697, Iverson & Lange, 2011). Furthermore, MTBI has varied recovery rates from speedy recovery to permanent persistent symptoms (Iverson & Lange, 2011). To conclude, having mTBI is perceived as resulting in loss of cognitive abilities (Harrington, Malec, Cicerone & Katz, 1993). Irritability and somatic issues (such as head and neck pain) are perceived to be the next in line in
terms of commonly occurring symptoms in those with mTBI (Harrington et al. 1993). The effects of mTBI last from six months to a year and a half, with a quarter of those with mTBI not recovering completely (Harrington et al. 1993). After exhibiting symptoms, a person typically seeks medical advice to determine what is wrong with them and the next subsection describes how mTBI is diagnosed.

### 2.1.4. Diagnosis of mTBI

A mTBI diagnosis can only come about after taking into account the following three categories: Glasgow Coma Scale (A scale used to measure the state of consciousness a person is in) score, the period of time the person lost consciousness and memory loss right after or before the injury occurred (Buck et al., 2012). Based on the assessment of the three categories, a person is then given a diagnosis regarding the type of TBI (mild, moderate or severe) they have sustained (Uomoto & Esselman, 1993). However, diagnosing mTBI is not straightforward as researchers tend to offer different definitions as to what can be regarded as mTBI (Orman et al., 2011).

There are several definitions of mTBI (Carroll, Cassidy, Holm, Kraus & Coronado, 2004). One definition by the American Congress of Rehabilitation Medicine is that mild traumatic brain injury (mTBI) is caused by an injury to the head and is defined by one or more of the following: loss of consciousness (LOC) for less than half an hour, memory loss within a time frame of less than 24 hours before or after the injury, a changed mental state at the time of injury (appearing disorientated, dazed) and a score of 13 – 15 on the Glasgow Coma Scale (GCS) (Carroll, Cassidy, Holm, et al., 2004; American Congress of Rehabilitation Medicine, Brain Injury-Interdisciplinary Special Interest Group, Disorders of Consciousness Task Force, Seel, R. T., Sherer, M., Whyte, J.,..., & Zasler, N. (2010). Furthermore, the person should not have a penetrating cerebral injury or be under the influence of drugs or alcohol when being assessed (Carroll, Cassidy, Holm, et al., 2004). It also states that a person who does not exhibit any of the three symptoms could still be diagnosed with mTBI if there are any neurological abnormalities such
as seizures and intracranial lesions not needing surgery (Carroll, Cassidy, Holm, et al., 2004).

The World Health Organization (WHO) definition of mTBI is similar to the first definition by the American Congress of Rehabilitation Medicine (Holm, Cassidy, Carroll & Borg, 2005). However, it introduces the term post traumatic amnesia in place of memory loss, the term favoured by the American Congress of Rehabilitation Medicine the post traumatic amnesia (PTA) and states that a person should not be having another existing medical problem or language barrier when being assessed for mTBI (Holm et al., 2005). Therefore, definitions of mTBI vary, with some researchers including loss of consciousness and/ or post traumatic amnesia and others excluding one or both in their definitions (Carroll, Cassidy, Holm, et al., 2004). In addition to this, some researchers did not include GCS scores in their definitions of mTBI while others narrowed the range from 13-15 to 14-15 or 15 (Carroll, Cassidy, Holm, et al., 2004).

Besides the definitions above, Post Concussion Syndrome (PCS) has often been used to diagnose mTBI (Gerber & Schraa, 1995). PCS symptoms that are commonly attributed to mTBI are irritability, anxiety, memory loss, limited concentration span, headaches, blurred vision and sensitivity to their surroundings in terms of light and sound (Gerber & Schraa, 1995). However, PCS symptoms are not exclusive to mTBI and can also be found in other medical conditions such as chronic pain (Smith-Seemiller et al., 2003). This suggests that exhibition of these PCS symptoms might indicate other conditions rather than mTBI. Another condition that is commonly associated with mTBI and hinders diagnosis of mTBI is posttraumatic stress disorder (PTSD) with clinicians being divided as to the coexistence of mTBI with PTSD (King, 2008).

Given the thesis’s focus on mTBI in the military context, and considering the variety of mTBI definitions in the civilian population, the definition of mTBI given by the Defense and Veterans Brain Injury Center (DVBIC) in the United States bears in mind the earlier WHO definition in terms of duration of LOC but shifts from the WHO definition by specifying a time duration for the altered state of consciousness
(appearing dazed/ confused) (French, 2010). Furthermore, the DVBIC and the Veteran Health Administration in the United States exclude GCS scoring in their definition of TBI (McCrea et al., 2008; Pogoda, 2012). It also varies from the other definition in that it not only states how the injury might have come about but also describes symptoms that a person with mTBI might experience (McCrea et al., 2008).

Besides the definitions of mTBI in the civilian and military context, the instruments used to assess mTBI and determine the level of cognitive deficits are also important. Some of these tests measure cognitive deficits of mTBI while others measure the extent of post concussion. The researcher looks at these instruments beginning with the Glasgow Coma Scale (GCS). The Glasgow Coma Scale looks at the loss of consciousness and coma (Teasdale & Jennett, 1974; Middleton, 2012). Barlow (2012) and Healey et al., (2003) highlight the importance of using the scale but not using the combined score. The rationale for this is that the combined scored overinflates the neurological outcome after brain injury (Barlow, 2012). Furthermore, a combined score reveals little to predict the neurological outcome. Instead some researchers recommend that individual scales assessing the three predictors would be a better option (Barlow, 2012; Healey et al., 2003). The motor response is the best predictor of outcome of the three predictors (Healey et al., 2003). However, Heron, Davie, Gillies and Courtney (2001) question the emphasis on the motor aspect of GCS stating that GCS has higher interrater reliability for verbal responses while faring the worst in the motor response category. This suggests that the scale is not very accurate in predicting problems that those with mTBI face in relation to their motor responses.

Given that the scale was introduced close to four decades ago, researchers have reviewed the scale to gauge its efficacy in assessing neurological injury and predicting severity in TBI (Healey et al. 2003). Some researchers state that the GCS scores highly on inter-observer reliability however others dispute this (Gill, Reiley & Green, 2004; Saatman et al., 2008). Some critics of GCS declare that it is unreliable, has low inter-observer reliability and that there are discrepancies in the scoring indicating that there is a need to evaluate the scoring procedure or simplify it so that
everyone who uses it remembers what the scores indicate across levels (Green, 2011). Besides remembering how to rate the scores, critics pan the focus on the need for agencies to be mindful of which version of the scale they are using noting that British hospitals did not standardize their use of GCS, with some using the earlier 12 point version and others using the later 13 point version (Wiese, 2003). Furthermore, a revised version of the GCS was published online in 2014 (Teasdale et al., 2014). While different versions of the scale may be used, it is important for those utilizing the scales to be aware of the differences within the scales and what those different scores indicate (Griffiths & ChandraBose, 2004).

In addition to differing versions of the scale, some researchers suggest different GCS scores; suggesting that the Glasgow Coma Scale Score for mTBI should be 13-15 instead of 14-15 (De Kruijk et al., 2002; Gomez, Lobato, Ortega, & De La Cruz, 1996; Sternbach, 2000). Borg et al. (2004) acknowledge this variation in GCS scores in their review of mTBI diagnostic procedures when patients are diagnosed. Some organizations such as the World Health Organization (WHO), Center for Disease Control and Prevention in the United States and Advanced Trauma Life Support (ATLS) prescribe GCS scores in the range of 13-15 as indicative of mTBI (Holm et al., 2005; Mena et al., 2011). Mena et al. (2011) however, in their own research, suggest retaining the old range of 14-15 for mTBI and 13 as a moderate TBI stating that the old categorization afforded better predictability and accuracy in determining clinical outcomes. In yet another turn of events, another group of researchers suggest only considering GCS scores of 15 as mTBI (Carroll, Cassidy, Holm, et al., 2004). Besides the debate about the score range and categories, researchers contend that GCS does not cover all aspects of neurological functioning but focuses only on three domains; therefore there is a need to use other scales concurrently with GCS to assess the other aspects of neurological functioning (Gill, Reiley & Green, 2004).

In conclusion, though GCS is utilized widely as a tool for measuring consciousness, its critics highlight flaws skewing the scores towards the heavyweight motor responses category. GCS’s interrater reliability the interrater reliability amongst inexperienced scorers is low. Furthermore, different versions of the scale
are used with some using the 13 point, 14 point and 15 point versions and this affects how they score the scales. Besides the different versions of the scales, there is ongoing debate on which score range to adopt when diagnosing, mild and moderate TBI. There needs to be a consensus on which version to use as well as which score range to adopt so that the use of the scale is standardized. Given that GCS is used as the main measure to assess mTBI, the uncertainties surrounding it and the differing scores and versions used suggest a need to look at other methods to complement it in the assessment of the injury. Given the thesis’ focus on the certainties or uncertainties of mTBI in terms of diagnosis, treatment and management the uncertain aspects of the scale which is the main measure of mTBI tend to suggest that more needs to be done to assess the injury. This could be in the form of using an additional method of assessment or modifying the current assessment.

Another method that is used is the Rivermead Post Concussion Questionnaire (RPCQ). Rivermead Post Concussion Questionnaire (RPCQ) is used to assess the extent of post concussion syndrome by looking at: cognitive abilities (such as memory power and processing speed), somatic aspects (such as dizziness, sensitivity to light, headaches and problems with vision) and emotional state (depression and mood swings) (King et al., 1995; Smith-Seemiller, Fow, Kant & Franzen, 2003). This is important as post concussion syndrome has been identified as one of the aspects of mTBI. RPCQ contains sixteen items which function as a checklist for individuals to self report their post concussion syndrome (PCS) symptoms (Smith-Seemiller et al., 2003). Besides the RCPQ, other tests are employed to look at other aspects of mTBI. Some of these measures do not aid in the diagnosis of mTBI but they aid in the diagnosis of the symptoms or effects experienced by mTBI. This is important in the thesis as the researcher looks at the symptoms of mTBI and how they are interpreted in terms of the extent of the loss of abilities and the recovery aspect.

Similar to the RCPQ, the neurobehavioural functioning inventory (NFI) measures neuropsychological abilities. Neurobehavioural functioning inventory (NFI) consists of six scales measuring depression, memory loss and attention span, aggression, motor skills, somatic symptoms (such as headaches, pain and) and
communication (Kolakowsky-Hayner & Kreutzer, 2001; Kreutzer, Seel & Gourley, 2001). It is completed by those with TBI and their families (Kolakowsky-Hayner & Kreutzer, 2001). NFI is a good predictor of depression as the items in the inventory enable accurate classification of patients who were depressed from those who were not depressed (Kennedy, Livingston, Riddick, Marwitz, Kreutzer & Zasler, 2005). This is important as depression has been observed in those with mTBI. However, the tool has to be used alongside other measures to get a wider perspective (Kreutzer et al., 1996). The NFI is also useful to provide information on the extent of the symptoms experienced by those with mTBI and this is important in the thesis as the researcher explores how mTBI is diagnosed as well as the impact of the injury on the lives of those with mTBI. Another measure that looks at depression is the Beck Depression Inventory-II (BDI-2). It is used solely to assess if someone is exhibiting symptoms of depression by assessing their moods and negative self perceptions of themselves (Green, Felmingham, Baguley, Slewa-Younan & Simpson, 2001; King et al., 1996). However depression is easily overlooked in TBI patients and some of the components in BDI-2 such as reduced concentration span and disruption to sleep are also experienced as a result of TBI and may therefore be overlooked as signs of depression in TBI patients (Kreutzer, Seel & Gourley, 2001).

Other test measures assess disability and serve to test the extent of the person’s disability post injury as well as provide insight as to the extent of their current capabilities. These aspects of these test measures determine a person’s rehabilitation post injury. In assessing rehabilitation, test measures on disability provide input on a person’s ability to return to work, perform skills or the level of support someone needs post injury. This is useful for those with mTBI and their employers who will then determine what tasks they can perform post injury. One such measure is the disability rating scale (DRS). The Disability Rating Scale (DRS) was published by Rappaport et al. (1983) and was developed for use in the assessment of people with severe traumatic brain injury. DRS is a 30 point scale assessing eight areas: independent living, grooming, feeding, eating, employability and components of the Glasgow Coma Scale (such as eye opening, motor response and ability to communicate verbally) (Dominiquez-Roldan et al. 2013; Wang & Gennarelli, 2009). The Disability Rating Scale (DRS) is frequently used to assess the
severity of disability in those with TBI from point of coma to recovery (Shukla, Devi & Agrawal, 2011). Moreover, the Disability Rating Scale (DRS) is utilized often to assess a person’s ability to return to work (Shukla, Devi & Agrawal, 2011). This scale serves to demonstrate a person’s ability to perform at work at pre injury levels and also gauges the extent of the impact of the injury on their overall abilities. The researcher is interested in these aspects of the injury and how people view and experience the injury and this test measures suggests areas that participants in the empirical studies may shed light on.

Having explored the measures used in the civilian population the researcher now looks at the tools the military utilizes to assess mTBI and determine the extent of the deficit in the personnel’s abilities. Automated Neuropsychological Assessment Metrics (ANAM) is used to measure neurocognitive functioning prior to deployment and has been in place since 2008 (Jaffee & Meyer, 2009). The test assesses the personnel’s neurocognitive functioning looking at a person’s ability to use different areas of their brain for example: to problem solve, verbal skills, recalling past and present events and ability to function independently (J. Addington & Addington, 2000; Green, 1996). ANAM is useful in that it evaluates processing speed, ability to recall as well as tests the working memory (Kabat, Kane, Jefferson & DiPino, 2001). It is easy to administer and can be administered to the same individual at several timeframes (Kabat et al., 2001). The repeat aspect of this test measure is important as it allows for assessing changes to the service personnel’s condition. While ANAM focuses on cognitive abilities, the next scale the Military Acute Concussion Evaluation (MACE) focuses on measures assessing consciousness post concussion, PTA and cognitive abilities.

The Military Acute Concussion Evaluation (MACE) evaluates on two levels: the first being a person’s history in terms of when they experienced a traumatic event such as a blast, fall, and/or accident as well as a person’s altered mental status or LOC (Jaffee & Meyer, 2009). The second level of evaluation focuses on the person’s cognitive abilities using the Standardized Assessment of Concussion (SAC) (Jaffee & Meyer, 2009). The Standardized Assessment of Concussion looks at four areas: orientation (the time, day and month of the year to assess if the person is not
disorientated), the person’s immediate memory recall, the person’s ability to concentrate and perform tasks and delayed recall (of words) (McCrea, Kelly, Kluge, Ackley, & Randolph, 1997). The Standardized Assessment of Concussion is typically employed in assessing concussion post sports injuries (McCrea et al., 1997; 1998). The Standardized Assessment of Concussion is effective in identifying concussion and determining when a person can return to their pre injury role (McCrea et al., 1998). The MACE itself consists of 13 items: 8 of which focus on the history of the injury, how and when the injury was sustained, LOC, PTA and presenting symptoms post injury. The remaining 5 items focus on the evaluation of cognitive abilities post concussion. The five items evaluate orientation; ability to perform immediate recall; screening of ability to perform tasks based on visual, oral and motor functions; concentration span; and delayed recall (Elder, Mitsis, Ahlers & Cristian, 2010). The five items had a total score of 30 and scores below 25 demonstrate neurocognitive deficiencies (Elder et al., 2010). The MACE has to be administered shortly after the injury as items being measured are time sensitive and delays in administering the scale such as administering it more than half a day after the injury would reduce the usefulness of the scale in determining concussion and ability to return to pre injury conditions (Coldren, Kelly, Parish, Dretsch & Russell, 2010). This aspect of the test means that the service personnel have to seek treatment immediately and not wait it out. This is important as those with mTBI have been noted to either seek assistance at the onset or wait for awhile before seeking help. While the MACE has to be administered early on post injury, the next scale Post-Deployment Health Assessment (PDHA) the researcher explores has been criticised for being administered too early post injury.

The Post-Deployment Health Assessment (PDHA) used by the Department of Defense (DoD) in the United States comprises of the earlier tool, Brief Traumatic Brain Injury Screen (BTBIS) which was first utilized post deployment to screen for TBI (Jaffee & Meyer, 2009). The BTBIS has been modified twice since its introduction to incorporate feedback from medical treatment facilities (Iverson, Langlois, McCrea & Kelly, 2009). Post deployment screening was previously conducted only on returning service personnel but in 2008 DoD mandated that all service personnel returning from tours of duty in Iraq and Afghanistan should be
screened for TBI (Iverson et al., 2009). The PDHA and BTBIS screens service personnel based on the DVBIC criteria (Iverson et al., 2009). They ask participants to fill out information on a checklist. The checklist first asks if they were involved in any events such as explosion/blast, vehicle accident, falls and/or bullet wounds (Iverson et al., 2009). The second component of the checklist asks if participants experienced losing consciousness, confusion, being dazed, not remembering before or after incident, concussion or a head injury (Iverson et al., 2009). The third component of PDHA list symptoms asks the participants to indicate if they have experienced any of these symptoms post injury (Iverson et al., 2009). The final component asks if participants have experienced the symptoms in the past week (Iverson et al., 2009). Following feedback that the PDHA screens too soon (at the onset of injury) after the TBI, the Post-Deployment Health Assessment (PDHRA) was developed to screen veterans at a later stage of the injury (Milliken, Auchterlonie & Hoge, 2007). Besides the original PDHA, the PDHRA includes categories to aid referrals to the military’s substance abuse and counselling programmes (Milliken, Auchterlonie & Hoge, 2007). The PDHRA thus measures all most of the symptoms of mTBI and is used to identify personnel with the injury. The changes in the assessing and the later screening suggest a continuum in the care plans for service personnel. This is of interest as the thesis explores the provision of treatment care plans for military personnel.

Most of the tools assessing mTBI have self reports components and explored symptoms experience. The next tool evaluates a person’s report on their functioning abilities post injury. Neurobehavioral Symptom Inventory (NSI-22) is a self-report measure which evaluates post concussion symptoms (King et al., 2012). Participants report the severity of their symptoms using a five-point scale ranging from zero (meaning rarely present or no symptoms) to four (severe stage at which impeded independent functioning). The scale assesses moods (irritability, anxiety, feeling tired), pains, headaches, and cognitive aspects such as concentration, forgetfulness and coordination (balance issues, dizziness) (Iverson et al., 2011). The scale is somewhat similar to the neurobehavioural functioning inventory (NFI) discussed earlier. The NSI’s internal consistency and validity as a tool have been evaluated against other test measures on depression and PTSD (namely Becks Depression
Inventory (BDI) and Post-traumatic Stress Disorder (PTSD) Checklist – Military Version (PCL- M) (King et al., 2012). The NSI was able to hold its own against BDI and PCL-M in measuring moods, cognitive aspects and pain (King et al., 2012).

In conclusion, the test measures described earlier serve to assess mTBI and determine the cognitive and neuropsychological functioning aspects post injury. In the thesis the researcher explores how people perceive mTBI in the military looking specifically at aspects of diagnosis, management and consequences of the injury. The test measures described allude to certain aspects of the injury in terms of diagnosis and functional outcomes. They suggest the areas that are commonly explored when evaluating the impact of the injury. These add to the knowledge gained here on the impact of the injury and aid the thesis in exploring the extent of the impact and subsequent recovery post injury. Before exploring the management of mTBI however, the researcher explores the consequences of mTBI. The consequences of mTBI shed light on what aspects of mTBI need to be managed and inform practice in terms of treatment and rehabilitation programmes for of those with mTBI.

2.1.5. Consequences of mTBI

MTBI temporarily affects the neurologic functioning of a person (McCrory et al., 2009). Therefore a person’s cognitive ability - the ability to relate to their surroundings and also to perform functions utilizing the body’s nervous system are affected by mTBI (Landre, Poppe, Davis, Schmaus, & Hobbs, 2006). Therefore, people with brain injuries tend to do better at emotional functioning than at cognitive functioning (Borgaro & Prigatano, 2003; Chaytor, Temkin, Machamer & Dikmen, 2007). Moreover, caregivers affirmed this view in their perception that the key significant change they experienced in their loved ones post injury was the change in the cognitive abilities (Wallace et al., 1998).

As a result of a reduction in cognitive abilities, most people with TBI tend to be less physically active following the injury (Dawes, Scott, Roach & Wade, 2006; Driver & Ede, 2009; Johansson, Berglund & Rönnbäck, 2009). In addition to this, those with TBI have a more acute sense of fatigue which could, in turn, result in
limited participation in physical activities (Stulemeijer, van der Werf, Bleijenberg, Biert, Bruaer & Vos, 2006). Moreover, post mTBI fatigue is more pronounced in those with depression though this fatigue gradually decreases three months post injury (Norrie et al., 2010). This suggests that those with mTBI start to regain parts of their routine three months post injury. Furthermore, the duration it took to resume an activity such as driving is related to the level of pain they experienced post injury (Preece, Geffen & Horswill, 2013). Those with mTBI felt the loss of their abilities and feared for their future when they contemplated returning to work post injury (Soeker, Van Rensburg & Travil, 2012). They (those with mTBI) felt that establishing routines and actively participating in their rehabilitation enabled them to get back into the workforce at an earlier rate than they would have envisioned (Soeker et al., 2012).

In addition to this, mTBI may or may not cause permanent brain damage (Iverson & Lange, 2011). In terms of severity, there is a wide spectrum within mTBI as noted by rehabilitation professionals (Harrington et al. 1993). This has prompted rehabilitation professionals to advocate for a grading system within mTBI focusing on the severity of the injury and the symptoms as well as the loss of cognitive and functional abilities (Harrington et al. 1993). Some individuals with the injury felt that their ability to function socially poses challenges years after the injury (Hoofien et al., 2001). This is brought about by a combination of factors: a reduction in cognitive abilities, a sense of isolation and depression at the inability to function independently (Hoofien et al., 2001; Riley, Brennan & Powell, 2004). The majority of those with the injury are young adults who would have been active socially pre injury: meeting peers; potentially have been in relationships, perhaps studying or working and engaged in hobbies (Morton & Wehman, 1995). The drastic change in the lifestyles of individuals with the injury caused these individuals to become anxious or depressed and this could in turn affect their rehabilitation and subsequent re-entry into the community at large (Morton & Wehman, 1995; Rosenthal, Christensen & Ross, 1998). Anxiety over losing their job/ not being able to return to their job quickly after the injury as well as the absence of close interpersonal bonds post injury could possibly lead to depression (Gomez-Hernandez, Max, Josier, Paradiso & Robinson, 1997). Those with mTBI tend to socially isolate themselves or,
sometimes, be socially isolated by others (Brown, Gordon & Spielman, 2003). This isolation can lead to depression and a further increase in social isolation, increasing their inability to cope post TBI (Anson & Ponsford, 2006; Curran, Ponsford & Crowe, 2000). This then spirals into an increasingly pessimistic view of their lives post injury and results in further social isolation (Tomberg, Toomela, Pulver & Tikk, 2005). If the cycle continues it could spiral into cutting off social contacts and result in those with TBI feeling dissatisfied with their lives (Dahlberg et al., 2006). Social isolation does not only affect those with mTBI. Instead, the increasing social isolation of those with mTBI could adversely affect their caregivers as the caregivers are also forced to live socially isolated lives while caring for those with TBI (Marsh, Kersel, Havill & Sleigh, 1998).

Societal perceptions have a major role to play in consequences of mTBI. How people perceive those with an injury has implications for how the person with mTBI copes with the injury as the lack of social support could serve to cripple the person’s daily functioning as well as socialization with their peers. Examples of this are the use of tests to determine the cognitive ability of those with the injury who are fighting for custodial rights and/or their rights to claim damages for work related mTBI. Furthermore, parents with mTBI hoping to regain custody of their children have to take a neuropsychological test to gauge cognitive ability Word Test Measure (WMT) (Flaro et al., 2007). This test is also given to those currently engaged in litigation seeking compensation (Flaro et al., 2007). The need for such tests shed light on how those with mTBI are perceived by others post injury: they have to prove their cognitive abilities are at an acceptable level dictated by societal/test norms.

Amongst those with mTBI, those exhibiting post concussion syndrome tended to perceive their injury more negatively, and were more likely to be stressed, anxious and depressed (Hou, Moss-Morris, Peveler, Mogg, Bradley & Belli, 2012). Furthermore, mTBI patients from racial minority groups experienced higher levels of depression than those in the racial majority group, feeling there were fewer social support options available to them (Brown, McCauley, Levin, Contant & Boake, 2004). In conclusion, mTBI affects all aspects of a person’s life and their ability to function changes post injury. The consequences of the injury can be temporary or
permanent and it varies from person to person. The extent and duration of the recovery is dependent on how the person with the injury and their caregiver perceives the injury, what information they are privy to as to the exact nature of their injury and the level of support they seek and receive post injury.

In the thesis the researcher explores how various groups construct the injury. The consequences of the injury described here are important as they shed light on aspects of the injury in terms of daily functioning, socialization, ability to cope, mobility and changes in employment status. The researcher explores these aspects of the injury in the empirical chapters of the thesis.

### 2.1.6. Management of mTBI

Besides the consequences of the injury, it is important to look at what has been done to manage the injury in terms of rehabilitation and treatment. There is a range in the medical care sought and received by people with mild brain injury (Sosin, Sniezek & Thurman, 1996). Some sought medical care immediately post injury while others waited awhile (Sosin, Sniezek & Thurman, 1996). This suggests that the injury is apparent to some at the onset while that is not the case in some others who have a delayed response to their injury (Sosin, Sniezek & Thurman, 1996). In addition to this, some of those who sustained the injury are hospitalized while others are outpatients (Sosin, Sniezek & Thurman, 1996). These suggest that though people might have sustained the same type of injury, the impact of the injury on their brain may have differed, thereby calling for different modes of treatment (inpatient or outpatient and immediate or delayed treatment).

Majority of the literature on mTBI focuses on returning to the norm within three months post injury (Ruff, 2005). Those who do not return to the norm within that time frame are referred to as the “miserable minority” (Ruff, 2005). Though most of those with mTBI had a reduction in persistent symptoms, there is still a minority who exhibit symptoms three months post injury (Lannsjö, Geijerstam, Johansson, Bring & Borg, 2009). As such, some researchers oppose the classification of mTBI as an injury that is symptom free after three months (Lundin, de Boussard,
Edman & Borg, 2006). Furthermore, electroencephalographic (EEG) abnormalities in patients a year after the injury suggest that mTBI has long term effects (Cernak, Savic, Ignjatovic & Jevtic, 1999). As such, some researchers are calling for a recategorisation of mTBI’s period of being symptom-free, shifting it from the previous classification of three months to a year as most adults would achieve a total recovery within a year of injury (Carroll, Cassidy, Peloso, Borg, et al., 2004a; Okie, 2005)

Besides, grappling with short and long term effects of the injury, mental fatigue is common amongst those with mTBI and it results in a reduced information processing speed thereby affecting their reading ability and ability to decode information (Johansson, Berglund & Rönnbäck, 2009). This reduced ability post injury negatively impacts on the social life as well as employment of those with TBI (Johansson, Berglund & Rönnbäck, 2009). Further stumbling blocks in returning to work arise from employers’ views of those with TBI in terms of the employer’s willingness (or lack thereof) to work with the employee with TBI on and around the difficulties the person is facing with regards to their TBI facilitates (Soeker, Van Rensburg & Travill, 2012). The relationship between employee and employer prior to the injury has an impact on how much the employer is willing to make allowances for the changes in circumstances and how this impedes operational functions of the company (Soeker, Van Rensburg & Travill, 2012).

Besides the relationship the person with mTBI has with their employer, their relationship with their doctor and the medical personnel’s ability to convey the extent of the impact of their injury plays a part in how quickly the person is able to perceive deficits in their abilities post injury and work towards improving their condition (Soeker et al, 2012). Difficulties in obtaining information on their condition and being told their symptoms would cease over time affected the social re-integration of those with mTBI (Lefebvre & Levert, 2012). Those who were given adequate information on the consequences of their injury navigated their beliefs to either: processing that information to affirm the negative beliefs they have about the condition or using it to dismiss negative beliefs and construct positive beliefs on their condition so as to cope with the condition (Rogan, Fortune & Prentice, 2013; Wood,
Those with mTBI who affirmed the negative beliefs tended to report more symptoms symptomatic of post concussion syndrome (Rogan, Fortune & Prentice, 2013; Wood, 2007). Perceived negative impact of the illness, its severity in terms of ability to return to pre injury optimum levels and the perceived lack of control over the condition impede a person’s ability to work towards their rehabilitation goal of reaching pre injury optimum level (Snell, Hay-Smith, Surgenor and Siegert, 2013). Caregivers of those with mTBI perceived that increased levels of social support set them at ease with the life changes they experienced and they tended to view those experiences less negatively with adequate support (Wallace, Bogner, Corrigan, Clinchot, Mysiw & Fugate, 1998).

Public perceptions also play a role in the management of mTBI. The varied perceptions of the degree and severity of the injury has implications as to how they view those with the injury. The public tended to believe that a person could have a speedy recovery if they worked hard at recovery (Hux, Schram & Goeken, 2006). The general public with opinions on speedy recovery and total recovery do not expect those with brain injury to have memory deficits (Chapman & Hudson, 2010). Their views are diverse with some members of the public perceiving that the effects of concussion could be long term and that some symptoms could be manifested later (McKinlay, Bishop & McLellan, 2011). In general, members of the public tended to view someone more negatively if they were labeled as having a brain injury as opposed to a head injury (McKinlay et al., 2011). However those who were familiar with brain injury tended to regard brain injury less negatively suggesting that exposure to the injury was the key to understanding the injury (McKinlay et al., 2011). This has implications as to how they treat and perceive those with the injury. Moreover, those with mTBI perceive the social response to their injury as rather lukewarm as people tend to downplay their difficulties and their rate of recovery.

Besides how they are treated in their social circles, those with mTBI face another hurdle in their treatment and rehabilitation in the form of how clinicians regard them. Clinician’s reactions to those with mTBI are mixed. MTBI has been regarded a “trivial condition” (p.550) (Hughes et al., 2004). However, this condition “can affect memory, attention and executive function” (p.550) (Hughes et al., 2004).
MTBI, far from being mild, has long term implications for a person’s working memory, affecting a person’s ability to assimilate and process information, events and tasks around them (Cicerone, 2002; Vanderploeg, Curtiss & Belanger, 2005). Besides the impact on the memory and ability to process information and react to situation, those with mTBI are in the long term, more inclined to be depressed, have impaired gait and present post concussive symptoms (Vanderploeg, Curtiss, Luis & Salazar, 2007). Despite this, other researchers dismiss the notion that mTBI is anything but mild; stating that full recovery in mTBI is the norm (Hoge, Goldberg & Castro, 2009). They discount neuro-cognitive testing of those with mTBI stating that it is ‘mostly inconclusive’ (Hoge et al., 2009, pp. 1590) after the period of injury as most measures of symptoms such as memory impairment rely on self reporting and are therefore not entirely accurate (Russo, 2012). This raises questions in terms of how clinician treat and manage and injury they are quick to dismiss or classify as trivial.

Finally, the all encompassing term of “traumatic brain injury” (TBI) is sometimes used interchangeably to refer to mild, moderate and/or severe traumatic brain injury (Alexander, 1995; Morton & Wehman’s, 1995; Green, Rohling, Lees – Haley & Allen III, 2001; Warden, 2006). The term’s interchangeable use impedes defining and differentiating amongst the different types of TBI since they are referred to as a collective set and this affects the treatment and rehabilitation plans for each individual TBI as mTBI’s treatments are placed alongside more intense TBIs (Carroll, Cassidy, Peloso, Garrity, Giles-Smith, 2004b)

### 2.2. Key issues arising from mTBI

From the literature, mTBI appears to be an injury which has many symptoms. Some of these symptoms are common to other disorders and conditions such as PCS and depression. This therefore makes it difficult to ascertain if the person is suffering from PCS as well as mTBI or just one of the disorders. MTBI could also be the result of a head trauma that has either penetrated the peripheral of the brain or has not penetrated the brain. It could be caused by head trauma and/or brain damage as a result of a blow or jolt to the head or other body parts such as the neck. Depending
on which part of the brain/body the injury occurred, the extent of the injury varies. Also, some people have no visible symptoms of mTBI and as such do not seek treatment immediately choosing to do so later. As most diagnosis tools of mTBI are time centred, diagnosis at the point of injury is optimum. In addition to this, diagnosis of mTBI varies according to which definition a person subscribes to. Some definitions include post traumatic amnesia while others opt for the more generic memory loss. Definitions of mTBI also use different scores further solidifying the heterogeneous aspect of defining mTBI.

The variability of mTBI does not end at its diagnosis and continues in its manifestations. Most experience mTBI symptoms for three months post injury while some experience these symptoms even years after the injury. A wide spectrum of symptoms is experienced by those with mTBI. No two people have the exact same symptoms as the injury is highly individualistic due to the difference in where the injury is located. The different experiences can also be related to varied coping strategies employed based on the amount of information on their injury made available to those with the injury. The level of support from their workplace as well as society at large also plays a role in how those with mTBI coped with their injuries.

In conclusion, beginning with the symptoms of mTBI, there are varying perspectives in every aspect of mTBI. Nothing is conclusive with symptoms from other disorders mainly PCS being included to symptoms of mTBI and then being discarded in other criterion of mTBI symptoms. There are variations in mTBI definitions as well suggestions that they are not standardized and are open to various interpretations. Furthermore, from the ratings on the Glasgow Coma Scale being contested by some researchers leaning towards either increasing or decreasing the ratings on the mTBI category, to the apparent mildness of the injury, every aspect of what makes up mTBI is contested. The variations in definitions, symptoms, definition and diagnosis serve to construct mTBI as a disorder that is hard to define.
2.3. The military context

Most of the research on mTBI in the military context focus on rehabilitation outcomes and cause and effects of the blasts causing the injury. The primary focus seems to be on the duration post injury before redeployment. Given the hegemonic masculinity aspect of the military, the need for a find and fix solution seems a plausible explanation for this. Other research on mTBI in the military focus on the caregivers’ burden in caring for service personnel with the injury. Families have been used to seeing the service personnel being fit and active, ready for duty. Furthermore, service personnel with mTBI experienced greater difficulties with visual – spatial abilities besides having problems with their attentions span and processing speeds (Cooper et al., 2010). In addition to this, service personnel with mTBI often report experiencing difficulties in cognitive tasks (Spencer, Drag, Walker, & Bieliauskas, 2010). Given the changes in circumstances families as well as the service personnel with the injury struggle to come to terms with the injury and the loss of the abilities in those with the injury. The sudden change in their disposition affects how the families view them. Research on mTBI in the military have also looked at substance abuse and depression incidents post injury and attribute the substance abuse and depression to preexisting conditions prior to deployment. This suggests a need to assess troops prior to deployment to exclude those who had preexisting conditions.

US service personnel with blast related mTBI even reported experiencing lower levels of satisfaction with their health, reporting health related problems post deployment (Heltemes, Holbrook, MacGregor & Galarneau, 2011). Considering most mTBI in the military are blast related, the experience of the US service personnel and their reports of lower levels of health satisfaction give rise for concern. Moreover, some of these researches highlight the need for more information and transparency so that those with mTBI and their families can gain access to knowledge about what is happening to them. Very little research has been conducted however, on the lived experiences of service personnel with the injury. This is interesting as the military is an institution that is not easily accessible to the public. It can be likened to an impenetrable fortress. Research typically tends to be about post deployment and return to work after injury as well as the recovery of cognitive
abilities post injury. In addition to this most of the measures for mTBI employ self reports. Research on self reporting of symptoms in recent years have suggested that the self report aspect of test measures are not helpful when assessing service personnel as they tend to downplay their injuries or not report them as they do not want to be removed from active service (Marion, Curley, Schwab, Hicks, & the mTBI Diagnostics Workgroup, 2011). This is rather dangerous as the underreporting of symptoms would mean they get deployed sooner than they would have been if their injuries had been detected and as such increase their likelihood of sustaining a second mTBI (Marion, Curley, Schwab, Hicks, & the mTBI Diagnostics Workgroup, 2011). Besides information on recovery of cognitive deficits, very little information is known about the military’s treatment and care management plans for those with mTBI. As such, the researcher looks to the constructions in the empirical chapter to provide more information on what the injury is like.

Beginning with its symptoms and diagnosis, researchers are divided in their stand on the mildness of mTBI, its link with other disorders as well as its categorization as a signature injury. The high profile nature of the injury appears to stem from the uncertainties centring each element of the injury. All this serves to draw attention to mTBI as a disorder that needs to be redefined. In addition to the diagnosis of the injury and its symptoms, treatment, the mildness of mTBI is constantly a point of contention with some stating that mTBI is anything but mild with long term consequences (Sterr, Herron, Hayward & Montaldi, 2006). On the opposing end of the spectrum others sought to do away with the categorization of mTBI in the military as a “signature injury,” “invisible wound” and “silent epidemic” stating that these categories are in poor taste (Hoge, Goldberg & Castro, 2009, p. 1589). Further efforts are made to downplay mTBI’s place amongst injuries with it being referred to as a ‘common consequence of modern warfare’ (French, 2010, pp. 38), while most of the literature cites the injury as a signature injury of the war. French’s (2010) suggestion portrays a picture of consistency with no need for alarm over the increasing incidences of mild traumatic brain injury amongst service personnel.
The interest in mTBI in the military stems from the lack of information of the injury in the military. Furthermore, the differences in the battery of test undertaken, diagnosis criteria and the different facets of mTBI in the military make it a phenomenon of interest. Starting with its cause, mTBI in the military context differs from those in the civilian context as, the injury occurs as a result of blasts, falls or accidents in the vehicles resulting in a trauma to the head (Rona et al. 2012). It is caused by trauma to the head, rapid increase or decrease in a vehicle’s speed resulting in a jolt. As such, the DVBIC defines mTBI as a brain injury caused by “an external force and/or acceleration/deceleration mechanism from an event such as a blast, fall, direct impact, or motor vehicle accident” (p. 15) (McCrea et al., 2008). Furthermore, literature on mTBI in the military paradoxically caution against narrowing down possible causes of mTBI while at the same time cautioning against broadening the inclusion criteria on some possible symptoms of TBI (Mac Donald, et al., 2011). As such, it brings defining the injury to a standstill.

2.4. Theoretical framework of the thesis

According to Moscovici, social representations theory is the grasping of a phenomenon using sociological and psychological concepts (Moscovici, 1984). Individuals react to events or situations the way researchers do and their understanding of events is based on the information processed (Moscovici, 1984). A central principle of social representations theory is to render the unfamiliar familiar (Marková, 2008; Moscovici, 2001). Firstly, social representations define a situation. It establishes the representation in a set category. It forms our notion of reality. Any new developments must adhere to the rules that define the category. Moscovici (1998) adds a sub clause to the notion that new developments must adhere to old rules stating that a predetermined notion of reality is altered in the face of new information and experiences (Moscovici, 1998). However, there is a caveat to this: altering a set notion of a representation is only engaged with if it is considered socially acceptable. Secondly, representations tend to impose their viewpoint on people. Human interactions serve as the body an soul of social representations with their ability to influence an individual’s behaviour (Farr & Moscovici, 1984). Social
representations are based on knowledge already acquired by the producers of the social representations based on their understanding of reactions to situations or events and when their representations were affirmed or realigned based on new information they processed. Language is presented as that of observation and logic (Bauer & Gaskell, 2008). It is the medium through which people come to terms with events in their everyday lives. Social representations theory is the thread that connects the power of past events with today’s reality, catapulting it into the future (Moscovici, 2000). The extent to which a person accepts a social representation is related to the extent to which the person identifies with a particular group (Bauer & Gaskell, 2008). Therefore, exclusion and inclusion in social representations are represented in terms of the ‘we’ and ‘they’. In a reified world where not everyone is equal, divisions exist in the form of the interactions between the ‘we’ (this could refer to the layperson, society at large, those in positions of authority) and ‘they’ (this could refer to those in positions of authority or those that are outside of the community) and the superiority of views based on professional ability to discuss a phenomenon can be explored using social representations theory (Jost, 1993).

There are two processes that aid in the generation of social representations: anchoring and objectifying (Moscovici, 1984; 2000). Anchoring is a process of conceptualizing the unfamiliar to a familiar concept (Moscovici, 1984; 2000; O’Connor, 2012). Classifying and naming are two aspects of anchoring (Moscovici, 1984; 2000). When rendering a phenomenon familiar, labels are attached to the phenomenon. These labels are either negative or positive. In this process of classifying, the phenomenon in question is placed in a category it is similar to (Moscovici, 1984; 2000). Within this classifying, the distinct features of a phenomenon as well as the similar features are highlighted in attempts to conceptualize the phenomenon as either a cause for concern or a situation under control (Moscovici, 1984; 2000). When rendering the unfamiliar familiar, the naming aspect is also critical (Wagner et al., 1999). When naming a phenomenon the characteristics of the phenomenon are described. Distinct characteristics are highlighted (Wagner et al., 1999). How a phenomenon is named and which features of the phenomenon are brought to the forefront would determine a phenomenon’s position and reception in social representations. The other process of social
representations, objectification is the process of turning an abstract thought into a concrete concept, to give an object a form, something everyone identifies with (Laszlo, 1997). Part of the process of objectifying is to render a group’s jargon into everyone’s vernacular (Devine-Wright & Devine-Wright, 2009).

Moscovici (1984) describes three types of social representations: hegemonic, emancipated and polemical. The hegemonic representation is shared by a group that is higher up on the hierarchy scale. It is a group that typically tends to be uniform and rather rigid in structure. Its views are associated with ideology and power and have more leverage than other social representations. The emancipated social representations are comparable to a medical narrative of illness that has now been legitimated. This type of representation is from the perception of a minority group. The polemical social representation stems from conflict between groups and is considered as a challenge to the dominant representations presented (Moscovici, 1984).

In the literature on mild traumatic brain injury, the representations shift from being hegemonic, to emancipated and polemic. In the hegemonic representations, mild traumatic brain injury is presented from the experts’ point of view; where those who decide on definition and diagnosis tend to suggest that mTBI is trivial with short term symptoms (Huang et al. 2009). The aspect of hegemonic social representations that appeals to the researcher is that it is more than ‘expert’ opinions. It is about how an issue is put forth to suggest authority or superiority in terms of knowledge/ strength. This corresponds with the first study’s aims to explore how those in an expert position construct the injury. The second study also subscribes to this type of representation as the study deconstructs how the authors of the reports set out to highlight or discredit aspects of the injury in order to create an impression that all is well. Emancipated social representations are of interest as well since they add to the sense making in the thesis with their focus on how a disorder is legitimated by authority figures using medical discourse. Amongst the three types of representations, polemic representations with its emphasis on conflict between groups serves to draw out the sense making the researcher looks at in the empirical chapters. It does this by focusing on the differences within the representations and
how they serve to put forth the variations in their perceptions of mTBI. The types of representations serve to harness the perceptions set forth in the empirical studies in terms of what is certain or uncertain about mTBI.

2.5. Epistemological position

The thesis adopts a pluralistic approach employing a bricolage stance (Levi-Strauss, 1972, Frost, 2009). Social representations theory with its concepts of anchoring and objectifying serves as a useful lens with which to look at how different social groups render the unfamiliar phenomenon (mTBI) familiar. The researcher adopts a pluralistic approach in the thesis using social representations theory as the overarching framework of inquiry. Social constructionism, Critical realism, and phenomenology are employed as ways of looking along with various methods of inquiry: discourse analysis (DA), critical discourse analysis (CDA), thematic analysis (TA) and interpretative phenomenological analysis (IPA) to explore how these representations are constructed. This is useful as social representations theory is typically linked to social identity theory so as to observe how people function in groups: one as an individual and the other in the group’s context (Castro & Lima, 2001). In the absence of social identity theory in the thesis, the range of epistemological positions and qualitative methods of enquiry perform this role instead. In the first study, the researcher employs social constructionism as the first approach to explore social ‘realities’. Social constructionism and the method that explores the social constructions, discourse analysis are employed to harness the subjectivity in the discourses (Houston, 2001). Using social constructionism the researcher is able to tap into the interaction of the different realms – the social and individual and look at how actions are linked to our beliefs (Hoffman, 1990; Houston, 2001). Using discourse analysis in this study, the researcher attempts to delve into patterns in the constructions, looking at what the authors of the reports are setting out to do in their constructions of mTBI and how they go about achieving this. The social constructionist tenet that nothing is fixed allows for an in depth analysis of how representations within the discourse undergo changes (Taylor, 2001). These changes in constructions are embraced as they add to the bigger picture: how social groups make sense of and understand mTBI in the British military. It also
counters the cognitive reduction of the processes of SRT as social constructionism embraces realities without setting constraints on them.

The researcher employs a social constructionist approach using discourse analysis in the first study to explore how project team members construct mTBI in the British military. In the second study, critical discourse analysis is employed to unpack the earlier constructions of the first study’s preliminary investigation. The pluralistic approach employed here enables the researcher to observe who decides on and legitimates the labelling of mTBI: which labels are encouraged and which labels are discredited. Similar to social constructionism, this approach explores ‘realities’. However, the study goes a step further by examining power relations and ideology. Critical discourse analysis enables the exploration of how those outside of the socially acceptable representation are constructed, that is how they are ‘othered’. Therefore the cognitive reductionism caused by anchoring and objectification as well as limited scope in the social representations theory for delving into issues of ideology and power is countered by employing critical discourse analysis (Potter & Wetherell, 1987; Voelklein & Howarth, 2005). In conclusion, critical discourse is employed to deconstruct how the authors of the final project team report construct mTBI utilizing positions of power, ideology and social inequalities. The third approach the researcher employs the critical realist position to explore representations of mTBI by a sample population of the general public.

The critical realist position sets boundaries as to what should be rejected and what can be harnessed in representations. Similar to the second approach, this approach decides on what is socially acceptable and what can be altered. It draws up perimeters with which to explore how members of the public view mTBI amongst British service personnel. This aspect of critical realism allows the researcher the flexibility to pool the different perspectives together and draws on external perspectives of a phenomenon, looking for ways to piece the different representations together to formulate a brand new version of ‘reality’ (Patomäki and Wight, 2000). In the case of the thesis, this stance makes allowances for looking closely at individual member of the public’s views as opposed to being quick to accept common responses and discarding the dissimilar views. Thematic analysis is
included in this approach as though it does not define set perimeters, it assimilates the perimeters of the approaches it is paired with and thus lends itself to the research goals of exploring how the public view mTBI. The researcher employs a phenomenological approach using interpretative phenomenological analysis to explore how former service personnel with mTBI make sense of and understand mTBI in the last empirical study. Phenomenology embraces differences and subjectivity in accounts of experiences while celebrating the singular experience. IPA looks at the outer and inner worldview and embraces variability in how people make sense of and understand a phenomenon. IPA’s ability to access the inner and outer worldview are along the lines of what the researcher seeks to explore in the final study on former servicemen’s accounts of his experience with the injury. The cognitive reductionism in SRT is countered by the objectivity (living governed by principles laid forth by society) and subjectivity (making life’s choices freely, embracing a lived in experience) thereby freeing up the concepts of anchoring and objectifying working instead with the hermeneutics aspect of IPA, interpreting the lived in experience of the person recounting their experience.

In conclusion, the epistemological positions in the empirical studies in the thesis aid the researcher in exploring how mTBI is constructed in those groups. The assumptions and concepts inherent in these methods of inquiry serve to enable the researcher to differentiate the representations amongst various social groups and draw upon common and divergent perceptions of mTBI. Using the literature review as a stepping stone, the researcher identifies groups to explore as well as the research aims of the thesis.

2.6 Research Aims of the Thesis

In the thesis the researcher aims to explore how different groups make sense of mTBI. How the groups define mTBI and what they have to say in terms of the impact of its injury form the body of the empirical chapters in the thesis. Using a pluralistic approach, social representations theory (as a framework) is paired with a series of traditions and methods of analysis to explore how various social groups make sense of and understand mTBI in the British military. The first and second
study analyzes an official text to explore how the Mild Traumatic Brain Injury Final Project Team constructs mild traumatic brain injury (mTBI) in service personnel returning from tours of duty in Iraq and/or Afghanistan. In light of media attention, the Surgeon General of the Ministry of Defence’s Defence Medical Services commissioned an mTBI project team to conduct a review of clinical aspects and develop a management plan to deal with mTBI amongst service personnel. The project team presented their findings and recommendations to the Ministry of Defence (MoD) in a final report in March 2008 (Mild Traumatic Brain Injury Project Team, 2008).

The first study explores how the Mild Traumatic Brain Injury Project Team represents mild traumatic brain injury in service personnel returning from tours of duty in Iraq and/or Afghanistan. In this study the researcher explores how brain mild traumatic brain injury amongst military service personnel is constructed by the final project team members. The researcher explores the type of discourses invoked by these constructions and the rhetorical functions performed by these constructions. The researcher concludes this exploration by looking at how possibilities for providing services and support to military personnel affected by mild traumatic brain injury are shaped, if at all, by these constructions of mild traumatic brain injury?

The second study deconstructs the mechanisms used by the military in the first study’s dataset. The researcher explores the processes of delegitimation and marginalization employed by the authors of the text. The researcher looks at how mTBI’s labeling and symptoms are described by the final project team members. The researcher explores how mild traumatic brain injury amongst service personnel is constructed in the text paying attention to what the discourses tell us of the ways in which the project team report members’ delegitimate and marginalize mild traumatic brain injury in their constructions of the military context.

The third study explores how members of the public make sense of mTBI in the British military. The researcher explores what members of the public think about mild traumatic brain injury in the military as well as the extent of the public’s knowledge of mild traumatic brain injury in the military. Given the military focus of
the study, the researcher also seeks to explore the views (if any) that members of the public have about health care provisions for British veterans of the Iraq and/or Afghanistan conflicts.

The fourth study shifts its focus from the macro of the organization (the British military in the first two studies) and the general public (the third study) to the micro (individual service personnel). The fourth study explores how former service personnel with mTBI make sense of their mild traumatic brain injury. The researcher seeks answers on the former service personnel’s understanding of mild traumatic brain injury while looking at what having mTBI means for the former service personnel. The extent (if any) and impact of the injury on the former service personnel’s decision to leave the military is also explored.

The Next Chapter

In this chapter the researcher explores how authors of the final project report on mTBI perceive mTBI in the British military.
Chapter 3. Study 1: Discourse analysis of an official report on the phenomenon of mild traumatic brain injury (mTBI) in the British military

3.1 Introduction

Though early records document the presence and knowledge of brain/head injury in ancient times, the injury regardless of its type, was not regarded as an epidemic till the twentieth and twenty first centuries when representations of brain injury granted it epidemic status (Goldstein, 1990). Goldstein (1990) refers to TBI as a silent epidemic. Goldstein (1990) however is not alone in portraying TBI as an epidemic. Chua et al. (2007) represent TBI (the combination of all traumatic brain injuries: mild, moderate and severe) as a twenty first century epidemic.

Other researchers steer clear from the use of the word epidemic and its connotation of a widespread panic inducing outbreak, opting instead to portray the injury as a serious health risk. Examples of these are Kraus et al.’s (2007) depiction of TBI as “a serious public health problem” (p.2508) and Hayward’s (2008) categorization of TBI as the “signature of modern conflicts” (p. 200). With such representations of TBI it is little wonder that mTBI which is encompassed under the TBI umbrella, is explicitly named a “perennially thorny issue” (Feinstein & Rapoport, 2000, p. 325). A United States Congress report by the National Center for Injury Prevention and Control (2003) on mild traumatic brain injury sheds some light on the reasons for mTBI’s status as a “thorny issue” by stating that the consequences of mTBI are not mild and that it would lead to serious public health issues. All these serve to construct mTBI’s status in the public health arena. In the thesis, the focus is on how mTBI’s status in the military is depicted. Fear et al., (2009) describe how mTBI ‘has become an increasingly high-profile battle injury’ (p.1379). Some researchers attribute this high profile status to the labeling of the injury; others focus on mTBI’s symptoms while another group of researchers state that it owes its status to mTBI’s long term effects.

In an attempt to make sense of this ‘high-profile battle injury’ (Fear et al., 2009; p. 1379) in this chapter the researcher explores official constructions of mild
traumatic brain injury in the British military as offered by the team members of the final project report commissioned by the Surgeon General of the United Kingdom’s Ministry of Defence’s Defence Medical Services. In this exploration the researcher seeks answers on how mild traumatic brain injury (mTBI) amongst military service personnel is constructed by the final project team members; paying particular attention to what discourses are invoked by these constructions. The researcher looks at what rhetorical functions are performed by these discourses and explores how possibilities for providing services and support to military personnel affected by mTBI are shaped, if at all, by these constructions of mTBI.

In an attempt to engage with these questions, attention is paid to the recurrent discourses in the data set looking at what discourses are raised, paying particular attention to how they (the discourses) are constructed. What the discourses construct is of interest as it sheds light on the official stance on incidences of mild traumatic brain injury amongst British service personnel.

3.2 Method

3.2.1 Background

The data reproduced below are derived from the Mild Traumatic Brain Injury Final Project Team Report (2008) obtained from the Ministry of Defence (MOD)’s website. The text analysed is written by experts in the field of brain injury in the civilian and military contexts. The text used is accessible to members of the public.

This study’s focus is on how the language used opens up and closes off various interpretations of the mTBI phenomenon. Some of the rhetorical devises discussed later in the analysis are alliteration, three – part lists and positioning (Atkinson, 1982; Wooffitt, 2001). Alliteration is where same sounding words or letters are used to draw attention to the content being framed. Three – part lists typically highlight a course of action by stating it thrice, thereby highlighting it. An example would be strengthening, consolidating and reinforcing. All three words refer to the same concept of fortifying.
3.2.2 Design

In this study, the researcher looks to social constructionism to unpack the final project report team members’ constructions of mTBI. Social constructionism appeals to the researcher as it focuses on social processes (Conrad and Barker, 2010; Danziger, 1997; Gergen & Gergen, 1991). It (social constructionism) assumes that the result of the interaction between the social realm, the realm of the individual and our actions are linked to our beliefs (Hoffman, 1990; Houston, 2001). It perceives ‘reality’ to be socially constructed, using language as a medium to construct a version of reality and present one’s knowledge on a social reality (Korsgaard, 2007). Discourse analysis being a part of the social constructionist approach, is a way in which we perceive social reality (Pedersen, 2009). It approaches language as a construction of reality determined by social interaction (Gee, 2011; Jørgensen & Phillips, 2002).

Discourse can be differentiated into two levels: ‘molecular’ and ‘molar’ analysis (Wetherell, 1998, pp. 390). On the molecular level the analysis deals with action orientation and stake accountability while on a ‘molar’ level the analysis would typically expand on power and subject positions in the discourse (Gill, 2000; Hollway, 1984). Action orientation looks at what the discourse is setting out to do (Gill, 2000). In other words, attributing the function or reconceptualising the actions in the discourse (Potter & Edwards, 1990). Stake accountability in a discourse expands on this by going beyond describing the role, focusing instead on the impact of the position taken by the role (O’Reilly, Dixon-Woods, Angell, Ashcroft & Bryman, 2009). Therefore, discourse analysis explores social practices such as texts and verbal communication by paying attention to rhetorical devices that describe and embody those practices (Potter, 1996a). The researcher subscribes to Wood and Kroger’s (2000) interpretation of Potter and Wetherell (1987)’s version of discourse analysis there are three assumptions of discourse analysis: 1) discourse constitutes action, 2) discourse draws attention, and 3) that there is variability both within and between participants engaging in discourse.
In conclusion, this study employs a social constructionist approach using discourse analysis to analyze the final project team report.

3.2.3 Data analysis

The data in this study is analyzed using discourse analysis. The focus here is to observe what patterns are located in the constructions and what functions the language used holds for these constructions (Taylor, 2001). This type of discourse analysis can be described as ‘epistemic’ (Horton-Salway, 2001, pp. 148). That is, it focuses on the constructions rather than a descriptive analysis. The researcher reads and re-reads the data to get a sense of the discourses being constructed in the report. The tone of the discourses and what images they invoked give an impression as to the version of reality being constructed in the final project report. Initial discourses are identified along with quotes that exemplified these discourses. The data is then reanalyzed by the researcher to discern patterns or differences in the discourses so as to formulate a story pieced together by the constructions. How the report spells out mTBI’s presence in the military, what it highlighted, what it dismissed and the language used in discussing mTBI form the core of the analysis. In essence, it looks at how mTBI is presented in this report. The analysis was read by the researcher with the aim of ensuring the extracts identified represented the discourses constructed by the final project team members. This is to ensure credibility in the interpretation being constructed. The constructions presented here are the researcher’s interpretations of the project team members’ constructions. It is possible that other interpretations of the data set might be constructed.

The data in this dataset could have been analyzed using critical discourse analysis since critical discourse analysis like discourse analysis deals with discourses and looks at social interaction. However, discourse analysis is employed here rather than critical discourse analysis as critical discourse analysis deviates from discourse analysis in terms of the attention it pays to inequalities in social relations. While discourse analysis draws out what the text/ discourse is saying critical discourse analysis focuses on the researcher’s interpretation of the domination of one discourse over another. Critical discourse analysis looks particularly at what is highlighted and what is relegated to the sidelines. As this first study is a preliminary investigation of
how the final project report team members construct mTBI, it is necessary to employ discourse analysis in the first instance to look at the variations in discourse rather than focusing on what the researcher discerns as: is emphasized or is not said in the text. Using discourse analysis enables the researcher to explore how the type of discourses constructed here serves to inform our understanding of how the authors of the report perceive mTBI in the military context.

In addition, the study employs the overall framework of social representations theory to explore final project team members’ (the authors of the mTBI final project report) representations of mTBI. To recap, social representations theory seeks to render the unfamiliar familiar (Marková, 2008). It has been used in research to explore how the public understand matters pertaining to science (Farr, 1993). Here, the use of social representations theory accords the researcher the opportunity to explore how the final project team members define the mTBI phenomenon in the British military. Using discourse analysis in a pluralistic approach with an overarching framework of social representations theory counters some of the criticisms levelled at social representations theory in the previous chapter. One of these criticisms is cognitive reductionism (Voelklein & Howarth, 2005). Cognitive reductionism involving the SRT concepts of anchoring and objectification is countered by the use of discourse analysis (Voelklein & Howarth, 2005). While the anchoring and objectification processes of social representations theory work to contain or define a situation within a set of terms, discursive psychology (which discourse analysis is a part of) enables the introduction of new labels (e.g., traumatic brain injury and signature injury) and renegotiates old labels such as shell shock and posttraumatic stress disorder within the context of the discourse. Given the final project team members’ identities as scientists and (in some cases) members of the military, their group associations may have framed the constructions. To date, no analysis of official texts on mTBI in the British military has been undertaken. As such an analysis of the report commissioned by the Surgeon – General of the Defence Medical Services could possibly present mTBI in terms of how the British military has defined it: its origins, the effect of mTBI on the British military and the military’s plans to contain (treat and manage) it. The extracts included in the analysis were selected because they were representative of the constructions presented in the
data set as a whole. In the final project team report, the historical reference, scientific evidence, stereotypes and the notion of compensation form the elements in the investigation, treatment and management plans for the phenomenon of mTBI in the British military.

3.3 Analysis

The main focus of the study is how mTBI amongst British service personnel is constructed by the final project report team members. The project team members centre their constructions of mTBI on three discourses: ambiguity, care and collaboration discourses. In the extracts on the ambiguity discourse, attempts are made to remove the ambiguity surrounding mTBI and at other times in the same discourse, mTBI is presented as uncertain. The first seven extracts presented here are constructions of the ambiguity shrouding mTBI. Please note that the line numbers in the extracts below describe the lines as they appear in the chapter and are not indicative of where they appear in the final project team report in Appendix A.

3.3.1 mTBI: a phenomenon shrouded in ambiguity

The ambiguity of mTBI seem to revolve around the pathology; the number of incidences in the UK being unknown; and the disparity in the number of incidences of mTBI across both sides of the Atlantic. With the proclamation at the onset of the report that traumatic brain injury (TBI) “is not a new phenomenon” (p. 2, para 1; p. 4, para 1), attempts are made to dispel the uncertainty surrounding mTBI. The construction of mTBI as an old phenomenon downplays its implications and serves to render it familiar. Moscovici (1998) had previously stated that history weighs heavily on the bearing of present events. As such, in the below extract, the final project team members’ references to past phenomenon similar in aetiology to mTBI, such as shell shock and post concussion syndrome weigh heavily in the representations constructed in the report.

In extract 1 below, mTBI continues to be constructed as “not a new phenomenon” (lines 1–2). The positioning of the words “almost certainly” (line 1)
before the negation of mTBI as a new phenomenon serves to construct its status as a long standing one. The coupling of shell shock and PCS from the two World Wars with mTBI of the present conflict lends support to the construction of an old phenomenon. The three – part list “share striking symptomalogical similarities” (line 4) draws attention to this old phenomenon construction, highlighting the similarities in the pathology of the three medical phenomenons. Here, Brown’s (1995) first two stages of illness constructions are presented. Extract one discusses the emergence of the phenomenon by positioning the emergence as an old phenomenon. The identification of mTBI qualifies it as a condition that is questionable based on Dumit’s (2000) list of characteristics (described earlier in chapter 3): MTBI shares similar pathology to shell shock, a disorder whose very status as a disorder was constructed elsewhere in the report as highly contested.

Extract 1

**Taken from the Mild Traumatic Brain Injury Project Team’s final report**

1. MTBI sustained during military operations is almost certainly not a new phenomenon. Shell shock during World War 1 and post-concussion syndrome (PCS) during World War 2 share striking symptomalogical similarities with mTBI.

   However, just as the ambiguity shrouding mTBI is lifted, it is pushed back into uncertainty in extract 2 and 3. In these two extracts, the causes of mTBI are constructed as uncertain and the incidences of mTBI is declared “unknown opening up constructions of a new, mysterious phenomenon. In extract 2, the use of the term ‘thought’ (line 6) suggests that the cause of mTBI is not a confirmed fact: it creates a possibility for contesting the presented cause and a space for other possible causes. This is in line with another characteristic on Dumit’s (2000) list that presents mTBI as a questionable condition. Extract 2 attempts to use the objectification process of social representations theory to render the group jargon on the definition of the cause of mTBI by representing it in common vernacular. It describes ‘changes in velocity resulting in brain shearing’ (lines 5-6) as something that has been thought to be a possible ‘cause of mTBI’ (line 6). The project team members thereby attempted to simplify the possible cause into the common vernacular rather than scientific lingo.
However, given their collective representation as scientists, they do not succeed entirely in breaking down scientific terms. “Diffuse axonal injury” (line 5) is not a concept that is familiar to those outside the scientific circle and remains pretty much a mystery even when followed up with the ‘changes in velocity resulting in brain shearing’ (lines 5–6). In extract 3, the worldwide incidence of mTBI being unknown continues to work up uncertainty (line 10).

**Extract 2**

*Taken from the Mild Traumatic Brain Injury Project Team’s final report*

5 (1) Diffuse axonal injury following sudden changes in velocity resulting in brain shearing is thought to be the cause of mTBI.

The mysterious, uncertain aspect of mTBI is constructed once again in extract 3 when a wide range of symptoms linked to mTBI are deemed to overlap with other known ‘psychological disorders’ (lines 7-8). Extract 3 addresses the unofficial numbers of incidences. Line 10 about the worldwide incidence of mTBI being unknown contributes further to the working up of uncertainty and adds further to Dumit’s (2000) list of characteristics on questionable conditions which have unknown incidences and overlapping symptoms.

**Extract 3**

*Taken from the Mild Traumatic Brain Injury Project Team’s final report*

7 (3) A wide range of symptoms assigned to mTBI overlap with other recognised psychological disorders.

9 **e. Epidemiology.**

10 (1) World-wide the true incidence of mTBI is unknown.

11 (2) The reported worldwide incidence of mTBI cases seen in hospital is 100-300/100,000 per year. The incidence in self-reported population studies is often more than 600/100,000 per year.

14 (3) Unpublished data suggests that the mTBI rate seen in current conflicts is likely to be less than 2% of all injuries. However, the data that have generated this incidence have not been collected with a view
to satisfying the Holm/WHO definition.

(4) The rate reported from the US is that mTBIs are sustained by 12-16% of all service personnel suffering injuries.

(5) 80% of all civilian brain injuries seen at UK A&E departments are mild.

An incidence of mTBI in conflicts is presented in line 14 but in such a way that grounds for contesting this figure are simultaneously presented: the data are ‘unpublished’ (and thus are constructed – for those knowledgeable about the construction of academic evidence – as not having been subjected to a peer review quality check) and there is a query about these data satisfying the new ‘Holm/WHO’ criteria (line 17). Quantification rhetoric is a feature of discourses when making a case in point or undermining an existing situation (Potter, Wetherell & Chitty, 1991).

Across this extract, the presence and absence of (in the case of United Kingdom’s statistics for mTBI in the military) quantification rhetoric and the (opening up of possibilities for) contestation of claims serve to construct uncertainty about the ‘reality’ of the situation (lines 12–20). The quantification rhetoric in this extract also serves to anchor the mTBI phenomenon to the existing literature on mTBI. Bauer and Gaskell (2008) had mentioned that the extent to which people relate to a social representation is related to how much they identify with the particular social group. The final project team members relate to mTBI as scientists’. They attempt to conceptualize their understanding for the layperson using quantification rhetoric in a story telling fashion to represent the mTBI phenomenon in a public domain as opposed to a military domain. When mTBI incidences are described in the military context in this extract they are accompanied by disqualifiers such as “unpublished” (line 14) data and “not collected with a Holm/WHO definition” (line 16–17). Thus in the naming and classification processes of anchoring the mTBI phenomenon, the project team members work up representations of the phenomenon as uncertain and not a major risk amongst service personnel with “less than 2%” (line 15) of the military population sustaining mTBI. The next extract below however, suggests that there is more to the uncertainty that shrouds mTBI and incidences of mTBI in the military may in fact be higher than previously reported.
Extract 4

Taken from the Mild Traumatic Brain Injury Project Team’s final report

In 2005, mild Traumatic Brain Injury (mTBI) attained a high profile within Congress when data suggested that its incidence in the military was higher than previously suspected.

In extract 4, the final project team members draw on the representation of mTBI in the US Congress. They classify mTBI as higher profile than “previously suspected (lines 24-25). The extent of the incidence of mTBI and the attention given to it adds to the air of uncertainty attached to mTBI. The suggestion of attaining ‘a high profile’ (line 23) within a body of authority such as the US ‘Congress’ (line 23) constructs the level of importance given to mTBI occurring within another important body of authority, the US military (line 24). The suggestion rather than confirmation adds to the shroud of uncertainty surrounding mTBI (line 24). The uncertainty and concern over mTBI continues in the next two extracts. In extract 5 the disparity between the UK and the US incidences of mTBI ferments the uncertain aspect of mTBI further. In extract 6 and 7 the long term effects of mTBI on military personnel are constructed as uncertain.

Extract 5

Taken from the Mild Traumatic Brain Injury Project Team’s final report

UK/US Comparisons. The incidence of mTBI sustained by UK military personnel appears to be lower than the US experience. The reasons for the difference in comparison to US figures are not fully understood.

Extract 5 works up representations of classifying experiences with mTBI as different in the British and American military setting. However, attempts to anchor mTBI as familiar fall short on account of the naming process. In the above extract, the project team members are unable to provide distinct rationale distinguishing the differences in experiences of both nations. The extract explicitly states that the
‘incidence of mTBI’ amongst UK military personnel is lower than the US experience (lines 26-27). The air of uncertainty created by the word ‘appears’ (line 27) suggests nothing is known for sure and therefore warrants caution. It goes on to construct the difference as ‘not fully understood’ (line 28). This constructs the phenomenon as at least partially indeterminate and therefore works up a need to exercise caution when comparing the incidences of mTBI in the two countries. It furthers the construction of the uncertainty attached to mTBI and how it could be different when both countries sent their troops to Iraq and Afghanistan. This subscribes to Dumit’s (2000) point about questionable conditions having a level of uncertainty and ambiguous incidences of mTBI. The next extract continues to add to the questionable status with the air of uncertainty. Adding to the confusions stemming from the ambiguities surrounding mTBI, the presentation of mTBI symptoms beyond three months set the stage for the next discourse on the continuum of care. Extract 6 presents quantification rhetoric from 1986 and weighs it against “recent US investigations” (line 32). It counters earlier constructions in the final project report on being symptoms free beyond three months (line 30). Here, there are attempts to classify mTBI as an injury which can be subdivided into two categories: those who are symptom free “within three months” (line 30) and those who have “enduring” (line 32) symptoms.

Extract 6

Taken from the Mild Traumatic Brain Injury Project Team’s final report

29 Although a study conducted in 1986 showed that most
30 subjects recover within three months of injury (only 8% having significant
31 symptoms at follow-up a year later), recent US investigations suggest a
32 higher proportion with enduring disorders.

Extract 6 constructs mTBI’s staying power. Here, the positioning of the word ‘only’ (line 30) before the presentation of quantification rhetoric ‘8%’ (line 30) attempts to defend the notion that mTBI normally results in being symptom free ‘within three months’ by drawing focus to the small percentage presented (line 30). However this construction is quickly shut down by the ‘recent US investigations’
suggesting a ‘higher proportion with enduring disorders’ (lines 31–32). The use of the adjective ‘enduring’ (line 32) before disorder in reference to mTBI suggests the long – lasting almost permanent nature of mTBI adding to the construction that mTBI is here to stay. The ambiguity of mTBI and its long term effects are constructed in the next extract.

Extract 7
Taken from the Mild Traumatic Brain Injury Project Team’s final report

33 a. There is concern about the potential long term adverse health effects
34 that mTBI and repeat concussions might have on military personnel. The
35 time taken to be fully deployable again after mTBI is unknown. The UK
36 shares this concern.

In extract 7 mTBI is constructed as possibly having ‘long term adverse health effects’ (line 33). It is worked up as having a role to play in determining the timeframe military personnel would take ‘to be fully deplorable again’ (line 35). This construction is developed further with the emphasis on ‘UK shares this concern’ suggesting this concern of operational capability is felt elsewhere (lines 35–36). In this extract mTBI appears to be in for the long haul. In extract 7 the final project team members objectify their representations of mTBI by keeping things simple by not using scientific jargon to describe long term effects of mTBI. Instead they represent mTBI as a phenomenon which leaves the service personnel with an uncertain timeframe as to when they can be deployed again post injury.

The ambiguity discourse here constructed the ambiguous nature of mTBI, the unknown incidences of mTBI in the UK military populations, mTBI’s pathology and similarities with other disorders/ syndrome and its staying power all serve to work up a need to ensure a continuum of care is in place. Based on past lessons in history where veterans (from the Vietnam War and World Wars one and two) have returned and faced health issues previously unheard of, here it seems like a natural progression to set up a care plan for the treatment of injured service personnel.
3.3.2 Spectrum of continuum of care

With the emergence of brain injury as a signature injury of the Iraq/Afghanistan conflict, it was imperative to look into how the personnel would be treated (Borg et al. 2004; Hoge et al. 2008; Holm et al. 2005). Brain injury was deemed a silent injury by many afflicted by it as well as by the scientific community at large (Feinstein & Rapoport, 2000). The notion of continuous care by the Ministry of Defence (MoD) made up the second segment of the project team members’ construction of brain injury amongst military personnel. The first extracts of the care discourse were centered on the US care plan and are juxtaposed against the UK’s care plans for service personnel. The focus of their discourse was the presentation of past, present and future care plans. The last extract in the care discourse however, focused on post mTBI and the minority of patients presenting symptoms three months after mTBI.

Extract 8
Taken from the Mild Traumatic Brain Injury Project Team’s final report

2. The US Defence and Veterans Brain Injury Centre (DVBIC), formerly the Defence and Veterans Head Injury Program (DVHIP) (established in 1991) coordinates military TBI evaluation and data collection. In 2005, mild Traumatic Brain Injury (mTBI) attained a high profile within Congress when data suggested that its incidence in the military was higher than previously suspected. In January 2007, the US Department of Defence (DoD) established a TBI Task Force, to undertake an assessment of the diagnosis, treatment, research and resources required to manage mTBI.

3. In the UK, Defence Medical Services (DMS) staffs have been involved in work on TBI for several years although more focused on the moderate and severe sectors of the spectrum. The UK already routinely screens all the personnel who are admitted to the Defence Medical Rehabilitation Centre (DMRC) Headley Court with multiple injuries for signs of brain injury. In addition the Defence Science and Technology Laboratory (Dstl)
Porton Down has been researching aspects of traumatic brain injury as a component of the combat casualty care programme. Dstl is undertaking world-leading research on neural markers subsequent to head injury and this work is of particular interest to the US.

Extract 8 highlights service provision and not the service users. With the exception of line 53 where there is reference to a “neural marker” the rest of the extract is descriptive of the prescriptive care plan in force. They describe what the two nations have done in terms of contingency planning. Project team members objectify the work done by brain injury centres, rehabilitation programmes and brain injury task forces by representing them in laypersons’ terms not going into specifics. The scientific representations in the extract point to all that has been done from start to finish (from when the mTBI phenomenon became known and till date of the report). The contingency planning of the two countries, the United States and the United Kingdom, is constructed in lines 3–54. The introduction of the years 2005 and 2007 (lines 39 and 42) serves to construct the timeline of the importance given to mTBI and the development of containing the issue since then by establishing a task force and a project (line 43) aimed at the diagnosis of mTBI and its management (line 44). An implicit comparison is made in the presentation of the US work and UK work on mTBI in the military (lines 37–54). Lazarus’ (1993) temporal frame of coping with the situation by learning from the past, present and future is evident in this extract. In line 47, the use of the adverb ‘already’ before routine screening suggests this has been carried out. The present participles ‘researching’ and ‘undertaking’ (lines 51-52) suggest work in progress. A hint of UK being ahead in the research is seen in line 53 with the construction of ‘world – leading research’ of ‘particular interest to the US’. In line 52, the mention of a ‘combat casualty care programme’ reinforces the construction of caring for its own kind.

Extract 9

**Taken from the Mild Traumatic Brain Injury Project Team’s final report**

Both the UK and US military medical communities face similar challenges concerning the clinical manifestations of mTBI (including the symptoms,
Extract 9 above suggests similarities in the US and UK ‘military medical communities’ in lines 55–58. The three-part list ‘symptoms, signs and results’ (lines 56–57) and the management of ‘short, medium and long term’ (line 58 suggests a continuum in the care planning. However the next lines (lines 59–60) ‘seemingly inconsequential head trauma’ constructs callousness in how the working team members views mTBI. In this extract the “military medical communities” (line 55) of both nations are represented as facing “similar challenges” (line 55). No delineation is named in their care plans. An attempt at classifying mTBI was made with a reference to the mildness of mTBI (line 59). However the reference of mild mTBI was teamed up with effects of “disabling and enduring symptoms” (lines 60–61) thereby discrediting any naming of distinct characteristics in the symptoms in the traumatic brain injury spectrum.

Extract 10
Taken from the Mild Traumatic Brain Injury Project Team’s final report

Consequent upon increasing concern at the potential incidence and significance of mTBI, the UK Surgeon General (SG), in June 2007, directed that a project be set up, to run for 6 months, to conduct an extensive review of the clinical issues and research being conducted in the areas of diagnosis and management of mTBI. The team consulted widely with laboratory and clinical specialists, in the UK and overseas, both military and civilian.

After the construction of the UK’s superiority over the US efforts, the next extract concentrates solely on the UK care plan. It unfolds the plan up to the present time. It gives the background to the mTBI final project report. The timeline and
sense of urgency in dealing with mTBI in the United Kingdom (UK) is constructed in lines 62-64. The ‘increasing concern’ (line 62) at the ‘potential incidence’ (line 62) set the stage for a series of follow ups in contingency planning with a project ‘set up, to run for 6 months’ (line 64). The words ‘extensive review’ (line 65) and the team consulting ‘widely’ (line 67) in the local and overseas settings (lines 67–68) across military and civilian circles suggests collaboration (line 68) as well as precision in ensuring all bases are covered in securing information on dealing with the issue at hand: the incidence of mTBI in military settings. The overall construction here is of the UK’s efforts and the superiority to the US efforts as well as the attention to the minute details of care right down to the individual service personnel. Extract 11 continues the present to future time frame with references to the project directions and the rolling out of the questionnaire and educational material.

Extract 11
Taken from the Mild Traumatic Brain Injury Project Team’s final report

69 6. An interim report was delivered on 14 Sep 07 which outlined the direction of the project and recommendations for further work, including evidence-based interventions. The report formed the basis for discussion at a plenary meeting at the project mid-point when the future direction for the project was agreed.

74 7. Educational material dealing with awareness and early management of the symptoms of cognitive disturbance has been issued via the chain of command down to individual level. Separate advice has been promulgated to Service General Practitioners.

78 8. The diagnostic/surveillance questionnaire has been rolled out and staffs are being recruited to administer and run the mTBI enhancements to the Moderate Brain Injury Programme at DMRC.

In extract 11, mTBI is classified as an injury “involving cognitive disturbance” (line 75) which requires a management plan on different levels: “evidence-based interventions” (lines 70-71) “Educational” (line 74) and “diagnostic” (line 78). In lines 69-73, there is a construction of an interim report and
future directions for intervention. The importance of the research going into the project report and contingency planning is constructed with the ‘plenary meeting at project mid – point’ (lines 72). The introduction of educational ‘materials dealing with awareness and early management’ (line 74) to be ‘issued via the chain of command down to individual level’ (lines 75-76) and separate advice given to service general practitioners adds to the construction of the continuum of the care (lines 76-77). It serves to construct work already carried out at every level of military hierarchy. This construction is carried a step further in lines 78–80 when the reports states that the diagnostic questionnaire ‘has been rolled out and staffs are being recruited’ to ‘run the mTBI enhancements to the Moderate Brain injury Programme’. Apart from constructing the future direction of the care continuum, this serves to close all forms of opposing views as to whether every angle of assessing, approaching and solving the problem has been considered by constructing the notion that every aspect has been dealt with. While extracts 8 - 11 suggest a continuum of care and espouse diagnostic and intervention care plans in a past, present and future temporal frame, the extract below constructs the perception of personnel who have persistent symptoms after/ beyond 3 months.

Extract 12
Taken from the Mild Traumatic Brain Injury Project Team’s final report

81 **d. Persistence and Overlap of Symptoms of mTBI.**
82 (1) Persistent symptoms beyond 3 months have little correlation with
83 the initial exposure itself but are strongly correlated with pre-existing
84 psychiatric and social factors and compensation seeking.
85 (2) Persistence of symptoms after 3 months is seen in a minority of
86 patients but such symptoms can cause significant functional impairment.
87 The persistence of symptoms one year after injury is evident in about 1-
88 2% of patients.

Recalling extracts 6 and 7’s suggestion of enduring symptoms beyond three months and long term effects of mTBI, the construction in extract 12 attempts to address long term health effects and enduring symptoms. Extract 12 shifts from
extract 6’s classifying of mTBI into two categories: within three months and beyond three months by dividing the latter category into two groups: symptoms after three months and symptoms after a year. Distinctions in the categories are named: those with symptoms beyond three months are “strongly correlated with pre-existing psychiatric and social factors and compensation seeking” (lines 83-84). In addition, those with symptoms beyond three months are represented as having the possibility of having “significant functional impairment” (line 86). Extract 12 serves to dispel the notion that symptoms after 3 months are part of exposure as a result of military duty, constructing them instead as a pre-existing factor and linking them with compensation seeking (lines 83-84). This construction delegitimizes the military responsibility to personnel with long lasting effects. Coupling this notion of beyond three months with compensation seeking may constitute a rhetorical strategy for locating cause outside the military context and thus deflecting responsibility (of the form ‘this condition was not caused by exposure to blasts but was present before’) and therefore constructing a reworking perhaps of compensation packages to sieve out pre-existing injuries. Before this notion can be contemplated, the construction of this group of individuals being in the minority (line 85) constructs it as a marginal issue. However when teamed with ‘significant functional impairment’ (line 86) it gives rise to concern over the care of these individuals and the cost of such care. Before this impact on the functional capacity of the armed forces can be dwelt on in lines 87-88, the presentation of quantification rhetoric of ‘1 – 2% of patients’ undermines its importance (Potter, Wetherell & Chitty, 1991).

The implications of the constructions presented here undermine the notion of “combat casualty care” (line 52) constructed in extract 8. It suggests that the long term care plans alluded to in extract 11 would not necessarily be handed down to service personnel at the individual level. It also constructs the MOD as trying to attribute long term enduring effects (previously constructed in earlier extracts as a feature of mTBI), to now be an attribute of a pre-existing conditions and compensation seeking. This is in keeping with Wellard’s (1998) observation of normalization in illness constructions where persons failing to meet the set norm, in this case being symptom free after three months, are constructed as deviant.
The US and the UK are the two key nations involved in the policing of the conflict in Iraq and Afghanistan. The earlier discourse of ambiguity surrounding mTBI and the current discourse on the spectrum of continuum of care constructed the collaboration between the US and the UK and also the way in which the two nations dealt with mTBI amongst their military service personnel. This leads to the final discourse on the consortium of collaboration between the US and UK in grappling with mTBI in military settings.

3.3.3 Collaboration consortium across both sides of the Atlantic

In this discourse on the collaboration between the two nations, the supremacy of the UK system over the US, the two systems being on par with each other and the difficulties in making direct comparisons between the two nations’ data are worked up. Four extracts are presented here that construct collaboration consortiums across both sides of the Atlantic. In extract 13 the positioning of the adverb ‘closely’ (line 90) before ‘aligned (line 90) suggests the intimate association between the nations in dealing with mTBI. Here the strong collaboration is worked up from the taxonomy to classification of mTBI, extending to the research into mTBI (lines 90 – 92). In this extract, the two nations seem to be on equal footing in dealing with mTBI in a military setting.

Extract 13

Taken from the Mild Traumatic Brain Injury Project Team’s final report

89 d.
90 The UK and US are closely aligned concerning taxonomy and
91 classification of mTBI and are working together on a number of areas of
92 clinical and laboratory research that will shed more light on mTBI.

While extract 13 names the two nations as “closely aligned concerning taxonomy and classification of mTBI” (lines 90-91), extract 14 below attempts to classify the two nations efforts at managing mTBI in their militaries by stating what the UK has already set in force and that the US would be particularly interested in
head injury neural markers (lines 101-103). Extract 14 was a part of extract 8 in the earlier discourse on care. It lends itself to the collaboration discourse with the supremacy of the UK system worked up stealthily starting from the ‘several years’ (line 94) that the ‘Defence Medical Services’ (line 93) - a body of knowledge in the military medical spectrum spent working on moderate and severe TBI. The extract then adds to the construction of building on past knowledge by stating that the ‘UK already routinely screens all the personnel who are admitted to the Defence Medical Rehabilitation Centre (DMRC) Headley Court’ (lines 95-97).

**Extract 14**

_Taken from the Mild Traumatic Brain Injury Project Team’s final report_

3. In the UK, Defence Medical Services (DMS) staffs have been involved in work on TBI for several years although more focussed on the moderate and severe sectors of the spectrum. The UK already routinely screens all the personnel who are admitted to the Defence Medical Rehabilitation Centre (DMRC) Headley Court with multiple injuries for signs of brain injury. In addition the Defence Science and Technology Laboratory (Dstl) Porton Down has been researching aspects of traumatic brain injury component of the combat casualty care programme. Dstl is undertaking world-leading research on neural markers subsequent to head injury and this work is of particular interest to the US.

In this extract, another agent of authority ‘the Defence Science and Technology Laboratory (Dstl)’ (lines 98-99) is introduced. This suggests a collective effort of agencies (the DMS, DMRC and Dstl) across the UK looking into caring for and managing mTBI. The past participle of ‘researching’ (line 99) works up the notion of this ‘combat casualty care programme’ (line 100-101) being in place or researched for some time. Supremacy of the UK system is hinted at with ‘world – leading research’ (line 101) and that it might be of ‘particular interest to the US’ (line 102-103). The use of the adjective ‘particular’ (line 102) draws attention to the US being singled out as a nation that might benefit from this cutting – edge research.
extract 15 the collaboration between the two countries is constructed once again within the framework of UK supremacy.

**Extract 15**

Taken from the Mild Traumatic Brain Injury Project Team’s final report

104 d. **UK/US Alignment of Data Gathering.** Where the UK can align itself with the US in such areas as data collection, this will enable valid comparisons of experience and clinical outcomes. The UK has based its screening and diagnostic tool on the WHO definition of mTBI using the framework of the US Military Acute Concussion Evaluation (MACE). It must be noted that the MACE questionnaire has not yet been validated in a US military environment.

Similar to extracts 13 and 14, extract 15 constructs UK and US alignments on the treatment and management of mTBI in their militaries. While extract 13 had constructed the two nations working together here the UK’s moving ahead is emphasized with the use of diagnostic tools based on “WHO definition of mTBI” (line 107). This demonstrates the fluidity of the representation of collaboration where they sometimes work together and where one nation is ahead of another at times. In extract 15 the UK is positioned as a nation that can apart from aligning itself with the US in terms of collection of data and experience in the clinical management (lines 105 – 106), supersede the US in delivery (lines 108 – 109). The screening for mTBI in the UK setting is classified as having been validated while the US military has not done so. This labelling of validated and not validated is an attempt at naming differences in two nations’ approach to mTBI in the military. This process of naming the distinctions between both nations in screening service personnel is continued in the next few extracts. The UK used the US framework of MACE (lines 107 – 108) suggesting US is ahead in terms of evaluation of mTBI. This construction is quickly closed off with the observation that that MACE questionnaire has not been ‘validated in a US military environment’ (line 109). Extract 14’s construction of screening of all troops with multiple injuries and the construction here of screening with MACE suggests that the UK is already in the process of validating MACE in a military setting, suggesting that it is ahead of the US. This process of naming the distinctions...
between both nations in screening service personnel is continued in the next few extracts. This suggestion is worked up in the construction of supremacy in extract 16.

**Extract 16**

*Taken from the Mild Traumatic Brain Injury Project Team’s final report*

110 18. It is however difficult to make direct comparisons with US data because of critical differences in the definitions and inclusion/exclusion criteria utilized. 111 Additionally the questionnaires used to define cases by each study are slightly different. The US has still to validate a questionnaire that identifies mTBI cases at the time of injury. In this last respect, the UK are probably as far advanced as the US, if not slightly further ahead as piloting of the UK instrument to identify mTBI is currently being undertaken in both major operational theatres.

In extract 16, the difficulty in the naming process: to a direct comparison between the two nations is worked up at the very start of the extract (line 110). The differences in criteria and definitions are supposedly behind these difficulties (lines 111 – 113). The representations of difficulty and differences in “definitions and inclusion/ exclusion criteria” (line 111) between the two nations serve to anchor mTBI as a phenomenon that is difficult to classify with blurred boundaries on what to include and what to exclude when trying to define and identify its symptoms. However, this construction of difficulty in comparing the two systems is closed off as soon as its starts with the declaration that the US has yet to ‘validate a questionnaire that identifies mTBI cases at the time of injury’ (lines 113 – 114). The suggestion that the US is lagging behind the UK is worked up in lines 114 – 115. At first the UK is constructed as probably as advanced as the US suggesting both countries are on par. This opens up the possibility of constructing the UK as further ahead than the US with the ‘piloting of the UK instrument’ (line 115). This construction of UK supremacy and being ahead in the research is shared in the next extract.
Extract 17
Taken from the Mild Traumatic Brain Injury Project Team’s final report

25. I would expect that our US colleagues have invested substantial resources in the development of these sensors, and their procurement. At this time there is little information available on how they are going to analyse and use this data.

26. In my view there is a moderate degree of technical risk that the data being collected from the helmet sensors may not correlate to mTBI(blast).

27. The UK approach, initially understanding the scale of the problem and then determining the mechanism of the injury should help define the requirements for the capture of data from such sensors. This information may have significant value to our US colleagues and may well complement similar research they may have in place.

In extract 17 representations of UK supremacy are made with classifying the US efforts at developing sensors as still in its early stages with “little information available on how they are going to analyse and use this data” (lines 119-120). The UK approach is suggested as a solution to the problem of capturing data from the sensors the Americans had developed. It is constructed as complementing current US research (lines 126-127). The US is constructed as engaging in longstanding efforts to deal with the mTBI phenomenon by investing ‘substantial resources’ (line 117) in developing sensors. This construction is promptly shut down with the suggestion that there is little information on how the US is going to analyze or use their research (line 119). The subsequent suggestion of the UK approach adding ‘significant value to our US colleagues’ (lines 117 – 125) works up collaboration between the US and the UK on the research front besides hinting at supremacy of the UK approach when it (the UK approach) comes up with solutions to research that has been undertaken in the US. The US efforts are then further delegitimized with the construction that helmet sensors might not correlate to blasts (their main purpose of the research to begin with) (lines 121 – 122).
In conclusion, the researcher utilizes Gergen and Gergen’s (1986) three narratives in illness constructions to summarize the constructions in the study: a progressive one that orients towards the achievement of the goal, a regressive narrative that alludes to the impediment of the goal and the third narrative is a stable one where no change occurs. The final project team members’ constructions of mild traumatic brain injury move from one end of the spectrum to another. They begin their constructions with a regressive narrative where they construct mild traumatic brain injury as a heterogeneous disorder. The identification and diagnosis as well as its labelling as a disorder are constructed as impeding the management of the illness as it could potentially create chaos and confusion amongst the service personnel about the actual state of their well being. The final project team members then construct a progressive narrative describing the development and implementation of a diagnostic tool to successfully identify service personnel for mild traumatic brain injury. There is then a shift in their constructions of mTBI with a stable narrative on how they are ahead of the United States in their research on mTBI and how everything is under control with no need to change the status quo as they have already found solutions to the problem in terms of treatment and management of mTBI.

3.4 Discussion

Three discourses were discerned in the final project team members’ constructions of mTBI: ambiguity shrouding mTBI, continuum of care and a collaboration consortium. The final project team report was the sole document subjected to discourse analysis. Analysis of other documents such as MOD’s news articles may have presented a different set of discourses such as a pivotal focus on policing/ rebuilding Iraq and / or Afghanistan, which was a prevalent discourse on MOD’s website and other British military related websites. The researcher made a deliberate choice in subjecting the mTBI final project team report to a standalone analysis. The aim of this was to present the official constructions of mTBI constructed by the final project team members who had been commissioned by Surgeon – General of the Ministry of Defence’s Defence Medical Services (DMS) to
come up with a management and treatment plan to manage the incidences of service personnel returning with mTBI.

Revisiting the questions raised in the literature review of brain injury in chapter 2, the researcher explored how the final project team members answered these questions in their constructions. To recap, in chapter 2, the ambiguity of symptoms and the link between PCS & mTBI and PTSD and mTBI was constructed. In this empirical chapter, the similarities between these symptoms to those of mTBI were drawn extending it to problems in thereby diagnosing those presenting these symptoms as having sustained mTBI. Furthermore, the final project team report members appeared to subscribe to the popular worldview in the literature constructing those with persistent symptoms as compensation seeking. The final project team report members explored the criteria for diagnosis of mTBI in the military setting in their report and their report is accessible online to members of the public. Nettleton (2006) broached the issue of diagnosis and access to information on the condition. Being able to locate their symptoms in an established/ recognised medical condition enabled those with the conditions to seek help and be regarded as genuine sufferers of the ailment rather than being labelled a pretender (Nettleton, 2006). Positioning mTBI alongside shellshock constructed the danger of labelling a new disorder a ‘signature injury’ (Jones, Fear & Wessely, 2007). In the final project team report, associating mTBI with shell shock and lessons in history gone wrong suggested that mTBI had best not be considered a genuine condition of consequence. The projects team members subscribed to the construction of a problem solving approach to scientific discourse previously described by Wellard (1998). They discussed the problem of mTBI and constructed the solutions in place or to be put in place. All of this served to give an impression that everything was under control or would be managed soon. According mTBI more attention or a higher status than the current status quo could lead to problems in terms of compensation claims and rising healthcare costs of veterans. The project team members’ constructions of mTBI dealt with the diagnosis of the condition as fraught with difficulties. MTBI’s overlapping symptoms with other medical conditions posed problems at the diagnosis level. This suggested wariness on the part of medical professionals to accept the condition due to the uncertainty and overlap with other symptoms. This posed serious implications
for service personnel who may have sustained mTBI in terms of their access to treatment and information regarding their condition. Not knowing where they stood in terms of treatment options or diagnosis could possibly lead to increased anxiety and possibly heightened PTSD. PTSD was known to be more acute in personnel with mTBI (Elder & Cristian, 2009). Revisiting Conrad’s (2005) medicalization and the power medical professionals and social support groups have in lobbying for a medical condition to be included in the Diagnostic and Statistical Manual of Mental Disorders (DSM), it is to be noted that mTBI has been defined by the WHO. However, as constructed by the final project team members, diagnosis of mTBI still seemed problematic and encompassed in uncertainty. The representation of mTBI here was of a medical condition fraught with uncertainty, where classification was difficult and the naming of distinct features was impossible due to the injury’s similar symptomology to other disorders such as shell shock, post concussion syndrome and PTSD. Besides the uncertainties in defining mTBI and pinning down its symptoms to fixed categories, the duration of the manifestation of those symptoms were also represented as uncertain.

The final project team members had constructed the majority of service personnel with mTBI being symptom free beyond three months. This was constructed as a normal course of things. However, the team also presented evidence in the American literature that hinted at a higher number of individuals afflicted with longer, enduring symptoms of mTBI. Furthermore, symptoms beyond three months were constructed to be attributed to pre-existing ‘psychiatric and social factors and compensation seeking’ (line 84) rather than exposure to bomb blasts. Revisiting Wellard’s (1998) point on normalization, any deviation from the norm, in this case, persistent symptoms beyond three months was seen as abnormal. It is important to consider who sets these norms. These norms are derived by the scientists involved in investigating this phenomenon in the military. Who were these scientists and which organizations were they social members of? Most members were part of the military and as such this raised questions as to what were at stake in their constructions and how this affected the average service personnel. While social representations theory would have limited the scope of inquiry here due to cognitive reductionism of anchoring and objectifying, social constructionism removed the boundaries of
discourse focusing on action orientation, stake accountability and variability. This enabled a wider scope for delving into hierarchies and power (Voelklein & Howarth, 2005).

Social constructions of illness construct the emergence of the condition, identifying the cause of the condition and end with the management of the condition (Brown, 1995). The discourses reproduced here lent themselves to the ideology of scientific discourse. They presented experiments and results, drawing comparisons with other disorders that were identified in previous conflicts. Locating the discourses within the list of characteristics identified by Dumit (2000) served to place mTBI in a questionable light (sharing similar characteristics with other disorders and uncertainty as to what caused mTBI). This effectively questioned mTBI’s legitimacy as a disorder, which in turn, raised the question of mTBI’s status in the British military. Was mTBI a disorder of considerable importance? Had sufficient measures been put in place to identify, treat and manage service personnel with mTBI? The constructions of mTBI here bring forth the notion of hegemonic masculinity. Hegemonic masculinity deals with power and control over a situation (Connell, 2005). In a situation such as the war on terror, hegemonic masculinity is presented in the role of the protector (Tickner, 2001). In the extracts presented here, the project team members employed hegemonic masculinity to present the MoD’s Defence Medical Services in the UK as the protector of service personnel. Line 47 suggested that service personnel were “already routinely” screened and line 107-109 constructed the UK as advanced in its screening using WHO definitions of mTBI while the US was yet to validate the tool in their military setting. This positioned the UK as superior in dealing with the situation even though both countries are operating in the same conflict zones. It also suggested that all is well and there was no need for concern over the incidences of mTBI as the situation was under control. This construction continued in lines 110-111 where possibilities for discussion on the discrepancy in the UK and US reported incidences of mTBI was shut down by the construction of the piloting of the tool to identify mTBI “currently being undertaken in both major operation theatres” (line 116).
The representations of mTBI in the final project team report were medical representations of mTBI: defining it, describing the difficulties in definition and management while highlighting ongoing efforts to manage the incidences of mTBI in the British military. Representations of a united front to deal with mTBI were put forth with the constructions of collaboration between the US and the UK. Though the report was technical on some levels with its descriptions of the manifestations, attempts were made by the final project team members to objectify the incidences of mTBI and its symptoms so that it was easily understood by the layperson. The representations of mTBI in the report suggested that a coordinated team effort was in place to manage and treat British service personnel with mTBI. Further research (such as public opinion and individual accounts by service personnel with mTBI) into the versions of realities constructed in the final project team report would help to shed light on the phenomenon of mTBI in the British military. Research into mTBI in the military setting have previously looked at adjustment of service personnel and causes of the injury as well as treatment options. Analyses of texts on mTBI in the British military have not been attempted. While this paper focused on the final project report commissioned by the Surgeon General of the DMS, other textual accounts such as reports by British newspapers might construct mTBI in the British military differently, which might in turn, open up or close off provision of services and support to service personnel with mTBI. Researchers could observe service personnel with mTBI and identify the number of personnel with enduring symptoms. Personnel with blast injuries who have not been sent to Headley Court could also be screened for mTBI to determine if they have sustained mTBI. This might present an increase in the number of service personnel affected by mTBI. This could then change the face of contingency planning for service personnel in the United Kingdom with mTBI.

3.5 Conclusion

The constructions and representations here open up avenues for future research on mTBI. The project team report members raise questions on the pathology of mTBI and construct care plans to manage and treat mTBI incidences in the British military. Future research could explore what members of the public make
of the mTBI phenomenon as well as look at individual service personnel’s experiences with mTBI. The constructions discussed in this chapter are just one interpretation of the final report. Other researchers might subject the report to a different form of analysis and interpret another set of constructions. The next chapter attempts to do this by subjecting the final project team report discussed here to a critical discourse analysis looking at processes of delegitimation and marginalization.

3.6 Reflection

In this empirical chapter of the thesis, the researcher looks at research on the mTBI phenomenon in the British military. Initially the researcher had plans to analyze British military magazine articles on mTBI in the British military. However, this proved to be an arduous task. While the American military magazines had articles on mTBI and service personnel’s accounts of their injury, their British counterparts had none. Enquiries with the magazines resulted in no response. The only magazine which responded to the researcher’s enquiry was Soldier Magazine. However their response was that “we have never nor will be ever” publish articles on mTBI (personal communication). This suggests yet another difference between the US and the UK in dealing with mTBI in the British military. This inequality in the accounts formed the basis for the next study on what is highlighted and what is marginalized in constructions of incidences of mTBI in the British military.
Chapter 4. Study 2: Deconstructing the mechanisms used by the military to create certainty from uncertainty

4.1. Introduction

In the previous chapter the researcher explored how final project team members constructed mTBI. The study focused on the unpacking of the type of discourses the authors of the report constructed. Official documents tend to display discourse structures of ideology and power relations in their constructions (Abrams & Hogg, 2010; Burman & Parker, 1993; Burr, 2003; Parker, 1992; van Dijk, 1998). Following a preliminary exploration of the final project report on mTBI in the previous study the researcher was interested in looking at the same dataset to explore discourses on ideology and power relations in the final project team members’ constructions. Building on the previous study as a foundation, the researcher delves into the same dataset to deconstruct the mechanisms used by the military to create certainty from uncertainty. While the previous study focused on the type of discourses constructed and what they tell us about the final project team members’ perceptions of mTBI, the researcher looks to expands on this in this study by dissecting what was said to why it was said and what implications that holds for how mTBI is perceived by the authors of the report. In this chapter the researcher reexamines how mTBI amongst service personnel is constructed in the text. The focus however shifts, moving from exploring the type of discourses in the previous chapter, to focus instead on what the discourses tell us of the ways in which the project team report members’ construct mTBI in the military context. Expanding on the analysis from the previous chapter on the same dataset, the researcher explores the processes of marginalization and delegitimation in the final project team report. The ways in which the final project team members emphasize and tone down certain aspects of the injury is also attended to.

4.2 Method

The data reproduced below are derived from the Mild Traumatic Brain Injury Final Project Team Report (Mild Traumatic Brain Injury Final Project Team, 2008)
obtained from the Ministry of Defence (MOD)'s website. The text analyzed is written by experts in the field of brain injury in the civilian and military contexts. The text used is accessible to members of the public. Through a preliminary analysis of the report, three discourses were discerned: mystery surrounding mTBI, continuum of care and the collaboration across both sides of the Atlantic. The three discourses shape the official construction of mTBI presented in the report. They are presented amidst a backdrop of scientific and historical discourses. During the preliminary analysis, the researcher discerned processes of delegitimation and marginalization. As such, this study extends the constructions of the previous study by exploring the processes of delegitimation and marginalization of mTBI by the authors of the project team report. Given that the project report is compiled by a team commissioned by the Surgeon General of the Ministry of Defence's Defence Medical Services what the project team chooses to highlight or not (marginalize) and acknowledge and/or accord it a status or not (delegitimate) would form the basis of the analysis. This analysis proceeds to explore the ways in which mTBI is constantly relegated to the sideline (marginalized) and constructed as questionable as a disorder (delegitimated). Marginalization could suggest the presence of an ideology that is contrary to those being presented (de Beaugrande, 1999).

4.2.1 Design

Since the report is commissioned by the Surgeon General of the Ministry of Defence's Defence Medical Services, the researcher is interested in the ideology and power relations that may have been present in the constructions. As the report is written by an elite group, the researcher is interested in the elitist discourses present and is interested in analyzing the data using a pluralistic approach of discourse analysis drawing on elements of critical discourse analysis. Of particular interest is the type of ideology put forth in the construction of mTBI in the text. Critical discourse analysis with its emphasis on ideology and power is introduced to enable the analysis to be magnified from the micro (preliminary analysis in the previous chapter) to the macro lens (van Dijk, 2004a; Wodak & Weiss, 2005). Critical discourse analysis explores the power relations and social inequalities presented in discourses (Parker, 2005). The use of critical discourse analysis allows for an
exploration of the ideology of the social group that presented the report (Seymour-Smith & Wetherell, 2006). This would facilitate the unpacking of the project team’s notions of what they consider to be core issues in their understanding of mTBI. Critical discourse analysis is employed here in this study rather than discourse analysis as the researcher is interested in deconstructing the earlier constructions by the authors of the final project team report so as to explore how the authors attempt to position mTBI in terms of care, treatment and management plans. In the preliminary investigation of the same report discourse analysis was employed to look at the type of discourses constructed. In this study, the researcher wants to look beyond the descriptive to explain why the interaction is framed in a certain way and what this can be interpreted as (Chouliaraki, 1998). In van Dijk’s (2001b) words critical discourse analysis is “discourse analysis with an attitude” (Koreinik, 2011, pp. 96). Therefore, using critical discourse analysis instead of discourse analysis enables the researcher to deconstruct the constructions in the previous study and offer their own interpretation of those constructions.

4.2.2 Data analysis

The data are subjected to a critical discourse analysis using van Dijk’s (2004) definition of the context of the text as a starting point. According to van Dijk (2004b), the context model has a series of categories (location, people and action) and subcategories (the roles of the people, their identity in terms of organization/group they belong to and its aims). Knowledge and ideology weave the link between the categories and subcategories (van Dijk, 1995). The knowledge of what is presented in the text is located in the context of who is presenting it and this is in turn linked to the organization or social group that the person presenting belongs to (van Dijk, 1998. What is presented would be part of the group’s ideology (van Dijk, 2004a).

How a story is presented and from which viewpoint has an impact on its reception (Fine, 1998). Within each extract, the context in which the data were presented and the how the social actor’s role was aligned to the arguments presented were discerned. Particular attention is paid to the presentation of the data. What is
said is not as important as how it is said/presented (Potter & Wetherell, 1987). Stressing one viewpoint to the extent of neglecting another viewpoint can lead to a form of marginalizing (Oteiza, 2003). Therefore the discourse structure of the arguments presented is analyzed. The principles of critical discourse analysis dictate the examination of the dominance of power, and how the group(s) projects this power (van Dijk, 1993). A major component of the discourse structure in critical discourse analysis is the concept of othering through the use of ‘us’ and ‘them’ (Bishop & Jaworski, 2003; Fine, 1994, van Dijk, 1995). Based on Potter (2005)’s discussion of how othering in the form of accountability is situated within the power relations and ideology the researcher sets out to explore how the authors constructed the accountability within the role of the social actors of the report: the final project team and the immediate subscribers of the report, MoD in relation to mTBI incidences within the military context. Besides critical discourse analysis, the researcher used the overarching framework of the thesis, social representations theory to explore representations of mTBI made by the project team.

The researcher began the analysis with how mTBI incidences amongst service personnel were constructed. The researcher read and re-read the report and identified the emergence of three discourses. The discourses are:

- mTBI: the controversial label
- Beyond three months: the miserable minority
- Managing mTBI

MTBI: the controversial label has elements of caution against labeling, difficulties in quantifying a controversial disorder, and the question of mTBI’s status as a signature injury of the Iraq and Afghanistan conflicts, while managing mTBI had elements of the challenges posed as well as defining mTBI in medical terms. What is outside the norm is considered unacceptable and labeling is called into question. The ‘us’ and ‘them’ idea is subscribed to in this analysis.
4.3. Analysis and Discussion

The notion of script formulation and modal construction was introduced as qualifiers of legitimisation/delegitimation and marginalisation (Sneijder & te Molder, 2005). Following a formulated script of presenting scientific evidence pitted against self-reported symptoms served to delegitimate and marginalize mTBI. Modal constructions focused on the use of quantification rhetoric, constant reference to analogies between shell shock and mTBI and lessons learnt in history from the popularity of shell shock served to delegitimate and marginalize mTBI.

The analysis focused on mild traumatic brain injury (mTBI) amongst service personnel in Iraq and Afghanistan, as constructed in government reports and Ministry of Defence (MoD) publications. Three discourses that marginalized and/or delegitimated mTBI in the final team report are discussed here. Please note that similar to chapter 3, the line numbers in the extracts below describe the lines as they appear in the chapter and are not indicative of where they appear in the final project team report in Appendix A.

4.3.1 mTBI: the controversial label

Social constructions focus on the social labeling of a problem/issue (Brown, 1995). The labeling of mTBI as a disorder was queried throughout the constructions of mTBI in the text.

Extract 1
Taken from the Mild Traumatic Brain Injury Project Team’s final report

1 b.
2 Both shell shock and mTBI are naturally recovering disorders. The sub-
3 population of chronic cases are, however, notoriously resistant to treatment.
4 c.
5 ‘Shell shock’ and ‘mTBI’ are purely descriptive labels, and do not assist
6 in questions of aetiology or prognosis.
There are good reasons for caution before endorsing a new label such as mTBI. Labels are often applied before an apparently novel disorder is properly understood. Those that strike a popular chord are often misleading and can inhibit understanding and effective treatment.

There were historical representations of mTBI situated here in relation to shell shock. This served to anchor mTBI within the associations of the shell shock experience. Caution was expressed here in the medical/diagnostic representation and naming of the disorder served to delegitimate the disorder and discourage the naming of it as new. In this extract, the mTBI project team set out to present mTBI as a disorder that was ‘naturally recovering’ (line 2). Political discourses typically utilize the good versus bad alignment when presenting their arguments. Their views are normally aligned with good and opposing views are cast as bad (van Dijk, 1995). By presenting chronic cases of mTBI and shell shock as ‘notoriously resistant’ (line 3) the authors of the final report set out to construct their ideological standpoint on mTBI’s labeling as a disorder. The reference to notorious suggests chronic cases of mTBI as bad. From the start of the extract, mTBI was constructed as similar to shell shock (lines 2-5). It was worked up as a ‘descriptive’ (line 5) label and marginalized as not being able to aid with ‘prognosis’ (line 6). Labels were then constructed as having the power to mislead (line 10) and sway the reader/listener (Huibers & Wessely, 2006). The identity of the agent of action (endorsing) was ambiguous. Who held the authority to endorse (line 8) the label – the scientist researching the phenomenon, the government or the media when reporting the phenomenon? It was concerned with warning against the over-hasty adoption of ‘mTBI’ as a ‘label’, keeping it, for now, away from the mainstream of accepted diagnostic labels (with their attendant power).

The initial specific concern with mTBI was followed by a presentation of a general principle or trend (‘Labels are often applied before an apparently novel disorder is properly understood’), with practical risks being associated with labels that ‘strike a popular chord’. This common musical metaphor invoked a phenomenon that appealed to and was taken up by the masses, even though it was ‘often
misleading’. Here the collective was constructed as ill-equipped to discern the ‘misleading’ nature of that which they have embraced. The adverse implications associated with this were not insubstantial: they relate to both knowledge and practice (‘can inhibit understanding and effective treatment’). The ideology presented in this extract cautions against the labeling of this new disorder. This extract thus provided a sense of what was worked up as being at stake in not marginalizing mTBI until its credibility can be determined by those who are equipped to do so. MTBI was worked up as a fairly new disorder shrouded with uncertainty.

MTBI continued to be built up as a disorder that has similar symptoms to two other disorders: shell shock and post-traumatic stress disorder (PTSD) in extract two. The text here oriented towards the problems faced by labeling mTBI as a disorder. The caution against endorsing new labels expressed in extract one makes way here for a historical discourse centered on labeling. Drawing parallels between shell shock and mTBI, it recounted lessons in history (with shell shock in the First World War) and how patients were affected by the labels. The extract constructed a sense of delegitimizing mTBI by association.

Extract 2

Taken from the Mild Traumatic Brain Injury Project Team’s final report

46. Preliminary results of a study of UK troops returning from Iraq suggest a very strong association between the symptoms of mTBI and those of post-traumatic stress disorder (PTSD). Indeed, studies of civilians with mild head injury had shown an association with PTSD. It appears, therefore, that it can be difficult to distinguish between the effects of mild head injury and an exceptionally stressful experience. Even with the social acceptance of PTSD, service personnel still prefer to be labeled as suffering from mTBI than a psychological disorder. Shell shock too was largely free from stigma when used in the early phase of the First World War because it was perceived as a wound, or a neurological lesion. Raynor, a divisional psychiatrist serving with the AEF, recalled “with what tenacity men clung to a diagnosis of ‘shell shock’…”
something which was generally recognized as incapacitating and warranted treatment in a hospital”.

Although it may be better for self esteem and career prospects for a veteran’s symptoms to be attributed to mTBI rather than PTSD, it is also important to note that labels themselves affect prognosis. For example, a study of post-concussional syndrome by Whittaker et al. suggested that subjects who believe that their symptoms have lasting and deleterious effects are at heightening risk of experiencing an enduring disorder of this kind. In other words strongly held negative beliefs play a part in maintaining symptoms and functioning – exactly the reasoning which led the British Army to discourage the use of term shell shock in 1917.

Similar to the previous extract, this extract dwelt on historical and medical representations. The representations of mTBI here served to suggest that though social representations were somewhat fluid, they remained fixed in this representation where past informs the future. This past informing the future was also a key feature of CDA. Thought the representations here were about disorders and symptoms, the tone of the representations were not weak coming across as rather strong resisting the labeling of a disorder. In this extract, mTBI was constructed amidst a backdrop of scientific and historical discourse. Here, the variation in the construction of mTBI to include scientific evidence as well as association with yet another disorder (PTSD) spoke volumes about the ideology and the function in this discourse (Potter, Wetherell, Gill & Edwards, 1990). Ideology in this case would be a set of beliefs held by a group that functions as a baseline for scientific interpretations shared by a collective group of medical professionals (van Dijk, 2006). The discourse was rooted in the scientific knowledge and thereby hard to dispute. Scientific evidence was put forth with references to ‘strong association’ (line 13) between PTSD and mTBI. According to Walker (2006) this was an attempt to pathologize an illness with correlations and other such scientific evidence. This construction was continued with a reference to ‘divisional psychiatrist with the AEF’ (lines 20 - 21) and ‘Whitaker et al’ (line 27) demonstrating expert opinion and thereby marginalizing mTBI as a stand alone disorder. The AEF is the acronym for the American Expeditionary Force that served during the First World War. Reference
to this group lent power to the statement being presented. Service personnel’s preference to be labeled an mTBI sufferer as opposed to PTSD and the rationale behind this was worked up. It reinforces extract one’s construction of caution on the part of medical experts on labeling of new disorders and the caution resounds in lines 27 - 31 citing the British Army’s discouraging the use of the term ‘shell shock in 1917’ (line 31). The ideology presented here constructed the service personnel’s role in illness construction. Cohn, Dyson & Wessely (2008) explored how rumour might trigger self diagnosis and impact on patients’ perspectives on their illness and their subsequent behavior and attitude to treatment. Illness diagnosis kick started the labeling process (Brown, 1995). In this extract, this ideology was presented with references to the ‘tenacity’ (line 21) of the men clinging onto the shell shock label (line 21 – 22). This constructed the notion of the power of the patients in selecting the labels that present better benefits for them. This was qualified with reference to better ‘self esteem and career prospects’ (line 24). In addition, the notion of new disorders being relatively ‘free from stigma’ (line 19) was introduced along with how labeling can affect ‘self esteem and career prospects’ (line 24). The example of ‘post-concussional syndrome’ (lines 26 – 27) and the patients’ beliefs in ‘lasting and deleterious effects’ (line 1511) worked up how a disorder can create certain perceptions of its enduring effects on its patients. This was qualified with how ‘strongly held negative beliefs play a part in maintaining symptoms and functioning’ (line 29 – 30). Likening mTBI to shell shock and then working up a rationale as to why shell shock as a label was discouraged delegitimated the labeling of mTBI as a disorder.

Extract three continued with the historical discourse on mTBI repeating the shell shock and mTBI analogy and extending it by constructing the state of frenzy caused by shell shock. Here, for the first time, labeling was introduced as having implications for compensation claims.

**Extract 3**

* Taken from the Mild Traumatic Brain Injury Project Team’s final report

34  72.  The following clinical description is taken from the First World War
but could equally apply to a case of concussion suffered in Iraq of Afghanistan:

The lieutenant under my care told me... he felt a great pressure against him; it was soft but sufficiently powerful to knock him down unconscious. He did not know how long he was unconscious, but thinks it must have been an hour. When he recovered consciousness, he got up and was helped away. His head felt as if it would burst and ever since he has had a whizzing in his left ear and dizziness.

In terms of mTBI, there are similarities between the current conflicts in Iraq and Afghanistan, and the British Army about to begin the Somme offensive of July 1916. Head wounds and concussion were common battle injuries and potentially life threatening. Yet diagnosis was problematic and it was often unclear what aetiology related to specific symptoms, especially in cases that had become chronic. Shell shock, like TBI, had caught the popular imagination and also the attention of the media. They have both become high-profile disorders without obvious stigma. The British Army struggled to define shell shock and without a clear understanding of what it constituted failed to produce a coherent management plan. The post-war ramifications were catastrophic with escalating war pension claims and a series of costly initiatives designed to treat chronic cases. So troublesome had been the disorder that the term shell shock was proscribed on the outbreak of the Second World War and draconian policies introduced to try to prevent its reappearance.

Extract three started off with a medical representation of shell shock and it was represented as being similar to symptoms suffered by those returning from Iraq/ Afghanistan. The descriptive aspect of the representation of shell shock twinned with mTBI served to classify mTBI as the same as shell shock and as ‘troublesome’ (line 50) as shell shock. MTBI was named a disorder which would have serious implications of health care costs (lines lines 49-52). The extract worked up similarities between the First World War and current conflicts in Iraq and...
Afghanistan. Here, the discourse structure was one of the presenting problems of the disorders: shell shock and mTBI. No solutions were in sight save the proscribing of the label (line 51). Whether the same should be done with the new label mTBI was not discussed in the extract. The popularity of the two disorder alluded to in extract one was continued here in more detail. The similarities in aetiology of traumatic brain injury (TBI) and shell shock were worked up yet again (lines 40-47). Highlighting the similarities of the two disorders, suggested a homogenization of their characteristics. With this homogenization, the notion of othering through the invocations of ‘us’ and ‘them’, were worked up. The social actors of the text were positioned as the outsiders, the narrators of the lessons from shell shock. The structuring of the use of negatives like ‘problematic’ (line 43), ‘failed’ (line 48), ‘catastrophic’ (line 49) and ‘troublesome’ (line 50) presented mTBI in a negative light. The popularity of the two disorders with the media and possibly the troops was constructed as problematic and to a certain extent resulting in chaos in the war management system (lines 47-52). The positioning of the adjective ‘popular’ (line 45) before ‘imagination’ (line 45) attempted to marginalize mTBI as a disorder as popularity can be regarded as a feature that will wax and wane. This invocation of fluidity was seen earlier in extract two’s worked up reference to shell shock’s stigma-free days ‘in the early phase of the First World War’ (line 19) and the ending with the British Army’s discouraging the ‘use of the term shell shock’ (line 31) towards the end of the war. The use of the word “caught” in line 45 invoked as sense of fishing for attention as well as doing something wrong and being found out/caught out. This almost borders on the tones of wrongful representation of the disorder due to its ‘problematic’ symptoms (line 43). The use of ‘catastrophic’ (line 49) followed by ‘escalating war pension claims’ (line 49) and costly initiatives (line 50) constructed a state of disorder. This was reinforced with the depiction of the disorder (shell shock which had earlier been worked up as similar in aetiology to mTBI) as being ‘troublesome’ (line 50). The ‘draconian policies’ (line 1816) to prevent the ‘reappearance’ (line 52) of shell shock and the constantly worked up similarities between mTBI and shell shock delegitimated mTBI and attempted to marginalize mTBI to the point of absence (preventing its reappearance) (line 52). Extract three thus provided a sense of mTBI being worked up as similar to shell shock, the very labeling of which was fraught with problems such as war pension claims and
treatment. Compensation as a consequence of labeling was alluded to in research mTBI (Walker, 2006). This extract constructed a tug of war notion of power relations between shell shock (and by association mTBI) and the British Army (Walker, 2006). Shell shock seemed to have had the upper hand during the First World War. Its power waned and the authorities’ (British Army) power to make or break a label was demonstrated with the banning of shell shock as a label on the outbreak of the ‘Second World War’ (lines 51-52).

In the previous extracts, the difficulties presented by prematurely adopting the controversial mTBI label and the similarities between mTBI and a problematic label from the past: shell shock was worked up. Throughout the sample the exact incidence of mTBI was constructed as unknown. Extract four is about quantifying the controversial label. The extract constructed incidences of mTBI as difficult to quantify.

Extract 4
Taken from the Mild Traumatic Brain Injury Project Team’s final report

53  52. Accurate statistics for disorders that are controversial or carry stigma are notoriously difficult to collect.

In extract four without referring to it explicitly, mTBI is classified as part of disorders ‘that are controversial or carry stigma’ (line 53) and were worked up as difficult to ascertain in terms of exact incidence. The adverb ‘notoriously’ (line 54) encountered previously in extract one appeared once again. It worked up the difficulties attached to the task of collecting data on a disorder that is undesirable. The controversial aspect of mTBI was thus constructed. In this extract, the difficulty in procuring accurate statistics served to delegitimate mTBI as a disorder. The worked up controversial aspect of mTBI served to marginalize mTBI as a serious disorder. This presentation of the problematic aspect with no solution was in line with van Dijk (1993)’s discourse structures of power, blaming mTBI instead of looking at why it was difficult to quantify the incidences of mTBI. In this extract,
mTBI was represented as a disorder that is difficult to classify or name since it was ‘controversial’ and carries ‘stigma’ (lines 53-54).

The controversial aspects of mTBI and its seeming popularity as well as its similarity to shell shock were constantly alluded to in the texts. The next extract looked at how the popularity of mTBI may inhibit one’s ‘understanding and treatment’ (line 60) of the disorder. This extract was actively orienting towards power relations.

Extract 5
Taken from the Annex A of the Mild Traumatic Brain Injury Project Team’s final report

55 Despite the efforts of specialists in psychological medicine and the military authorities, shell shock continued to be regarded as a legitimate medical disorder by most soldiers, the press, politicians and the general public. 56 It was popularly conceived as a physical consequence of exploding ordnance and as such a lasting and debilitating disorder. Thus, a misconceived label, 57 if applied early and allowed to establish itself, can plausibly inhibit understanding and treatment. Mild traumatic brain injury as a label possesses some of the characteristics of shell shock. A relatively new term (possibly introduced in 2004), in the UK it appears to have replaced the more neutral ‘mild head injury’ (MHI). Striking a popular chord, mTBI carries an implication of serious pathology and covers a wide range of non-specific presentations.

In the above extract representations of misconceived labeling and difficulties in clarifying the labels or renaming the disorder was constructed. These negative representations served to name mTBI as difficult in classifying meeting with moderate success going from “Mild traumatic brain injury” (lines 60-61) to “mild head injury” (line 63). The tone of this extract was caution against labeling and how labels withstand the test of time in the face of new evidence. It suggested that once a label was allowed to plant its roots, its power would be irrevocable, taking on a life
of its own. After citing the example of shell shock and a lesson in history of labeling gone wrong, attempts were made to marginalize mTBI which, it was suggested, held a similar pathology to shell shock. In this extract, a process of delegitimation unfolding through an analogy between mTBI and ‘shell shock’ was drawn. According to Brown (1995) social constructions of illness have three levels: the micro (individual), mesolevel (medical professionals) and macro (state or national arena). In lines 55-57, the concept of the ill-informed collective appeared again, with the three levels of illness constructions: ‘most soldiers, the press, politicians and the general public’ set against the specialist minority (‘specialists in psychological medicine and the military authorities’) whose ‘efforts’ in querying shell shock ‘as a legitimate medical disorder’ were not heeded. Here, the authors of the report pair micro and macro levels together while the mesolevel (the specialists) was presented as having an opposing view. This defining of us and them was typical of political rhetoric (van Dijk, 2005). The mesolevel’s attempt at controlling the situation failed. Instead the power here seems to have been accorded to the micro and macro level where the disorder has been given a lease of life with the word ‘continued’ (line 56). The power accorded to the disorder was unequal as suggested by the ‘exploding’ (line 58) and ‘debilitating’ (line 59) aspects of the disorder. What was at stake in allowing mTBI to be prematurely accepted was expressed in the form of a general principle in lines 58-60, using developmental language (drawn from the human and possibly plant domains ‘conceived…misconceived…allowed to establish itself’), with potential adverse implications specified again for ‘understanding and treatment’. Although the first part of the analogy was well established at this point, the core of its logic was qualified in line 61, where mTBI was constructed as possessing ‘some of the characteristics of shell shock’: the similarity was thus not worked up as absolute, which may function as a reasoned, careful (and hence credible) position. The positioning of ‘misconceived’ (line 59) suggested a miscarriage of justice. The analogous characteristics were presented in lines 63-65, where mTBI was said to have struck ‘a popular chord’, to carry ‘an implication of serious pathology’ (with ‘implication’ querying its actuality) and to cover ‘a wide range of non-specific presentations’ (with connotations of vagueness and therefore flexibility of application). Also, ‘mTBI’ was said ‘to have replaced the more neutral “mild head injury” (MHI)’, which constructed ‘mTBI’ as not neutral, that is, as
biased and embodying a particular viewpoint. The analogy functions to query the legitimacy of the mTBI category and worked up a need to halt its take-up, while also specifying criteria for legitimacy, that is, specialist validation and some sort of 'objectivity'.

Bond (2009) quotes Wessely's caution against the use of the label 'epidemic' which veteran organizations tended to favour at the onset of the discovery of prevalence of mTBI amongst service personnel who had served in Iraq and Afghanistan. This notion of a new phenomenon was actively deflected in government and military reports. Instead brain injury was routinely constructed as similar to the phenomenon that was present in the First World War, shell shock, and post-concussional syndrome (PCS) in World War Two. In extract five, the conception imagery of a seed being allowed to firmly 'establish' (line 60) its roots constructs the notion of taking on a life form of its own (lines 58-65). The dangers of introducing a new label and allowing it to establish itself were constructed by the use of 'conceived' (line 58) and 'misconceived' (line 59). This was qualified by the construction of the new label as inhibiting 'understanding and treatment' (line 60). This notion of labels inhibiting was first constructed in Extract 1 (line 11). The idea of mild traumatic brain injury, as a label in its infancy gaining momentum over a previous label was constructed in lines 62-63. The use of the word 'Despite' (line 55) before the introduction of shell shock as a legitimate medical disorder (line 56) served to dismiss its legitimacy. MTBI’s legitimacy was called into question when it was equated to possessing some of the 'characteristics of shell shock' (line 1384). This extract introduced the stakeholders as 'soldiers, the press, politicians and the general public' (line 57). They were the people who acted on / listened to this information. The next sentence carried a warning with the words 'serious pathology' (line 64). The danger of supporting or accepting a label which has many 'non-specific' (line 64) symptoms would make diagnosis difficult, thereby making an attempt to marginalize mTBI.

Extract one to five worked up a need for caution against labeling mTBI a disorder. MTBI was constructed as a disorder shrouded with uncertainty. Increasing public focus on mTBI was likened to the past experience with shell shock as a label. MTBI
the controversial label takes on a different platform in the next two extracts as it looks at mTBI as a signature injury of the conflict in Iraq and Afghanistan.

**Extract 6**

*Taken from the Mild Traumatic Brain Injury Project Team’s final report*

7. There is some emerging evidence of neuropsychological problems seen within US troops returning from Operations Iraqi Freedom and Enduring Freedom and it has been cited as one of the four the ‘signature illness’ by commentators on these US operations. Work by the DVBIC suggests that 59% of injured personnel had experienced a TBI whilst on deployment (Warden 2005). Naturally this has heightened concerns and debate about the short term and potential long-term effects of mTBI in the UK service personnel. The most recent paper by Hoge et al (Hoge 2008) reveals that some 16% of US soldiers returning from Iraq reported an injury that had caused alteration of or loss of consciousness.

8. The UK figures available suggest that head injuries are far less common than those for US personnel for mTBI and UK experience is that most service personnel being treated for TBI have sustained a moderate or severe injury (Pers Comm 2007). (This may be due to differing levels of engagement, lack of recognition at the time of injury or because service personnel suffering mTBI continue to operate at a level that, whilst suboptimal, goes unnoticed for a variety of reasons. There is evidence that UK service personnel with probable mTBI (and even moderate brain injury) may only present to medical care many months after injury, often as a result of a change in their working environment or personal circumstances. However with the increase in the mTBI case load noted in the US, mTBI is taking on a high public profile in both Government and the media

In extract six the scientific representation at the start though heavily laden with quantification rhetoric, served to portray the US in a less favourable light in
managing mTBI. The absence in UK figures was delegitimated with the words ‘far less common’ (line 77). The discourse structure in the extract suggested the unfolding of scientific evidence – based discourse. It presented the quantification rhetoric and what the numbers could possibly mean in terms of the smaller percentage of UK incidences of mTBI amongst service personnel. Here, mTBI is ‘cited as’ (line 69) a disorder that is a ‘signature illness’ (line 69) of the conflict. By citing it as ‘one of the four’ (line 69) signature illnesses, the authors were not advocating this construction but citing ‘commentators’ (line 69) on these operations. Being ‘one of the four’ (line 69) such conditions, relativised mTBI’s salience without dismissing it. The ‘neuropsychological problems’ (line 67) and debate about short and long term effects (line 72) worked up a state of affairs where all is not well. The quantification rhetoric ‘59%’ (line 70), and ‘16%’ (line 74) paired with the ‘loss of consciousness’ (line 75) suggested the extent of the disorder created by mTBI. The smaller percentage in the ‘recent paper’ (line 73) was backed by scientific evidence – ‘Hoge et al’ (line 2226). MTBI was thus marginalized to affect a relatively small percentage of troops. The next few lines served to marginalize mTBI incidences in the United Kingdom stating they were lower than the American statistics. Probable reasons for this difference were worked up (lines 80-85) and the disorder in the system was worked up with the presentation of mTBI going unnoticed for a variety of reasons (lines 80-85). This served to marginalize mTBI as well as delegitimate mTBI as a disorder since external factors (e.g., change in work environment) impacted it more than the disorder itself. Its status as a ‘signature illness’ (line 69) was thus marginalized. The ideology presented here suggested that though the numbers were small in the UK, the increasing attention on mTBI in the US, had led to an increase in its ‘public profile’ in the UK (lines 86-87). This suggested the power relations and the hold on public opinion that the US wielded. The notion of mTBI as a signature illness continued to be marginalized in extract seven below. Strategic processing took place in the form of ‘us’ and ‘them’ (van Dijk, 1995, 2006). ‘Us’ being good and ‘them’ being bad was the focal point of the presentation. The reworking of mTBI as a category was an attempt to paint an accurate picture of the ‘true’ state of the extent of the disorder.
Extract 7

Taken from the Mild Traumatic Brain Injury Project Team’s final report

88 76. At the time of writing enthusiasm for the mTBI concept, linked to an
89 Admiraible and genuine desire to help our armed forces, is at a high just
90 as shell shock rapidly gained in popularity when first introduced. The
91 painful experience of battle led doctors in the First World War to reassess
92 this earlier enthusiasm and in particular to conclude that shell shock was
93 neither a signature injury nor simply a consequence of cerebral damage caused
94 by exposure to blast.

In this extract, the authors of the final project team report represented
themselves in a positive light as people wanting to help. The social actors juxtaposed
their ‘enthusiasm for the mTBI concept’ (line 88), ‘admirable and genuine desire to
help our armed forces’ (lines 89-90) with the ‘painful experience of battle led doctors
in the First World War’ (lines 90-91) and ‘reassess their earlier enthusiasm’ (line
1848). This suggested a need to reexamine mTBI’s popularity. TBI was yet again
worked up to be as popular as shell shock (line 88). After the enthusiasm of labeling
a new phenomenon wore off, the subsequent reassessment of the causes of the
phenomenon leading to another conclusion was worked up. The reassessment
outcome of not being a signature injury (in terms of shell shock) and the earlier
references to similarities between mTBI and shell shock might suggest that mTBI
was also not a signature injury. This was different from what was written elsewhere
in the text on mTBI being one out of four signature injuries (e.g., extract six). Thus
mTBI was delegitimated as a signature injury of the conflict. Extracts six and seven
presented a ‘is it or isn’t it’ question as they queried mTBI’s status as a signature
injury, lending itself to the controversial aspect of mTBI. Another ‘is it or isn’t it’
question presented itself in the next discourse on mTBI beyond three months.
Researchers presented empirical evidence of mTBI being symptom free beyond three
months.
4.3.2 Beyond three months: the miserable minority

The persistent nature of mTBI and its enduring nature were constructed throughout the sample of texts through the analogy of its similarity with shell shock and the problems posed by shell shock. While the previous extracts explored caution against labeling, difficulties in quantifying incidences of mTBI and mTBI’s legitimacy as a signature injury; the next two extracts presented a discourse on mTBI beyond three months. The next two extracts constructed mTBI’s ability to endure as a disorder and the challenges presented by its enduring nature without references to shell shock. Here the scientific discourses focused on the aetiology of mTBI and the classification into types of less than or more than three months.

Extract 8
Taken from the Mild Traumatic Brain Injury Project Team’s final report

Epidemiology

Epidemiology papers examined show that approximately 80% of all treated civilian brain injuries are mild (Wade 1997, Ivins, 2006). The best evidence suggests that there are no objectively measured cognitive deficits solely attributable to mTBI beyond 3 months in most cases. There is strong evidence that persistent symptoms are more likely to be attributable to psychological and social factors rather than the mTBI itself (Holm 2005). Persistence of symptoms after 3 months is seen in a small sub-population often referred to as the ‘miserable minority’ (Ruff 2005) and such symptoms cause significant functional impairment. Kashluba S., (2007) noted that those with persistent symptoms may be predicted soon after injury on the basis of greater symptom reporting early on, pre-morbid psychological issues and compensation seeking behaviour.

Extract 9
Taken from the Mild Traumatic Brain Injury Project Team’s final report

There is consensus in the literature that the majority of patients with MTBI will be symptom free within 3 months (Barth 1998 Levin H.S 1987).
The WHO Task Force on mTBI (Holm 2005) identified a number of factors associated with poor outcome. It has since been established that patients likely to exhibit persistent symptoms at 3 months following injury may be identifiable at an early stage, on the basis of the severity of initial self reported symptoms, premorbid psychological issues and involvement in compensation seeking (Kashluba 2007).

Extracts eight and nine attempted to marginalize the persistent nature of mTBI by presenting scientific evidence and ‘consensus in the literature’, (line 106) on mTBI persisting beyond three months. The notion of ‘us’ and ‘them’ demonstrated a shared ideology within and between the researchers (van Dijk, 1995). References to various researchers and their doubts on mTBI incidences beyond three months oriented towards a shared ideology that this phenomenon is a small proportion. Attempts were not made to investigate this group’s presentations. This follows the observations of other research on social construction of medical conditions (Oudshoorn, 1997). Parallels can be drawn between Oudshoorn’s (1997) querying of the absence of male menopause in the presence of female menopause and the current study’s query of the presence of mounting scientific evidence supporting symptoms till three months and the absence of or marginalization of research on persistent symptoms beyond three months. The looming scientific evidence and minority of symptoms beyond three months suggested an uneven power relation favouring the scientific evidence. The power to legitimate the experiences of those with symptoms beyond three months lay with the researchers and the scientific evidence they presented (Walker, 2006).

The presenting symptoms beyond three months were presented as deviances (Brown, 1995). According to Brown (1995) this was in keeping with the stages of social construction of medical conditions. The stages dictated observing a deviance, getting medical consensus on the deviance, seeking to align the condition as a medical phenomenon with views from medical and non – medical personnel before embarking on legitimating the condition through legislation (Brown, 1995). The small group was regarded as attempts at ‘compensation seeking’ (lines 105 and 112). This discredited those who claimed to be experiencing mTBI beyond three months and thereby questioned the entitlement of the minority group (Freeden, 2003).
lack of objectivity in measuring ‘cognitive deficits’ (line 97) marginalized evidence on the persisting nature of mTBI beyond three months. They were also constructed as the fault of the individual since ‘psychological and social factors’ (line 99) were alluded to. The invocation of ‘psychological and social factors’ (line 99) served as a deflection. A psychological factor would imply that it is not organic and, from a materialist perspective, therefore “unreal”. ‘Self – reported’ (therefore not totally reliable) symptoms and ‘compensation seeking’ (line 112) built up a sense of delegitimating mTBI beyond three months. Social constructions of bodily injury alluded to the United Kingdom moving towards a culture of compensation seeking, presenting statistics on soldiers making claims (Bell, 2006). This lent credence to the construction presented here of compensation seeking service personnel. Reference to the World Health Organization (WHO) task force worked up credibility in the factors identified as reasons for persistence beyond three months (lines 107-108). Attempts to marginalize the group who persisted with symptoms after three months was worked up in the form of the alliterations ‘small sub – population’ (line 101) ‘miserable minority’ (line 101). This double emphasis on the smallness of the group with symptoms persisting more than three months marginalized their experiences. The authors of the texts were not the advocates of the quote ‘miserable minority’ (line 101) in the citation. This view was a popular opinion as seen from the words ‘often referred to’ (line 101). The term ‘miserable’ (line 101) served to delegitimate this group as not important by constructing them as contemptible. It trivialized their existence with the choice of words by minimization and abnormalization (Potter, 1996b). Constructing a group as a minority served to other them as abnormal and therefore of little importance (Bishop & Jaworski, 2003; Fowler, 1985). In the extract, this served to delegitimize and marginalize those with mTBI symptoms persisting more than three months. In the two extracts, the medical representations were painting those who had enduring symptoms after three months in a negative light. Here the representations anchored towards naming and shaming those with ‘persistent symptoms (line 103) as compensation seeking (line 112).

While extracts eight and nine looked at the marginalization and delegitimation of mTBI beyond three months, the next extract focusesd on yet
another discourse: managing mTBI (the challenges posed by mTBI for the UK and US military and defining mTBI in medical terms).

### 4.3.3 Managing mTBI

While the past extracts explored the controversial aspects of mTBI label and mTBI beyond three months, the next three extracts worked up a sense of the challenges posed by mTBI in terms of management and medical definition.

**Extract 10**

**Taken from the Mild Traumatic Brain Injury Project Team’s final report**

4.113 Both the UK and US military medical communities face similar challenges concerning the clinical manifestations of mTBI (including the symptoms, signs, and results of special investigations that will define a case) and the management of cases in the short, medium and long term. This is particularly so at the mildest end of the spectrum where seemingly inconsequential head trauma might provoke disabling and enduring symptoms.

Extract ten worked up the challenges faced by ‘the UK and US military medical communities’ (line 114) in terms of managing the disorder. mTBI was initially marginalized as the ‘mildest end of the spectrum’ (lines 117-118) and ‘inconsequential’ (line 118), and was later worked up as having the ability to cause ‘disabling’ (line 118) symptoms. The ability to ‘provoke’ (line 118) symptoms of alarming consequences constructed the magnitude of managing a disorder such as mTBI. Adding ‘seemingly’ (line 118) to ‘inconsequential head trauma’ (line 118) served to further delegitimize mTBI as a disorder. Despite the presentation of challenges posed by mTBI in terms of ‘disabling and enduring symptoms’ (line 118-119), mTBI was delegitimated as a disorder of any consequence. The next extract looked at deployability of service personnel after mTBI.
Extract 11
Taken from the Mild Traumatic Brain Injury Project Team’s final report

120 a.
121 There is concern about the potential long term adverse health effects
122 that mTBI and repeat concussions might have on military personnel. The time
123 taken to be fully deployable again after mTBI is unknown. The UK shares this
124 concern.

Repeat ‘concussions’ (line 122) and concerns about long term effects were
worked up. It is further worked up with the ‘UK shares this concern’ (lines 123-124).
The words ‘fully’ (line 123) and ‘unknown’ (line 123) suggested that service
personnel might not be fully cured of all effects of mTBI. The potency of mTBI as a
disorder was legitimated in this extract. The ‘long term adverse health effects’ (line
546) and sharing of concerns (line 124) over the full deployability of troops
constructed a sense of the unknown/absence being relatively important. The next
extract developed the potency of mTBI further by defining mTBI in medical terms as
well as highlighting the symptoms associated with the disorder.

Extract 12
Taken from the Mild Traumatic Brain Injury Project Team’s final report

125 5.
126 Although head injury is a significant cause of disability and death in adults, the
127 majority of cases (85% to 95%) are classified as ‘mild’ to ‘moderate’, and most
128 of these recover within weeks to months without specific therapy. Mild
129 traumatic brain injury (mTBI) is defined as a cerebral event that leads to loss of
130 consciousness for less than twenty minutes or post-traumatic amnesia lasting
131 less than 24 hours.
132 Post-traumatic amnesia refers to the period of memory loss between the
88

incident itself and the next fully remembered events. However, some US
studies have changed the definition of ‘mild’ to include loss of consciousness
for less than one hour rather than 20 minutes.

A wide-ranging literature survey concluded that for most cases there are no
objectively measurable cognitive deficits attributable to mTBI beyond 1-3
months’ post-injury, though self-reported symptoms are common. The
disorder is accompanied by a range of common and non-specific symptoms:
headache, dizziness, irritability or outbursts of anger, double vision, ringing in
the ears, loss of concentration and forgetfulness.

None of these are pathognomonic and can be found in a variety of neurological
and psychological disorders. Although a study conducted in 1986 showed that
most subjects recover within three months of injury (only 8% having
significant symptoms at follow-up a year later), recent US investigations
suggest a higher proportion with enduring disorders.

This extract was presented within a medical discourse. It was presented with
scientific evidence from other studies and sought to define mTBI’s presenting
symptoms. The symptoms were then marginalized as part of a ‘variety of
neurological and psychological disorders’ (lines 141-142). This posed challenges to
the medical teams in terms of accurate diagnosis of mTBI. In this extract the fluidity
of the classification of mTBI was constructed in lines 132-135. The changing of the
definition by ‘some US studies’ (line 133) suggested a non – standardization of the
classification of mTBI thereby discrediting its status as a disorder (Edwards, 2007).
Diagnosis is a crucial component of the social construction of a medical condition
(Brown, 1995). The depiction of symptoms of mTBI being found in a ‘variety of
neurological and psychological disorders’ (lines 142-143) sought to delegitimate and
marginalize mTBI as a condition. Extract twelve extended on the ‘whizzing of the
ear’ (line 38-39) in extract three. Here the ‘whizzing’ (line 38) first seen in extract
three was replaced with ‘the ringing in the ears’ (line 140). It outlined the nature of
mTBI and talked about the disorder in terms of changing definitions of mTBI (lines
134-135). Marginalization of mTBI as a disorder was worked up with the
quantification rhetoric ‘85% to 95 %’ (line 127). MTBI was referred to as an ‘event’ (line 134), which was a marked change from its previous and subsequent depictions throughout the sample as a disorder. This construction served to delegitimate mTBI as a disorder. Increasing the loss of consciousness from twenty minutes to an hour suggested marginalizing TBI as previously an hour’s loss of unconsciousness would signify moderate TBI whereas a loss of consciousness of twenty minutes would signify mild TBI. As in extract eight, the lack of objectivity in measuring ‘cognitive deficits’ (line 137) and the ‘self – reported symptoms’ (line 138) delegitimated the evidence on the persisting nature of mTBI beyond three months. Extract twelve thereby built up a construction of delegitimation of mTBI beyond three months by attributing it to self reports with no evident scientific proof to back it up. Lines 143-146 worked up an attempt to balance the power relations between the condition and the evidence presented against it being a serious condition beyond three months. Citing a 1986 study and the quantification rhetoric presented (the 8%) it built on the US recent studies suggesting a higher proportion. The hint of a suggestion (line 145) alone did little to legitimate mTBI as a disorder of consequence. The scientific representations here (citing a literature survey) and recent investigations all sought to objectify mTBI in the gray area where few were showing symptoms beyond three months while investigations were suggesting higher numbers.

In this study the researcher unpacked how the final project team members start off by constructing mTBI as a problematic disorder with symptoms that were similar to other diseases. The researcher deconstructed how the authors of the final project team report used van Dijk’s (1994) six acts of persuasion: 1) the act of presenting negative points right after the expression of dominance discourse; 2) downplaying the negative actions of the speaker while exaggerating the other person’s fault; 3) a deliberate choice of words implying positive views of self and negative presentations of the other; 4) narrating negative accounts of experiences with the other and providing rationale for why this might have been the case (all serving to portray the other negatively); 5) following up narrative with a few select points of summary on the other’s misdeeds and 6) concluding with quotes from reliable sources such as the media, past research or professional expert opinion, in their constructions to create a level of uncertainty about the disorder. The authors of
the report continued with their acts of persuasion when addressing reports on persistent symptoms of mTBI discrediting the accounts of those presenting symptoms beyond three months. Having established mTBI as problematic and discrediting long term effects of mTBI, the team members shifted stance to set about constructing a level of certainty on the management and treatment plans the British military have/ planned to set in place to deal with this problematic disorder that was fraught with uncertainty. In order to achieve this certainty they utilized processes of marginalization and delegitimation, which entailed discrediting, ignoring and casting aside anything that did not lend credence to their perspectives of mTBI.

4.4 Conclusion

In this empirical study the researcher unpacks the positions taken in the constructions of mTBI. Constructions are presented in the form of scientific discourse which serves to position them as indisputable facts (van Dijk, 2006). Interpretation of a situation varies according to a person’s role (Marecek & Hare-Mustin, 2009). Brown’s (1995) meso level and macro level of the stages of social construction of illnesses alluded to in the analysis and discussion were dealt with in the text. The micro level of the individual (the service personnel’s constructions of mTBI) could be addressed in future research using critical psychology’s stance on representing the less dominant groups as an avenue to obtain a balanced view of groups that are normally underrepresented (Marecek & Hare-Mustin, 2009).

Throughout the text mTBI is delegitimated and marginalized by the authors of the report. It is noteworthy that in a report commissioned to address the concerns raised in the media about mTBI incidences in the military constant attempts are made to discredit mTBI as a disorder. Othering of mTBI the label is carried out through the process of homogenizing mTBI with shell shock and PTSD and depicting those with mTBI beyond three months as a minority. Quantification rhetoric aids the process of othering by accentuating the incidences of mTBI thereby aiding in delegitimating and marginalizing mTBI (Potter, 1996b). The positions taken seem to place mTBI as trivial (bullet point 11(c) (2) of mild traumatic brain injury project team’s final report). Social constructions of illnesses focus on the labeling and it is ironical that in
the text caution is expressed against the labeling of mTBI. Past research on race, gender and illness suggested that blaming the individual could lead to inequality in power relations (Fine, 1994). Here, the researchers of the report and the sources they cite are depicted as stating facts and the good guy having to deal with the ‘notoriously resistant’ (line 3) bad guy, mTBI. The lack of scientific evidence supporting mTBI as a disorder of consequence seems to trust mTBI’s fate into the power of the authorities doing the labeling and managing of mTBI.

The ideology presented in the text oriented towards scientific and historical discourse. Scientific evidence is regarded as fact and the truth. The historical discourse is constructed as lessons in history of premature labeling. By having symptoms similar to other disorders mTBI’s position as a disorder raises doubt. MTBI has not received legitimate scientific status and is positioned as chaotic and problematic. MTBI is considered an outsider in the realm of disorders. Which leads us to the question, if mTBI is not a disorder of serious consequence, what were the issues that propelled mTBI’s status to that of a signature injury at the beginning of the conflict and what has changed now to warrant this delegitimation of its status as a disorder? When scientific representations were they are followed up with uncertainty suggesting a gray area as to mTBI’s status as an enduring disorder.

The social actors (in this case, the members of the final project report team) weave semantic relations between the problematic mTBI and being cautious in endorsing mTBI as a label (Fairclough, 2003). Different realities might be presented if the social actors were service personnel. Personal accounts of service personnel returning from tours of duty in Iraq and/or Afghanistan could well be the missing link completing the mTBI picture.

Summing up the discourses constructed in this empirical chapter, the discourses ‘other’ mTBI, positioning it alongside previous problematic labels in history such as shell shock and PTSD and depicting those with symptoms beyond three months in the minority. Quantification rhetoric serves to delegitimate mTBI with it small percentage of incidences. The constructions here are reminiscent of the constructions of mild traumatic brain injury in the literature review as short term with
those with symptoms beyond three months seen as compensation seeking. Problems in diagnosis and labeling are also constructed in the literature on mTBI. These are constructions from an official viewpoint. How is mTBI in the British military perceived amongst the general public in the United Kingdom? What representations are observed in the perceptions of mTBI by a sample population of the general public? The researcher seeks answers to these question in the next empirical chapter here the focus shifts to the general representations. To ensure that the researcher delves deeper to harness the representations the researcher employs a pluralistic approach calling on the critical realist position alongside the thesis’s overarching framework of inquiry, social representations theory. The third study explores public perceptions of mild traumatic brain injury in the British military and healthcare for veterans. The researcher asks the following research questions: What do members of the public think about mild traumatic brain injury in the military? Sub questions: What is the nature of the public’s knowledge of mild traumatic brain injury in the military? What views (if any) do members of the public have about health care for British veterans of the Iraq and/or Afghanistan conflicts?

4.5 Reflection

It might seem a little strange to reflect on the same data set twice but I felt this is necessary given that I use the data set differently at each instance. This study was undertaken after a preliminary analysis (the first study) highlighted the need to explore power relations and ideology separately in a second study. Though the data set was the same, I now found myself having to work on a different set of assumptions. Given the study’s focus on delegitimation and marginalization I had to be careful not to infer too much into the data in the hopes of exploring delegitimation and legitimation processes. I also had to be aware of my own views on the care and treatment plans in place for veterans with mTBI. I had to be careful not to draw too many inferences from external sources such as the newspapers and American magazines for service personnel. The American experience of the injury is not the focus of my thesis. As such, I had to ensure, I was aware of the boundaries of the scope with which I was exploring mTBI representations.
5.1 INTRODUCTION

In the previous chapter, a final project team report on mild traumatic brain injury was analyzed using elements of critical discourse analysis. The study focused on delegitimation and marginalization utilizing the first study’s data set. The researcher explored how mild traumatic brain injury amongst service personnel was constructed in the text as well as what the discourses tell us of the ways in which the project team report members’ delegitimate and marginalize mild traumatic brain injury in their constructions of the military context. The study provided insight as to how the final project team members commissioned by the Ministry of Defence’s) (MoD) Defence Medical Service’s (DMS) Surgeon-General delegitimate and marginalize the mTBI phenomenon in the British military. The constructions in the first two empirical chapters of the thesis focus on the official final project team report. In the media and scientific circles, mTBI is regarded as a signature injury of the Iraq/ Afghanistan conflicts (Dixon, 2011; French, 2010; Jones, Fear & Wessely, 2007; Ruff, Ruff & Wang, 2008; Stein & McAllister, 2009; Terrio et al., 2009). Researchers focus on the epidemiology, the problems with labeling mTBI as a disorder, the causes of mTBI and its symptoms overlapping those of shell shock and/or post traumatic stress disorder in their investigation of the phenomenon. In this chapter the researcher shifts the focus of the thesis to the members of the British public. With any phenomenon, the public understanding of the injury could shed new light on how the injury is perceived amongst the general population. As such the researcher is interested in exploring how the members of the public describe mTBI in the British military. The researcher explores the nature of the public’s knowledge of mild traumatic brain injury in the military, the views (if any) that members of the public have about health care for British veterans of the Iraq and/or Afghanistan conflicts and their views (if any) about military intervention in Iraq and/or Afghanistan.

The current study adopts a different perspective from the previous studies in the treatment of language. Here the researcher shifts the epistemological
position of inquiry to explore how members of the public view mTBI in the British military. The study pairs the critical realist position with the overarching framework of the thesis, social representations theory. To recap, social representations theory dwells on two processes: anchoring and objectifying (Moscovici, 1984; 2000). Within the first process of anchoring there are two aspects: naming and labeling (Moscovici, 1984; 2000). Anchoring attempts to render the unfamiliar familiar while objectifying is the process of turning an abstract thought into a concrete concept, to give an object a form, something everyone identifies with (Laszlo, 1997; O’Connor, 2012). In this study, the researcher looks at the labels members of the public employ in their attempts to familiarize themselves with a phenomenon that is not in the civilian context. The researcher explores how mTBI in the British military is objectified by participants of the study who are the members of the public.

The use of social representations theory as an overarching framework and critical realist position in this study provides a different ‘way of looking’ that accords with the research focus on what is experienced (mTBI in the military context) and the way in which it is experienced. This should not be seen as denying the usefulness of the previous study’s macro–assumptions about language within a particular context of inquiry. Indeed the data generated for the current study can also be analysed in terms of rhetorical function. However, the researcher employs a different set of macro-assumptions about language here in order to answer a different type of research question. This could be seen as a ‘both/and’ stance towards epistemology, one that overlaps in some ways with a ‘bricolage’ approach (Levi-Strauss, 1972) or, in qualitative psychology, with a ‘pluralistic approach’ (Frost, 2009).

In this study, the researcher employs critical realist position which serves as the bridge between theory and individual accounts (Harding, 2003). It dwells on the interaction between science and the individual allowing for a detailed and comprehensive understanding of new phenomenon (Pawson, Greenhalgh, Harvey & Walshe, 2005). Critical realism does this by looking at the generative nature of ‘social structure’ (pp. 173), intentionality and human action (Kemp, 2005). What sets critical realism apart as a way of looking is its emphasis on transcendental deduction (Kemp, 2005). Transcendental deduction is a concept of Kant’s that focuses on the
understanding of a phenomenon as opposed to the direct experience of the phenomenon (Mingers, 2000; Pereboom, 2006). Transcendental deduction came about when Kant was distinguishing a priori (understanding of a phenomenon based on one’s knowledge of it) as opposed to a posteriori (understanding of a phenomenon by experiencing it) concept (Baehr, 2006). This aspect of critical realism lends itself to the aims of this study exploring the general public’s perceptions and understandings of the mTBI phenomenon in the British military where participants of the study had no personal experience of the injury. Kant uses transcendental deduction to attempt a deduction of concepts beginning with a deduction of the categorization of human experience (Pereboom, 2006). Transcendental deduction reduces the human experience to the consciousness of self and some aspects of one’s representations of reality which are then attributed to be the result of mentally processing of what was experienced (Pereboom, 2006).

The researcher subscribes to Kant’s theory of transcendental deduction in the researcher’s due to a key feature in Kant’s a priori concept of categorization: synthesis (Pereboom, 2006). Synthesis works towards placing all the different representations together locating them into a representation of one cognitive process (Pereboom, 2006). In this study the researcher synthesizes the views of the people from different professions, age groups and locations across the United Kingdom who took part in the study on the British general public’s perceptions and understandings.

The act of synthesizing all the representations into one calls for placing the representations into distinct categories or modes (Pereboom, 2006). In the thesis, this refers to placing all representations under the views of public mode. To place a representation into a mode, the subject matter of the representation should first of all be understood (Pereboom, 2006). In this study the researcher looks at set patterns, what the participants mentioned collectively. The researcher categorizes these in terms of subject matter. The subject matter could only be understood if its distinct features are identified. This can be referred to as the object’s representation (Pereboom, 2006). The object’s representation aids the subject matter of the representation enabling the categorization of the subject matter which can then facilitate the synthesis of different representations (Pereboom, 2006). Critical realism
yields data that have a deeper level of meaning as it would combine the social interactions and their impact on the version of reality as well as provide a platform to relate discourse to social structures (McEvoy and Richards, 2006). Therefore critical realism is essentially a type of epistemological dualism (looking at two different epistemologies); drawing on a mental world view as well as an outer worldview (Danermark, Ekström, Jakobsen & Karlsson, 2002).

Moreover, critical realism advocates pluralism in the exploration of a phenomenon which allows for the different perspectives to be legitimated as well as queried (Angus, Miller, Pulfer & McKeever, 2006; Patomäki and Wight, 2000). The advantage of employing a critical realist approach is the importance given to the layperson’s knowledge of the phenomenon and that the layperson’s knowledge is as important as the so-called experts’ knowledge in the phenomenon (Pilgrim & Rogers, 1997). In this chapter the researcher embarks on methodological triangulation, utilizing a critical realist position as a way of looking (alongside the overarching framework of the thesis social representations theory) and thematic analysis as the method used to explore public’s understandings and perceptions of the mTBI phenomenon in the British military.

5.2 METHOD

5.2.1 Design

With the social representations theory framework, the critical realist position and thematic analysis the third study embarks on a comprehensive analysis looking at the realities presented by science, the combined inner and outer world views of truth and their social interpretations by members of the public.

5.2.2 Participants

Participants were invited to take part in the study through online and offline recruitment. Participants were recruited for the study through online adverts on social networking sites such as Facebook and Twitter. Participants were also recruited from
town councils, public libraries, national leagues such as scrabble, chess and table tennis and snooker, national associations such as kendo association, shooting and conservation, stamp clubs, astronomy clubs, orienteering clubs and embroiderers and quilters guild and societies in the United Kingdom. A hundred and twenty four people (sixty five females and fifty nine males) participated in the study. Participants were between 18 – 73 years old. None of the participants were members of the British military. The demographic information of participants is presented in Table A.

Table A
Demographic Information of Participants

<table>
<thead>
<tr>
<th>Age</th>
<th>Percentage of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–40 years</td>
<td>43.5%</td>
</tr>
<tr>
<td>&gt; 40 years</td>
<td>56.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percentage of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>47.6%</td>
</tr>
<tr>
<td>Female</td>
<td>52.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Percentage of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>52.05%</td>
</tr>
<tr>
<td>Married</td>
<td>47.9%</td>
</tr>
<tr>
<td>Civil Partnership</td>
<td>0.02%</td>
</tr>
<tr>
<td>Divorced/ Separated</td>
<td>0.02%</td>
</tr>
<tr>
<td>Widowed</td>
<td>0.01%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ethnic Origin</th>
<th>Percentage of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>White British</td>
<td>58%</td>
</tr>
<tr>
<td>White Irish</td>
<td>35%</td>
</tr>
<tr>
<td>Mixed White &amp; Black Caribbean</td>
<td>0.06%</td>
</tr>
<tr>
<td>Asian/ Asian British Indian</td>
<td>0.01%</td>
</tr>
</tbody>
</table>
Black or Black British African 0.03%
Unreported 6.9%

5.2.3  Ethical considerations

The University of Surrey’s ethics committee granted the study a favourable opinion. The notion that participants might experience emotional distress while talking about the conflict was considered. There was the possibility that participants might know someone who is in Iraq and or Afghanistan who has since returned who may have either experienced or know someone who has experienced a head injury. Also, participants may have lost someone due to illness recently. To ensure the well-being of participants, a list of hotlines for them to contact should they feel distressed as a result of the interview was included in the study’s online interface and offline hardcopies. Participants were also informed at the onset of the study that could choose to opt out of the study at any point should they wish to do so.

5.2.4  Procedure

Town councils, community centres, public libraries, religious organizations, hobby clubs/ societies and sports associations/ clubs/ leagues across the United Kingdom were contacted through letters and emails to seek their approval and assistance in disseminating softcopies/ hardcopies of the study or the study’s web link. An advert was also placed on Facebook advertising the study. The study was also tweetered out to potential participants using the social networking site, Twitter. The current study was run from June to December 2011. The study required that potential participants were British citizens and participants who were not British were thanked for their interest in the study while being informed that the study was to observe the members of the British public’s understanding of the injury.

The study consisted of an information sheet informing participants of the study’s aims: to observe their understanding of mild traumatic brain injury amongst British service personnel; the contents of the study (a vignette detailing a soldier’s experience with mTBI followed by twelve questions on mTBI in the British
military), it specified the duration it would take to complete the study and who to contact in case of questions regarding the study. The twelve questions were semi-structured with the research questions in mind. They were open ended so as to allow for the participants interpretation of the question in any way they chose to interpret the question. The twelve questions asked attempted to explore their understanding of the mTBI phenomenon in the British military. They were asked about their opinion on what should be done with service personnel with mTBI; how they viewed personnel with mTBI as well as how they viewed the lives of service personnel with mTBI; to list services they knew about that are available to service personnel with mTBI and their views of these services; their views on Iraq/ Afghanistan veterans access to healthcare public health care; and their view of the government’s role in treatment and management of service personnel with mTBI. The last question on their view on British military involvement in Iraq and/ or Afghanistan was optional.

5.2.5 Analysis

The responses from the questionnaire were analyzed using thematic analysis. Thematic Analysis is a method that identifies, as well as analyses, and reports themes or patterns in the data (Braun & Clarke, 2006). It is free from epistemological and theoretical underpinnings (Braun & Clarke, 2006). As such thematic analysis could take a data driven inductive approach (one that will not be constrained by theory but by what themes emerged from the data) or one that is deductive (using a theoretical standpoint focusing on the responses to the questions) based on what the researcher chooses to employ (Braun & Clarke, 2006; Fereday & Muir-Cochrane, 2006). Thematic analysis is ideal as it gives the researcher the opportunity to be connected with the data, observing the emergence of themes and also allows for the comparison between the groups being studied (Sullivan, 2003). Its strength lies in its flexibility (Braun & Clarke, 2006). However, freedom from theory and epistemology has been at the heart of the criticisms levelled at thematic analysis (Antaki, Billig, Edwards & Potter, 2002). Despite this, Braun and Clarke (2006) embrace the flexibility of thematic analysis while at the same time setting guidelines to harness thematic analysis in the hopes of providing rigour to a method that has been thus far been poorly regarded. The researcher attempts to follow Braun and Clarke’s (2006)
guidelines beginning with identifying the corpus date which is all the data collected for the study. In this study the corpus data refers to the 124 transcripts of responses to the online questionnaire. The responses to the vignette in the online study in terms of the answers to the questions after the vignette make up the study’s data set. In this study the researcher employs a deductive approach with the analysis being less descriptive. Adopting the critical realist stance in the analysis, the analysis focuses on how participants engaged with the vignette.

After deciding on the analysis from a deductive standpoint, the researcher decided on focusing on latent themes which tend to locate the identified themes within the theoretical and ideological framework of the study. Using latent themes ensures that the themes are not identified as patterns but as in relation to the researcher’s interpretation of participants’ responses to the research questions (Braun & Clarke, 2006).

In this study, the latent thematic analysis belongs to the critical realist position (Braun & Clarke, 2006). It is aided along by social representations theory, the overarching framework of the thesis. Thematic analysis or more specifically, latent thematic analysis enables the researcher to explore social representations within the patterns or themes identified. Thematic analysis or rather latent thematic analysis allows the researcher to identify and analyze thoughts, theories, assumptions and beliefs that are shaping concepts in the data set. Given the somewhat free form of thematic analysis, the critical realist position helps to steer the analysis in a particular direction focusing on answering the research questions.

The data was analyzed following the six phases of Braun and Clark (2006).

In the first phase, the researcher got familiarized with the data. The meanings and patterns within it the data set were read and highlighted. In keeping with the critical realist perspective latent thematic analysis was undertaken on the dataset as it provides for the development of themes based in ideologies (Braun & Clarke, 2006). As the researcher was interested in latent themes, attention was paid to emerging patterns. In the second phase, the researcher generated initial codes that provided information on the conceptualization of the phenomenon. The researcher went
through each data set to identify codes and matched them with data that illustrated the code. In phase three, the researcher searched for themes from the codes generated in the previous phase. The researcher mapped out the relationship between the codes and themes as well as between different themes. Themes were divided into main and sub themes. The researcher identified key themes which embodied the members of the public’s understanding of the phenomenon of mTBI in the military. In the fourth stage the researcher reviewed the themes: first each theme was reviewed with the extracts that were identified along with it; in the second instance, themes were reviewed with the entire dataset to ensure that the researcher had accurately mapped out their (the public’s) conceptualizations. At the fifth phase, the researcher refined the defining of the themes to ensure there was consistency in the unfolding narrative being presented. The researcher identified what was of interest and why it was so and in the sixth phase, the researcher wrote up the report to reflect themes, ensuring they were supported by the correct extracts from the dataset.

While the data in this study were analyzed using thematic analysis, another method of analysis could have been employed to look at the meaning the participants attribute to mTBI: content analysis. However, content analysis typically recounts the number of times a code appeared in the data set and/ or describes generalizable patterns in the data (Joffe & Yardley, 2004). Thematic analysis however chooses to explore the themes that occur frequently (Joffe & Yardley, 2004). Furthermore, thematic analysis is a method that allows for looking at a phenomenon from different epistemological positions (Braun & Clarke, 2006). This aspect of thematic analysis appeals to the researcher as it complements the critical realist approach as well as the social representations theory aspect of the study.

5.3 Results

Although participants in this study vary in background and ages, there are themes that were common to most participants. Five themes provide insight on participants’ perceptions of mild traumatic brain injury (mTBI) in the British military: different shades of mTBI, perceived impact of mTBI on normal life,
occupational hazard, entitlement to care and contradictory consequences of the need
for military intervention in Iraq and Afghanistan.

Different shades of mTBI

Participants perceive mTBI to have different shades which can be further divided
into two sub themes of trauma and brain damage. Within the different shades of
mTBI, the subjectivity of the interpretations of each participant’s demonstrates the
varied levels of interactions between their knowledge (or lack of knowledge) of
mTBI and the information they have from other sources such as the media. This
lends credence to the critical realist stance of the study of embracing the subjectivity
in each interpretation (Ponterotto, 2005). In the case of the first sub theme, trauma,
the responses suggest differing levels of trauma in the perceptions of what is
experienced by service personnel with mTBI.

Trauma

Within the trauma subtheme, the participants perceive diverse levels of
trauma experienced by service personnel with mTBI. As one participant states below,
the trauma can be twofold or threefold in nature.

“psychological and or organic trauma resulting in emotional and or physical
disturbances which compromise one's ability to function "normally". repeatedly re-
living the experience - running through the "what if" worst scenario and experienc-
ing the emotions of such a scenario coupled with guilt of less fortunate comrades. It is,
perhaps, a term used when a clear diagnosis is not determined.” * - Participant 1

From a critical realist stance, participant 1 is looking at the injury from what
they perceive to be happening in the real domain of critical realism. The participant
is thinking of the experience from the viewpoint of service personnel with the injury.
They start with the injury and move on to ‘less fortunate comrades’. Participant 1
raises the notion of multiple levels of trauma with the suggestion of ‘psychological’,
‘organic’ trauma which then affected ‘emotional and physical’ states. The participant
describes the departure from normal functioning. Participant 1 also alludes to the labelling of mTBI that was used when a ‘clear diagnosis is not determined’. This suggests an ambiguous labelling with no definite measures in place. This bleakness is however juxtaposed against the guilt felt towards ‘less fortunate comrades’ who possibly did not survive the Iraq/Afghanistan conflict. While the first participant describes mTBI as ‘compromising one’s ability’, the second quote below from participant 30 suggests that the trauma resulting from mTBI is rather mild in nature.

“a trauma to the head that may/may not result in loss of consciousness but doesn't trigger medical investigation at the time of trauma due to the lack of obvious symptoms. It becomes obvious at a later date, because cognitive deficits are relatively* mild” Participant 30

Participant 30 suggests that mTBI’s symptoms are not obvious at the start but present itself later and that the loss of consciousness may or may not have taken place after a trauma to the head. The notion of a trauma to the head resulting in mTBI is expressed by many participants.

“WHERE THE BRAIN HAS BEEN SUBJECT TO A PERCUSSIVE FORCE E.G. THE BRAIN HAS STRUCK THE INSIDE OF THE SKULL.” (Participant 75)* capital letters are inherent in the person’s response.

Participants 75 and 31 describe a blow to the head which resulted in the brain being ‘struck inside the skull’ (participant 75). Participant 31 takes this a step further to discuss the extent to which this affected the person with mTBI. Here the representation is rather violent with references to a ‘force’ and striking. The vulnerability of the situation is posed through references to the brain striking ‘the inside of the skull.’

“Brain injury caused by an impact (including the force of an explosion) to the head or which caused the neck to jerk in a way that caused the brain to impact on the skull; at a level which causes some symptoms but not to a very great extent (e.g.
Participant 31 describes brain injury as an ‘impact’ to the head. Here the participant delves into the real domain of critical realism by moving from the external to the internal realm. This seems to be a pattern in the data, moving from one realm to the next. The injury causes some symptoms but mostly returned to the norm. This look at the causal structure (injury) and it generates some symptoms but still maintains job and most of ‘usual routine’. They concur with participant 30’s suggestion of mildness of the impact of the injury, adding that service personnel with mTBI can still retain their jobs and go through ‘most of the their usual routine’. The term ‘most’ positioned in the middle of the usual routine suggests that there may be slight deviations from their pre-injury routine. With the exception of participant 1, the quotes so far have been about participants describing trauma in terms of blow to the head. The next few quotes revisit participant 1’s suggestion of multiple layers to the trauma. Participants 20 and 90 allude to trauma resulting from a past event. Participant 20 suggests that recalling past traumatic events in the past while participant 90 takes this a step further by suggesting the brain is ‘less functional’ (participant 90) because of a past trauma. Both the participants look at outcome the real domain of critical realism. Their understanding of the experiences of service personnel with the injury is stratified: trauma because of a previous trauma.

“Remembering previous "shocking" events.” Participant 20

“Where the brain becomes less functional because of a previously traumatic event?” Participant 90

While participants 20 and 90 allude to past traumatic events, participant 82 suggests that mTBI is “A form of mental illness caused by an injury.” presenting mTBI in yet another light, that of a mental illness. Participant 107 expands on this stating that mTBI is “a condition of mind arising from a violent impact on/or shaking of the head which may have resulted in a loss of consciousness or
concussion.” Both participants 82 and 107 therefore consider mTBI to be a “condition of mind” (participant 107) as a result of injury.

Participant 56 describes the symptoms of mTBI but then went on to say that they did not know this before reading the vignette. This suggests that their understanding of mTBI is garnered entirely from the vignette, with no prior knowledge/understanding of the injury. This is an example of how participants interacted with science. The participant’s world view changes from before they read the vignette.

“Its when the head has been banged and can result in the person having headaches, ringing in the ears, poor memory, difficulty sleeping and poor balance - but didn't know this before reading article” Participant 56*

The participants describe varying levels of trauma as part of their perception of mTBI. Participants also describe brain damage in their definition of mTBI. The next sub theme discusses what participants had to say in their interpretations of brain damage and how it defines mTBI.

**Brain damage**

Most participants who describe mTBI as damage to the brain discuss the consequences of the damage to the brain. Brain damage and the physical effect of the damage are describe in detail by participants. Comparison between mild and severe brain damage are also drawn.

Damage to the brain, which is localised and has smaller effects on a person’s daily life that a severe brain injury which could result in death.” Participant 17

Participant 17 describes the damage to the brain as ‘localised’ and having a ‘smaller’ effect on daily life in comparison to a severe brain injury which could lead to death. Participant 19 describes the problems caused by the damage to the brain.
This contrasts with participant 17’s take on smaller effects. Other participants (notably participant 2) have also expressed the impact of brain damage on daily functioning. They however contrast it with being not life threatening.

“Damage to the brain caused by an explosion resulting in problems with balance, memory, tinnitus and sleep.” Participant 19

“Physical damage to the brain via shock to the head, which is not immediately life-threatening but impairs daily functioning in some way” Participant 2

Other participants describe the brain damage as causing problems in functioning depending on where the damage to the brain is. This suggests different levels of the injury and that the injury is not the same in every person.

“Damage to the brain causing problems in certain types of functioning or processes, depending on where the damage is.” Participant 92

While some participants describe the damage as ‘subtle’ (participant 64) others suggest it ‘minorly’ (participant 95) affects brain functions.

This notion of differing levels of injury or different takes on the injury continues with the idea that the brain damage is subtle and inhibiting minor functioning (extracts from participants 64 and 95 below).

“Subtle damage to the brain as a result of some kind of trauma - lack of oxygen, physical damage for example” Participant 64

“Damage that may minorly* inhibit or restrict certain brain functions and efficiency” Participant 95

The differing shades of mTBI continue with participants 117, 122 and 10’s responses. Participant 117 alludes to the damage resulting in no longer functioning at
‘pre-injury level’ and equates mTBI sustained by service personnel with that of boxers sustaining injury over time.

“concussive blow to the brain, possibly from the brain impacting with the interior of the skull, which results in swelling of the brain and possibly some bleeding. Either way there may be some areas of the brain that are damaged and no longer function at the pre-injury level. Boxers probably sustain similar injury over time.” Participant 117

Participant 117 describes swelling of the brain and possible bleeding. This presents that brain damage in physical terms. Participant 122 extends the notion of physical brain damage to connecting tissue.

“Something similar to a mild stroke whereby part of the brain has suffered slight damage, or suffered minor damage to connecting tissue.” Participant 122

While the other participants describe brain damage in their perception of mTBI, participant 10 links the brain damage to explosions, thereby evoking the images of the conflict areas Iraq and Afghanistan where service personnel are deployed.

“Presumably it is a mild level of brain damage brought about by a traumatic incident, such as the sonic waves from a loud explosion.” Participant 10

The first theme of different shades of mTBI describes how participants defined mTBI. Some of the definitions are generic in nature and could well describe any mTBI not necessarily one sustained in the military. However, what the definitions suggested is the participants’ understanding of mTBI. Participants look at it from the perspective of past, present and future or in critical realist terms: the empirical, the actual and the real. Participants are trying to relate to the injuries from their worldview and shifting in their world view. The next theme moves away from the generic understanding of mTBI into participant’s perceived impact of mTBI on normal life. The theme shed some light on what participants thought of mTBI in the
British military. It also highlights their knowledge or lack of knowledge on the impact of mTBI on normal life.

**Perceived impact of mTBI on normal life**

Within the theme of perceived impact of mTBI on normal life, there are two subthemes: no knowledge of mTBI and different perceptions. Participants describe their knowledge of the impact of mTBI on daily life. Their responses extend on the views expressed in the first theme in terms of the impact on daily functioning. Their responses also shed light on the extent of their knowledge of the injury’s impact on daily life. With the first sub theme, participants who had expressed no knowledge of mTBI had stated they had not considered this (mTBI) before.

**No knowledge of mTBI**

Two of the participants had defined mTBI in the first theme. As such, how did they define mTBI without any knowledge? Their earlier quotes in theme 1 had the qualifier that they did not know this before reading the vignette (participant 56). Participant 20’s ‘remembering shocking events’ quote in theme one when placed alongside with their quote in this theme, sheds light on their perceptions of mTBI in the British military and their perception till now. It also gives the impression that before the study, the participant had not considered or thought of this injury. This view is expressed by other participants as well (notably participant 54 and 27).

“I didnt know the injury existed until now so i dont really have any views other than feel sorry for service personnel with mtbi”* Participant 20

“I have never heard about these injuries or considered them before. I would assume that any soldier suffering from these injuries would be given many different options for support, both medically and socially. So my understanding is limited.” Participant 54

“I don’t: I have not considered them” Participant 27
Participants 20, 27 and 54 had not known about the injury prior to the study and had not considered mTBI in the British military. This view is extended by participants 3 and 27.

“Other than the example on the previous page I have no understanding of mild traumatic brain injury” Participant 3

“I don’t: I have not considered them” Participant 27

While both the above participants had not heard/considered or had no prior understanding of the injury in the British military, participant 24 and 44 expressed that they had heard of the injury or had vague impressions of it.

“I know vaguely about it and have heard of the phrase mild traumatic brain injury. I do not know about it in detail though.” Participant 24

“I have very little understanding of this, although I would guess it is more common in incidence than I originally thought, and that it is very detrimental to a military personnel's well being.” Participant 44

Despite having no knowledge of the injury or vague knowledge of it some participants expressed that they felt sorry for the service personnel with mTBI and that they had not known it was more common than they previously had supposed and that it is ‘detrimental to a military personnel’s well being.’ (Participant 44).

Participants here are readjusting the world view of the phenomenon where there was no view previously. They are realigning their views based on the information in the vignette and possibly the internet if they were surfing the web while doing the study. This would become a common feature in the dataset where participants attempt to shape their understandings based on new information. These views expressed by participants with no knowledge of the injury were echoed or extended further by participants in the next sub theme different perceptions. In different perceptions,
participants give varied impressions of their thoughts on the injury’s impact on normal life.

**Different perceptions**

Similar to different shades of mTBI, in different perceptions participants give diverging views on the impact of mTBI on normal life. Participant 6 expresses that the impact of mTBI on normal life depends on the severity of the injury and what each person with the injury wants. As such, the impact of the injury on normal life is based on each individual’s wants and ability to cope. However, the participant also express that all ‘should receive treatment and support’ (Participant 6).

“It depends how severe it is and what each individual wants. Some may want and be able to stay in service but some may feel that they cannot carry on. All should receive treatment and support.” Participant 6

According to participants, “Brain injury that can result in mild loss of functions and trauma e.g. occasional memory loss/ forgetfullness*or certain things being affected i.e. if mild damage to temporal lobe perhaps some form of hearing loss. I believe the trauma of the accident could lead to sleepless nights/flash backs etc.” Participant 47. While Participant 47 states that the injury could result in sleepless nights, participant 31 stated that brain injury “causes some symptoms but not to a very great extent (e.g. patient is able to keep their job and maintain most of their usual routine).” Participant 35 subscribes to this view as well stating that “I would * describe a mild traumatic brain injury as one which doesn’t impact significantly on an individuals ability to carry out everyday tasks such as holding down a job, running a household, self care etc.” Participant 30 describes the impact of the injury on service personnel as “probably impacted in small but meaningful ways by their injury.” Participant 64 gives new meaning to the small impact by stating mTBI amongst service personnel “is not given high enough profile and appears only to focus on immediate evidence of brain injury* such as physical damage.” This suggests the existence of other forms of damage as a result of the injury.
Participant 25 describes a departure from being able to living a normal life and states that “I think they should be able to get free treatment for all the symptoms of the injury to help relieve and if possible cure them, so they can go back to living a normal life.”

Participant 42 contests this with “They may have some minor physical/mental difficulties (e.g. memory loss/balance loss), but have not been injured in such a way as to ruin their lives or change their personality.” Participant 2 shifts away from this and states that mTBI is “not immediately life-threatening but impairs daily functioning in some way”. How it impacts on daily functioning is not explicitly stated. Participant 10 expands on this notion of mTBI not being life threatening stating that mTBI is “Not life threatening; not likely to cause immediate evidence of cognitive liability in any (visible) form. Not an acute condition but an injury that may cause chronic problems”. This notion of causing chronic problems suggests a disruption to life experienced by the service personnel prior to mTBI.

Participant 23 sums up the different perceptions of the impact of the injury on normal life with “It might be called mild traumatic brain injury but if you had to live with those symptoms it would seriously disrupt your life – so I would view service personnel the condition as disabled and they should be supported as such”. This final quote on the perceived impact of mTBI on normal life suggests that service personnel with mTBI should be viewed differently as not able-bodied men and women but people who have disability and who are in need of support. Participants had expressed that service personnel with mTBI were affected by the injury. However, the extent of the impact is perceived differently by different participants. Most participants feel that mTBI did not affect the daily functioning too drastically while a few feel that that the injury would seriously disrupt the lives of service personnel, going as far as to describe them as now disabled. Some participants propose solutions for the future such as ‘free treatments’ and discussing return to normalcy. This is a recognition that things have changed, that all is not well for the service personnel with mTBI. The next theme on mTBI occupational hazard presents mTBI in the military setting and participants’ responses on the nature of the job and
the impact of the injury as a result of the occupation. The notion of the injury being part of the job is invoked repeatedly in extracts.

**Occupational hazard**

Within the theme of occupational hazard there are two sub themes: in the line of duty and a common injury in military circles. Some of the participants tend to take the stance that the injury is all part of the job while others describe the support networks already in place or that should be in place to support these service personnel. In the first sub theme, some participants describe the injury as a matter of course: the effects of war while others describe it as a risk service personnel take when they enter the occupation.

**In the line of duty**

Most participants express that due to nature of the job, service personnel were at risk of sustaining an mTBI. “No direct experience/ knowledge of anyone having such symptoms; would assume due to the nature of hazards Forces personnel are more likely to be exposed to, there would be greater prevalence of such injury in these (above other) organizations” * Participant 2. In some instances, participants felt the service personnel knew what they were getting into when they entered the military. Participant 44 describes the injury as a matter of course “with respect and compassion and a hint of "well, you chose this career path. Did you think it was going to be tea and cakes!"” Participants 15 and 19 allude to this as well but do so with the stance of the injury being an occupational hazard. There is no hint of ‘you chose the career path’ therefore you have to deal with it as was the case with participant 44. Participant 15 states “Mild traumatic brain injury is an occupational hazard (one of many) for the British military forces serving in areas where explosions are common. It is likely to be present at greater rates than currently estimated, as it may have occurred in soldiers without head injuries who were not routinely screened.” This view of higher risk and more incidences of mTBI are also expressed by participant 19 who says “That it occurs quite regularly due to the high risk of injury in what they do.” Participants 51 and 21 have a different take on this
stating that mTBI is “Some sort of disorder caused by the effects of being at war... not necessarily due a head injury” (participant 51) and that “conflict in war zones has led to many injuries which effect military personnel.” (Participant 21). This suggests that other injuries are also incurred. Participant 6 describes mTBI as “It sounds like it is affecting many soldiers now especially those in Iraq and Afghanistan. Now they have set up Headley Court Hospital they have experts on board so I would hope they can help the soldiers who suffer.” * This suggests that many service personnel were affected by this injury and that provision has been made to care for them. Participant 23 expands on this by stating that the service personnel with mTBI “should be excused from further service and provided with extensive medical and social support (medication, physiotherapy, diagnosis, counselling ect.).* I’m not sure about the issue of compensation, because I don’t know enough about the system. I think if all the above are provided then financial compensation would not be necessary; it is a hazard of their jobs.” The “issue of compensation” (Participant 23) is raised for the first time here and is the issue of being excused from further service. Participant 46 expands on the issue of service personnel with mTBI leaving the military by stating that “They are a risk to others therefore their participation within the military should be discontinued. It is unfortunate for the soldiers but they accept the risks that accompany the occupation when they decide to join the military.” Participant 46 also alludes to the risk that comes with the job which was also mentioned by participant 44. Participant 46 however feels it is unfortunate but a necessity nonetheless to remove these service personnel from duty.

The first sub theme focuses on the injury in the line of duty stating that the injury is most likely to be sustained given the nature of the job and exposure to conflict. Unlike other themes and sub themes, in this sub theme participants rarely looks at the change in circumstances of the service personnel as a need to change their view of the situation. Here the individual is singled out as having made the choice to join a group: the military and that the consequences of the choice should be borne by them alone and not society. This can be illustrated with the notion of help has been set up already: Headley court and they can deal with it, and here is no need for compensations since its part of the job. The tone of this sub theme is very different from the other themes and sub themes. The next sub theme pits mTBI as a
common injury in military circles. It extends on the first sub theme’s notion of in the line of duty.

**A common injury in military circles**

In this subtheme, the suggestion that mTBI is a common injury in military circles is raised. The idea that military training and actual warfare being two different things and that reality is harsher than the training is suggested. The question of the injury being more widespread than is known is also raised in this subtheme. The consequences of injury are also alluded to in this sub theme.

Participant 1 states that “Whatever training military personnel receive, it is surely little or no help when the reality of war and all it entails is experienced* first hand. Mild traumatic brain injury is probably equally widespread across all "military's" not just the British. Equally, i do not think it is different to other kinds of mild trauma in other areas of society. i.e. civilians who live through genocide, holocaust survivors, rape victims etc). Participant 1’s views of mTBI being widespread across all militaries suggested the incidences of mTBI in other militaries are as high and no different from the United Kingdom. The three situations referred to by participant 1 ‘genocide, holocaust survivors, rape victims’ suggests incidences of national and international disasters as well as on individual levels. The service personnel’s mTBI is likened to these disasters as is their (service personnel’s) experience of them. This view suggests that the injury is no different from any other injury. Participant 17 looks back to the common injury amongst military notion with “I understand that is it a common injury for military soldiers and that it can prevent their efficacy as a soldier, therefore it is most likely unsafe for them to continue in the British military.” However participant 17 calls into question the safety of service personnel with mTBI as well as their efficacy as service personnel post-injury.

Participant 25 continues with the notion of mTBI being a common injury in military circles stating that “I would expect many people in the British military would get mild traumatic brain injury as when fighting, they would experience
damage to the brain to the fierce explosions.” Participant 124 expands on this stating that service personnel with mTBI “are likely to be affected for a very long time unless offered effective support. I believe that many service personnel end up with drug/alcohol problems as a direct result of coping with the aftermath of MTBI’s.” While Participant 9 adds to the notion of mTBI being a common injury in military circles, the participant also raises the issue of mTBI being confused with post traumatic stress disorder by stating that “I have likely knowledge about the specifics of the condition but would imagine it to be common in the military and guess symptoms may be confused with post traumatic stress.” This allusion to mTBI being confused with post traumatic stress disorder (PTSD) is a first in the dataset.

This subtheme of a common injury in the military circle expands on the theme of occupational hazard discussed in the first sub theme of in the line of duty. In this sub theme the emphasis is on the injury being a common aspect of war. The impact of the injury is also likened to disasters such as genocide and holocaust. The confusion of mTBI symptoms with PTSD is also raised in this subtheme. The next theme moves away from the specifics of the injury towards the issue of veteran entitlement to care. The focus is less on the injury and more on healthcare provision and the role of government in providing healthcare.

**Entitlement to care**

In this theme on entitlement to care, there are three subthemes: empathy towards the service personnel with mTBI, perceptions of healthcare for veterans and government’s role in caring for veterans. In the first subtheme, participants state their perceptions on veteran’s entitlement to care describing the empathy they feel towards veterans with the injury with some references to the military’s responsibility

**Empathy towards the service personnel with mTBI**

Empathy for the service personnel results in three varying thoughts: feeling sorry for them, feeling that the situation or that the personnel were unfortunate and expressing hope to be considerate towards these service personnel. Participants
express wishes to personally reach out to service personnel with mTBI or to resolve to be understanding of service personnel with mTBI. Most participants often describe that they feel “sorry for them” (Participants 3, 19, 92 and 110) and that they “feel for them” (Participants 7 and 50). Within the notion of feeling sorry and feeling for them, there are varied reasons. Participant 19 expresses that they “feel sorry for them as life must be hard.” Participant 92 has a different view saying that they “feel sorry for them, because they have been doing good for the country and yet have come away injured. I feel like I want to help them or offer my condolences although this obviously isn't possible.” Participant 7 expresses that they “Feel for them it can’t be nice not being able to sleep and having the constant reminder of afgan/iraq” while participant 50 said that they felt “Awful. Feel great sympathy for service personnel”. This is a common sentiment across the subtheme.

A number of participants also feel that service personnel with mTBI are “unfortunate” (notably participants 30, 91 and 124). Participant 30 expresses that service personnel with mTBI were “unlucky, and let-down by the military if it hasn’t been identified prior to causing a problem.” This reference to the military was a first that would continue in the next two subthemes in the entitlement to care theme. Participant 91 mentions that service personnel with mTBI “are unfortunate and should be offered medical treatment”. This notion of service personnel “should be offered medical treatment” (participant 91) is revisited in the subsequent subthemes. Participant 124 describes the service personnel with mTBI as “Unfortunate and worthy if specialist help. I would possibly be fearful that they could be violent and aggressive.” However, participant 124 also raises the issue that service personnel with mTBI might “be violent and aggressive.” This is the first time this was mentioned. While most participants describe feeling sorry for them, one participant (participant 117) expressed hope that they “would be considerate and understanding if I knew of their problem.”

This subtheme focuses on participants feeling sorry towards the service personnel with mTBI and feeling that the personnel were unfortunate. Not being able to personally do anything to help the service personnel is also raised while one participant expresses the hope to be more understanding towards service personnel.
with mTBI. Here participants apply an individual, group and society take on the situation. They try to relate to the phenomenon on personal levels and negotiate their understandings and perceptions around what they thought the service personnel with mTBI will be going through. The next subtheme examines perceptions of healthcare for veterans. Here participants express their views on healthcare provision for veterans and offer suggestions as to further care/ support for the veterans.

**Perceptions of healthcare for veterans**

Most participants express that service personnel with mTBI should be entitled to help. Participants describe service to the nation and the nation’s turn to support these service personnel. Most participants feel that they should be given the same support or more as members of the public and offered examples of service providers available such as NHS and Headley Court. Some participants also state that they did not know about/ or know enough about the healthcare provision for veterans.

Participant 9 states that “They should be entitled to as much help as possible” while Participant 5 says that “Their injury occurred in the service of the country”. Participant 17 expands on this notion of being injured in the line of duty stating that “as a member of the military who has risked their lives to serve their country and has wounds to show for it. they *should be treated with respect and given which ever treatment they need to live a ‘normal’ life”. Participant 31 echoes this view stating that “As the injuries were sustained during service, full treatment and support should be offered to these patients.” This is further supported by Participant 20 “The military is charged with protecting “the people.” The people should therefore take care of its military.”

Many of the participants discuss priority healthcare stating that “They should have priority health care over non-veterans because they have risked their lives for our country” (Participant 44). And as participant 24 says “All the services that our wonderful National Health Service should be able to afford them with no expense spared.” Participant 43 felt that “they should be prioritised to good public health care as they are risking thier* lifes for the country and deserve respect and help after
fighting for their people.” Participant 92 echoed this sentiment stating that service personnel with mTBI should be given “as much help as possible, such as counselling. Give them the right to finish their service in the war to return to their families and try to recover their memory as much as possible.” Participant 92 alludes to the ending of the service so as to return to their families and recover. This is contrasted by participant 95 stating that “They should be made to quit the military as they pose a risk to themselves and others within a military scenario. I believe they should be compensated for the damage and they should be treated provided with proper treatment to help with their physical injury and possible psychological damage through therapy.” Participant 95 mentions compensation and this is a common sentiment expressed by participants. Revising priority care again, Participant 122 states that service personnel with mTBI “have earned the best care that is available.” And that they “have been materially and qualitatively affected by their service in the forces and they should be compensated and supported by the government” Participant 122. “always deserve and should be unconditionally* entitled to clinical and psychological support” Participant 20. Participant 19 expresses a view that service personnel with mTBI “should feel proud that they served their country well, they must accept all the help they feel they need and take one day at a time in their recovery.” This expresses the view that service personnel are entitled to and should be made to accept all service provision available to them as a result of the injury in the line of duty.

While some participants express that veterans should be cared for, other participants took the stance that veterans would definitely be provided for by the government. As Participant 54 states “I would assume that any soldier suffering from these injuries would be given many different options for support, both medically and socially.” Some participants are aware of the service provided to this group of service personnel however they express that the service provision is inadequate. Participants 1 and 74’s responses below illustrate this view. (Participant 1) “There is some support available through the likes of the British Legion, Veterans Association, SSAFA and the like but not enough.” and participant 74’s “NHS treatment Insurance through service contracts. British Legion. Private military hospitals and hospices.
Rehabilitation centres for the military. (Headley Court) From media reports I am of the opinion that the services are inadequate.” A number of participants have also expressed that they do not know or have little knowledge of the healthcare provision to veterans: “I don't know to* much about the services available to the service personnel but since such a vast number of personnel have had mild traumatic brain injury since 2003, there should be a number of services in place to help them deal with their injuries” Participant 88 and “I only know of Headley Court.” Participant 19 while participants 35 and 60 that they were unsure or do not know enough about the services provided: “I really don’t* know enough about what services are available to make a informed judgement.” Participant 35 and “Unsure what's available” Participant 60. Amidst the health care provision and compensation discussion participant 117 took the notion of the caring for the veterans further with the suggestion of “A measure of assistance through tax exemption or tax benefits should be given as the injuries can have long term impact on the soldiers earning ability and future career.”

This subtheme starts off with the entitlement to help, moved on to knowledge of the types of care available and ended with Participants 31 and 47 expression of their views of healthcare provision with Participant 31 stating that “The government is likely to consider very strong and sustained recommendations such as campaigns for more service hospitals, but otherwise is unlikely to consider this topic very often as it is not one that will influence most voters.” Participant 47 provides a different view stating that “As the word 'mild' is used I believe the military don't see it as a serious injury and so patients with it are pushed to the back of the line due to the perceived* 'more serious injuries.” This expression of the government and the military’s role recurs in the next subtheme on government’s role of caring for veterans. Participants are actively engaging with the critical realist stance viewing other domains to access the inner worldview of the service personnel with mTBI. They reflect on perceptions of past, present and future veteran healthcare plans.
Government’s role in caring for veterans

The differing views on the government’s roles are expressed in this subtheme. Starting from the views that the government should take care of veterans, the opinions are then expanded to some participants feeling they should do more; a few participants being unsure of the government’s role while a few participants felt they have no issues with the government caring for veterans as long as it is not at the expenses of the members of the public. Participant 23 states that “They are responsible for the aftercare of personnel injured.” Participant 50 supports this stating that “They should take absolute full responsibility and make them their priority.” Participant 88 gives suggestions for service provision stating “that the government should help provide personnel with facilities for treatment of mTBI by providing enough funding for this to be able to happen. These facilities should be located all over the country and not just all in London for example so that the facilities are available* to everyone.” Participant 54 supports this as well with “It is the governements* responsibility to help service personnel who have been employed by them.” Participant 100 states “I think the government do not do enough.” Participant 74 specifies who is responsible stating that “the MOD should fund rehabilitation.” Participants 95 and 78 offer suggestions for government’s caring for veterans with “They should ensure that all personnel are entitled to and receive sufficient treatment for their injuries.” (Participant 95) and (Participant 78)’s “There is not enough, although* places like Headley Court do they very best they can, I think more money should be made available from the Government specifically to help and treat troops returning from Iraq and Afganistan.”

While most participants provide suggestions or were of the view that more should be done, Participant 92 expresses that “I am not sure of what their role is. If it includes helping them and offering counselling etc, then I am pleased with their role.” A few participants also express is that “I have no problem with service personnel being given priority of care over others if the Govt. maintains existing military hospitals and welfare services rather than shutting them in cost cutting exercises.” Participant 123. This view by a few participants suggests that priority care be given only on the grounds that healthcare for civilians are not compromised
by cutting down on exiting military hospitals. The participants’ views on the government’s role in healthcare provision for veterans centres on the need to do more and that not enough was being done, suggestions on improving current service provision were made while a few participants expressed that they did not know enough about the services to comment on them. Participants demonstrate the critical realist stratum in their worldviews here. Employing a critical realist stance, participants delve into the external realm to make sense of/ access the internal realm of what service personnel with mTBI might need. Here, participants dabble with the three levels of exploring the phenomenon: individual, group and society on a surface level attributing the care giving role to the government and government/ military agencies. The next theme moves from the government’s responsibility to provide healthcare for veterans and focuses instead on the contradictory consequences for the need of military intervention in Iraq and Afghanistan. The need for the conflict, the reasons fuelling the conflict and the divergent views on the need to have engaged in military intervention are expressed.

**Contradictory consequences of the need for military intervention in Iraq and Afghanistan**

The need to enter the conflict areas, regime removal and changing standpoints are discussed in this theme. Participants expressed their viewpoints when the conflicts first started and how they viewed things now. There are two subthemes within this theme: in the beginning and the aftermath. Participants in the in the beginning subtheme state their divergent views on the need to be involved in the conflict areas.

**In the beginning**

In this subtheme participants discussed the need to have engaged in military intervention. Participant 122 states that “The removal of Sadam Husein* and the defeat of the Taliban are justified.” Participant 24 expresses that “I think the deployment of the military is essential to protect the public of the UK.” These views are followed by others who: a) started off agreeing with the need for military
intervention and then felt it was not getting anywhere, b) are totally opposed to military intervention but thought it should be the last resort and therefore acceptable now and c) were totally opposed to military intervention but supported the service personnel engaged in them. The first view is expressed by participant 18 who states that “Thought I understood the reason for Afghanistan at the outset and agreed with it. As the war has progresses they have increasingly thought we could not achieve a "lasting" result and have advocated speediest possible withdrawal. Iraq was a complete no brainer from the outset.” The second view expressed by participant 95, states that “I am personally morally opposed to it but I accept that when British involvement is necessary, we may resort to military efforts when other non-military efforts have been tried and have failed. I do not know enough about the events leading up to the British military's involvement to offer a view specific to this case.” Participant 95. The third view expressed by participant 13 “I was entirely opposed to our involvement in both conflicts but fully endorse all efforts to support the service personnel who are engaged in active service.” *

While those are the views of those who agreed with military intervention or disagreed but changed their mind, there are some participants who hold on to their views. Participant 117 expresses that “Neither area of conflict required soldiers from this country to intervene - the war in Iraq has been motivated by the american desire for expansion* into oil rich areas.” Participant 6 expresses a similar view “I think it is misguided.” Participant 47 also supports this stating that “we should never have interfered in these countries affairs.” While the views expressed earlier were from participants who were for or against the military intervention, a few participants expressed that “I don't know what started the war, so I don't know if it is our battle to fight. Either way, I don't feel war will solve anything.” (Participant 22). Participant 27 also state that they did not know stating that “I don't know enough about the conflicts to offer an intelligent and well researched opinion, therefore I won't give one.” This first sub theme on contradictory consequences focuses on whether there had been a need for military intervention in Iraq/Afghanistan, presenting views for and against intervention as well as opinions of those who express they did not know about the conflict to comment on it. The views presented by the participants here are representative of the fluidity of representations and the critical realist stance of ever
changing world views. Participants in this sub theme occasionally embrace the grand narratives offered by the media and government. When they rejected the grand narratives, they adopted the critical realist stance, delving into the meaning of what the new perspectives presented such as ‘speediest removal’ and ‘Iraq was a no brainer’. The next sub theme focuses on the aftermath of engaging in military intervention. The participants tend to focus on the past, present and future more evidently in this sub theme than the rest.

The aftermath

In this sub theme, participants dwell on the past. An example of this is Participant 100’s “Their involvement can be questioned heavily, since the war in my view was not really justifiable in the first place, whether it's worth the military loosing lifes* for something rather unnecessary is debatable. However since the war has progressed it's clear their involvement now is needed.” Participant 100 demonstrates the critical realist stance looking at all three domains: the empirical, the actual and the real. Their direct observation at the onset was that the war was not justifiable and that the loss of lives in the military and the progression of the war suggested no need for military intervention. Participant 123 also states their disapproval for military intervention and their shift in stance with the continuing conflict by saying that “I don't approve of such involvement but given that it has happened, service personnel deserve to receive adequate health care for all problems encountered.” This is echoed by Participant 57 “It is not being handled very well but was the right thing to do.” Participant 17 also expresses a similar view but moves on to talk about service personnel’s time to come home by stating that “I think that once we became involved, we had to stay and fight for the rights of the peopel in that country, but it is now time to leave and allow the county to rebuild itsself.” * Participant 64 has a different view stating that “I think the British military are doing all they can to improve the lives of the Iraqi and Aghan people and that they will continue to do so until there is peace and democracy in these countries.” while Participant 34 advocates for less involvement stating “We shouldn't be as involved as we are.”
While these participants at some point conclude that intervention is best, participant 1 disagrees with “I understand the reasons but in the end talking is the only way peace can be found. All wars only end when talking begins. I accept that sometimes war is a necessary evil upon which to start building the foundations for talk. But the end does not justify means. War is almost always the agenda of the few, the powerful, the politicians, and the extreme fringes of society.” This view seemed to be shared by Participant 74 “Britain should pull out of these conflicts and should never have participated in the first place.” Participant 92 felt similarly as well stating that “I think we should stop sending troops out to Iraq/Afghanistan, and withdraw from our involvement. Our involvement seems unnecessary (from what I am aware of) and just seems to result in unnecessary deaths.”

A few participants however, step away from the debate on the issue of the need to have entered the conflicts, expressing their opinion on service personnel involved in policing these conflicts by according them heroic status and calling on individuals who rioted to look at the troops to know what is really heroic. An example of this is participant 15’s “I feel that anyone proud enough to fight for their country is a hero and those taking parts in riots etc. should look at these brave and heroic individuals because they are the people who make me proud to be British.” Here as well, the three domains distinguished their interpretations based on current event and past glory (heroes who fought for the country versus those involved in the London riots).

The researcher uses the three domains of critical realism stated by Danermark et al. (2002): causal structure (what caused the phenomenon and breaking down the causes into categories); events the structures generate; and those events that can be empirically observed to summarize the perspectives of the general public who participated in this study. Applying this to the participants’ perspectives of mTBI in this study, the general public who participated in this study perceive that mild traumatic brain injury is caused by trauma or brain damage (causal structure). The events the structures generate are perceived impacts of the injury on normal life with differing perceptions of the injury’s impact based on their knowledge of the injury.
The observations of these events are that the injury is an occupational hazard and that the government has a role in caring for veterans.

5.4 DISCUSSION

The study’s focus was on what participants (who are members of the public) thought of mild traumatic brain injury in the British military. The nature of their understanding of the phenomenon of mTBI in the British military, the extent of their knowledge of the phenomenon and the views participants had about health of British veterans of the Iraq and Afghanistan conflicts were also explored in the study. The participants’ responses were grouped into five main themes: different shades of mTBI, perceived impact of mTBI on normal life, occupational hazard, entitlement to care and contradictory consequences of the need for military intervention in Iraq and Afghanistan. These themes provided insight as to how participants viewed mTBI in the British military. The different shades of mTBI described the divergent views of what the public thought about mTBI. It was not a clear case of trauma, loss of consciousness, brain damage but an assortment of symptoms. Researchers opined that the mTBI symptoms could be confused with other disorders such as PTSD. This view was also expressed in the literature on mTBI in military settings (Bryant, 2001a, 2001b; Schneiderman, Braver, & Kang, 2008; Castro & Gaylord, 2008; Elder & Cristian, 2009; Greenspan, Stringer, Phillips, Hammond, & Goldstein, 2006; Harvey & Bryant, 2000). The participants in their responses started off with the science of the injury and moved slowly away from the science to the here and now of veteran care and then projected this on a scale of past, present and future in their discussions of the military intervention in Iraq and Afghanistan. This was similar to a critical realist position in the construction of social realities, when one tried to reach a mid position between science and reality by starting at the beginning, science (Danermark, Ekström Jakobsen & Karlsson, 2002; Sims – Schouten, Riley & Willig, 2007). To recap, critical realism cites exploring the link between a person’s theoretical understanding and their engagement of the world as a union of theory and practice (Ponterotto, 2005). That is to say critical realism is a type of epistemological dualism; drawing on a mental world view as well as an outer worldview. In the study
participants alluded to this when they expressed the shift in their stance on war and the reality as they see it now and their take on the situation now. Participants also dwelt on this in theory and practice stance when expressing their views on the injury as something mild but yet having symptoms that affected their lives nonetheless. Participant 23 took this a step further by viewing personnel with mTBI as disabled and calling for them to “be supported as such” (participant 23). This is a negotiation of labels attached to service personnel with mTBI.

Connelly and Worth (1997) described the empirical, the actual and the real stratum in critical realism. Critical realism acknowledges that the world around us is always changing and that our understanding of the three strata (the empirical, the actual and the real stratum) changes as well. The empirical refers to the perceptions; the actual to the events that are likely to take place while the real refers to the processes that cause an event (Clark, Lissel & Davis, 2008). So are we the agents of change or are we swept up along the tides of change? Bhaskar (1997) stated that changes are not chosen. Rather, the past informs the present which in turn, shapes the future. Agency is therefore the result of social interaction between: a) the agents and social structures and b) agent and agent (Connelly, 2000). What do we mean by social structures? Here social structures refer to societal norms and practices which govern/ regulate behaviour (Connelly, 2000). In this study of the participants’ understanding of the phenomenon of mTBI in the British military, the agency of their views was shaped by their interaction with social structures. This was illustrated in the quote from participant 74 on how the media positioned provision of healthcare for veterans “NHS treatment Insurance through service contracts. British Legion. Private military hospitals and hospices. Rehabilitation centres for the military. (Headley Court) From media reports I am of the opinion that the services are inadequate.” Some of the participants drew on materials in the vignette to inform their view and reshaped their previous stance. Examples of these were when participants said they had no knowledge or did not know before reading the vignette presented in the study. Here the critical realist stance that the world is constantly changing was demonstrated when participants expressed shifts in their responses. Another example of this was in the discussion on the contradictory consequences for military intervention. Participants acknowledged their shift in stance from the start of
the war and their view now. Participants engaged in posteriori reduction. Posteriori reduction is a critical realist way in which someone reconstructed a reality dwelling on what the reality was after the event (Jeffries, 2011). In this study, participants began by discussing the phenomenon, the trauma, brain damage and moved towards the perceived impact on life. They expressed either no knowledge of the impact of the injury or differing perceptions of the injury on normal life. They then took a step back reviewing how the injury comes about. This is when they discussed the occupational hazard. They then brought the discussion forward to the present and expressed the need for healthcare provision. Participants went on to express views on government’s role in caring for veterans and ended with the contradictory consequences of the need for military intervention. In each of the themes participants dwelt on the reality after the event. They reconstructed the phenomenon using these as props: the war; the symptoms; the impact on daily life; health care provision and government’s role in caring for veterans. The props allowed for the observation of the phenomenon by presenting the multi layers of the phenomenon. Critical realism was therefore employed here to tease apart the factors that came into play in the birth of the mTBI phenomenon. Participants’ understanding of mTBI served to unpick the pieces of the mTBI fabric to bare the social realities within. These social realities were illustrated in the themes that were subsequently discussed. Each piece of the mTBI patchwork held a different meaning but when placed together they presented the social realities of the phenomenon as it was viewed by the participants.

The study also drew strength from social representations theory. Social representations theory connected past events with the present’s reality and pitched it into the future (Moscovici, 2000). The participants here engaged with the processes of social representations theory: anchoring and objectifying. Looking first at anchoring, participants classified and named the phenomenon, the two aspects of anchoring. They named the phenomenon as trauma and brain damage with varying shades of mTBI painted in between these two subthemes. Labels were attached to the phenomenon rendering it not life threatening and mild in nature as opposed to serious brain injury which led to death. MTBI was labelled by Participant 15 as “an occupational hazard (one of many) for the British military forces serving in areas where explosions are common.” The injury was also classified as ‘a common injury
for military soldiers’ (participant 17). Attempts were also made to objectify mTBI by stating that it was the result of ‘remembering shocking events’ Participant 20 and Participant 90’s “Where the brain becomes less functional because of a previously traumatic event?” as a form of explanation of the phenomenon. This second quote served to objectify mTBI by breaking it down in lay terms. It does not discuss blow to the head, bomb blasts or symptoms. Instead it explained the breakdown in brain’s functionality caused by a traumatic event. Another attempt at objectifying mTBI was Participant 2’s “not immediately life-threatening but impairs daily functioning in some way”. Without the details of the impact of the injury on normal life, it simply stated that sustaining mTBI did not endanger a person’s life but affected their ability to perform everyday tasks in some way.

Social representation theory provided a framework to explore different level of representations such as the public view of a phenomenon (Pearce & Stockdale, 2009). In this study participants represented mTBI as an injury in the line of duty. It was described as ‘an occupational hazard’ - Participant 15. It was described as ‘a common injury for military soldiers’ - Participant 17. Participants also stated their views on the British government’s as well as MoD’s role in the theme: entitlement to care. The participants labelled the injuries as ‘sustained during service’ – Participant 31 and therefore the people who advocated the war for (i.e. the people whose interest they went to protect) would have to care for the veterans. As participant 20 stated “The military is charged with protecting “the people.” The people should therefore take care of its military.” This representation charged the military with the task and passes that task on to the people as well. MTBI was also classified as a symptom that “may be confused with post traumatic stress.” – Participant 9. This classification has some support in the literature on the phenomenon (Elder, Mitsis, Ahlers & Cristian, 2010; Caldroney & Radike, 2010; Chen & Huang, 2011) as well as the thesis’s first study on the mTBI phenomenon, where the final project team members invoked past representations of shell shock and post traumatic stress disorder to make sense of mTBI in its current context. However the current study diverged from the previous study with its entitlement to care and contradictory consequences themes. The current study named the service personnel with mTBI as deserving of priority health
care as ‘they have risked their lives for our country’ Participant 44 and that ‘They have earned the best care that is available’- Participant 122. Participant 6 labelled the military intervention as ‘misguided’ while Participant 122 objectified “The removal of Sadam Husein* and the defeat of the Taliban” as justifying military intervention. Using social representations theory as a standalone epistemological position would not have given the researcher the opportunity to explore social and ideological representations due to cognitive reductionism. However, with the adoption of the critical realist position, the researcher was able to explore the representation of ideology here. Therefore employing a pluralistic approach using SRT and a critical realist lens to observe public perceptions of mTBI in the British military, the researcher was able to harness the differing perspectives of the participants in the themes beginning with different shades of mTBI and ending with contradictory consequences of military intervention in Iraq and/or Afghanistan. Future research could consider conducting focus groups to gauge yet another level of representations as participants would then engage in group dialogue while expressing of their views.

In summary mTBI in the British military was viewed by participants as having different shades to it, with varying perceptions of the impact of mTBI on normal life. It was also viewed as an occupational hazard that accorded veterans who sustained the injury entitlement to healthcare. The participants viewed the military intervention in Iraq and Afghanistan as one with contradictory consequences being for or against the military intervention.

5.5 REFLECTION

In the current study some of the data was generated online while some were through my offline interactions with the potential participants at some public libraries, community centres and town councils. With the online interaction with participants was to a minimum and as such, it was difficult to gauge their response to the questions they were being presented with. Initial analysis of the data yielded responses such as loss of consciousness, brain damage and other more clinical definitions of mTBI suggested that perhaps some participants had looked up mTBI online. I then went online to ascertain if this suspicion was true. My findings
surprised me as most websites on mTBI or head injury for that matter, did not describe the injury the way the participants were describing them. This then suggested that the responses were clearly their own. What I had judged to be clinical interpretations were in fact the layperson’s perceptions! I then took a step back to think of my own definitions of mTBI prior to starting my research on mTBI. My own definition then was a blow to the head causing problems. This was near and yet far in the spectrum of responses on defining mTBI.

Revisiting the online offline interactions I had with the participants, the participants whom I had recruited online talked a fair bit about the war in Iraq and Afghanistan and wanting to see the ‘boys’ return. Some potential participants who also expressed similar views however, declined to take part in the study as in their own words, they ‘were not interested in talking about the personnel with mTBI but were interested in talking about withdrawal of British troops from these conflict areas.’ Another aspect of having an online study was the responses to the study were dependent on website down time, server firewalls and such. The study had initially been placed on the University’s server and I found that when they updated the server, they had firewalls preventing other sites outside of the university from visiting university websites. This essentially meant the study could not be done during that time. This was an accidental discovery as some town councils and libraries emailed and tweeted me to say the link I had provided was timing out. I had checked the link at home and at university but because I live on campus I am connected to the university’s server and so failed to pick up on this, telling participants the serve was working. However, two days of emails from patient town council employees stating server timing out prompted me to check this with the Faculty’s technician who then investigated and identified that there was a glitch from the University’s main server. I then had to email and twitter the agencies I had contacted on the study and apologise for the down time and emailed them again when the study was up and running.

Another aspect of the online study was that I had assumed that placing the study on the World Wide Web would just get me my participants. Two months into the study being broadcasted online, the number of people who had completed the
study was rather small at 30. I was shocked and then proceeded to read up on how others had managed to successfully get participants to take part in their online studies. One person online said they had used Twitter to broadcast their study. I had never used Twitter before and proceeded cautiously at first. However once I discovered that some town councils, community centres, public libraries and national associations were on Twitter I started to bravely tweet my study to them. Some responded within the day suggesting I emailed them the details for their communications department to look at while others said they have placed it on their staff forum or intranet. Some tweetered the study to their followers on Twitter and I was cheered by the number of people they tweeted out to. The next step in garnering participants meant stepping out of the office, away from the computer and into the public libraries, town halls and community centres. Here yet another surprise awaited me as some community centres were more like community halls where most people did not gather during weekdays, meaning less potential participants for the study. This was a bit of a culture shock for me as most community centres in Singapore are constantly bustling with activities throughout the day regardless of which day of the week it was.

Being face to face with participants, some were disconcerted at having to fill in a questionnaire and I tended to move away to give them some privacy. Some would request another time for me to collect the completed questionnaire but would have failed to have completed it even in the time frame set by them and repeated visits had to be made to retrieve the completed questionnaires. Another aspect of being face to face with participants was that some participants would wonder at my choice of research topic and ask about why I chose to do my research on a phenomenon in the British military when I am not British. This often led to wonderful discussions of their visits to Singapore, my home country. They would share with me where they went and how they had enjoyed their trip. Besides my nationality, my ethnicity proved to be difficult for some participants as they were not able to figure out if I was not Muslim. I was asked repeatedly if I was a Muslim. One might wonder why or how being a Muslim would affect my data collection. Growing up in South-East Asia, most people in Singapore would have figured that I was not a Muslim from my name. Here, in the United Kingdom, people were not so sure and
some were cautious when I approached them to take part in the study with a few potential participants asking me if I was out to promote what they perceive to be a supposedly Muslim cause: persecution in Iraq and Afghanistan by Westerners”. This was puzzling to me as I had not thought that the study could be viewed along religious lines since none of the questions I asked in the study pertained to religion.

The discussion on military intervention also surprised me as many participants expressed that military intervention was right either at the onset or at present. In light of media articles that have expressly stated that the intervention was uncalled for and that Tony Blair; the then Prime Minister had lied about the presence of nuclear weapons in these countries, this expression of military intervention being right surprised me. It had me thinking about one of my initial reasons for researching mTBI in the British military and my own interest in people’s take on the military intervention in Iraq and/or Afghanistan. I had to be careful not to inflate their importance in the data set and had to bracket my assumptions as set forth in Giorgi (1985 as cited in Giorgi, A and Giorgi, 2008) and described by Gearing (2004).
Chapter 6. Study 4: The Lived Experience of a Former British Serviceman with mTBI: a Case Study

6.1 Introduction

The previous empirical chapters discuss how various social groups make sense of and understand mTBI from the official and general public perspectives. The previous studies (chapters 3, 4 and 5) constructed the uncertain aspects of the injury, the watertight treatment and care plans in place for those with the injury as well as perceptions of what the injury entailed. The last study (chapter 5) also constructed the injury as an occupational hazard that required the government to ensure adequate health care provision was in place for veterans. The previous studies in the thesis explored perceptions of mTBI by those who did not have the injury. The focus of the constructions was on the diagnosis of mTBI, treatment, symptoms experienced and consequences of the injury. The perceptions of those without the injury are important as they serve to construct how the injury and those with the injury are perceived by others. In this study the researcher shifts focus to weave the individual lived experience of mTBI into the previous constructions of mTBI in the thesis. Here the researcher is interested in harnessing the representations of the injury by former service personnel with the injury. In this study the researcher explores how former service personnel (with mTBI) make sense of their mild traumatic brain injury and their understanding of mild traumatic brain injury. The researcher looks at what having been through mTBI means for the former service personnel and the extent to which their injury has impacted their decision to leave the military.

Employing the phenomenological approach as a way of looking at personal accounts of the injury, the researcher utilizes interpretative phenomenological analysis (IPA) to explore how former service personnel makes sense of and understand their experience of the injury.
6.2 Method

6.2.1 Design

This study employs an existential phenomenological approach using interpretative phenomenological analysis to explore how a former serviceman with the injury viewed mTBI.

6.2.2 Participant

The researcher identified a set of inclusion and exclusion criterion to recruit participants to the study. These are listed below. Inclusion criteria are:

1) Former service personnel who have a formal diagnosis of mTBI from their neuro practitioner.
2) Former service personnel are asked if they are still seeking medical/ psychological treatment/ counselling/ assistance with any agencies. Important factors in the inclusion criteria are the length of time they have sought help, if they attend the treatment/ counselling sessions regularly and how they feel about seeking help/ treatment. Participants for the study are selected if they: attend the sessions regularly, feel positive about seeking or are inclined to seek help (as evidenced by the length of time they are known to agencies) and those who express a willingness to continue to seek/ attend treatment/ counselling are included in the study.

Potential participants who met the criterion are contacted for a pre – interview assessment. During the pre – interview assessment, former service personnel with mTBI resulting from incidents outside of their tours of duty such as falls or accidents are excluded from the study as the study’s focus is on former service personnel with mTBI as a result of blast related/ non blast related mTBI in Iraq and / or Afghanistan. Furthermore, potential participants who hoped to utilize the study as an outlet for therapy are excluded from the study. Potential participants who are not known to any agencies (such as self help, brain injury and counselling) or who have never sought help for their emotional/ medical issues are excluded. One former serviceman of
White British ethnicity, aged between 35-40 years old, who had been in the military for a little more than a decade and who had served on two tours of duty in Iraq and Afghanistan between 2005 and 2008 participated in the study. As he was worried about being identified, in addition to the confidentiality clause included in the information sheets given to him, he has asked that any identifying details be removed/ blanked out in the thesis. An example of this is specific dates, months when he was hospitalized as well as when he sustained the injury.

6.2.3 Ethical Considerations

The University of Surrey’s ethics committee granted the study a favourable opinion. The notion that the participant might experience emotional distress while talking about his injury and how he sustained it was discussed. To ensure the well-being of the participant, the participant was included in the study only after ascertaining that he was actively seeking help for distress and in constant contact with support agencies. The researcher also sought out the support agency he was with so as to ascertain that he has a support network in place to fall back on if he was distressed by the questions asked during the course of the study. A list of hotlines for the participant to contact should he feel distressed as a result of the interview was also included in the information sheet provided to him. The participant was also informed at the onset of the study that he could choose to opt out of the study at any point should he wish to do so. Interviews were conducted face to face so as to be able to observe when a participant might be feeling distressed by the questions. The day after the first phase of the interview, the researcher spoke to the participant on the phone to set up a meeting for the next session as well as to ask how the participant is doing after the first interview. This was so as to ascertain if the participant was distressed by the first phase of the interview and to give the participant time to reflect on the interview. The second phase of the interview was then conducted face to face. The face to face interview allowed the researcher to gauge if the participant was coping well since the first interview.
6.2.4 Procedure

Attempts were made to recruit participants from two service personnel online forums: (AARSE- the army rumor service) and the Veterans UK website forum as well as Combat Stress, Royal British Legion, Royal British Legion Industries, Headway: Brain Injury Associations in the United Kingdom and Poppy Scotland.

Attempts were also made to recruit participants on the social networking site Facebook. Former service personnel who had personal Facebook pages discussing injuries sustained during the war on terror were contacted about possible contacts they might know of who may have sustained traumatic brain injuries while on duty. The researcher also sought assistance from Headley Court Military Hospital to identify former personnel with the injury. The rationale for seeking former service personnel rather than active service personnel with mTBI is that it is difficult to get access to service personnel who are still serving as the researcher’s application to conduct research on active personnel with the injury had been rejected by the Ministry of Defence’s Research Ethics Committee. Participants, who had expressed their interest in the study, were contacted via telephone or email and a pre interview screening assessment via telephone or Skype was conducted to determine their suitability for the research. Participants were included/excluded based on the exclusion/inclusion criteria set out in the recruitment of participants section. A letter informing them of the research and consent forms was emailed/posted to the selected participants so that they could make an informed decision prior to the scheduled interview. The participant selected for the next stage of the interview was contacted via the phone within a week of mailing out/emailing consent forms and information letters and interview times is agreed on with the potential participant. An information sheet informing the participant of the study’s aims: to observe their experience of mild traumatic brain injury was given to the participant. The pre – interview schedule’s inclusion criteria was based on the action sheets on MOD’s mTBI website www.mtbi.mod.uk. Interviews were conducted face to face or via online video conferencing using Skype. The participant was interviewed individually. A diagram charting the pre – interview screening assessment and interviewing procedure is included in the appendix section (Appendix M). To ensure little inconvenience to the participant each interview is 30-45 minutes in length.
interviews were conducted in two stages. Dividing the interview into two stages allows the researcher to check if the participant developed a delayed response to the contents of the interview. In addition to this, there was a debriefing after the interview where the participant was invited to talk about how he felt during the interview and what he thought of the study. This was so as to ensure service personnel were provided a platform to discuss their feelings and thoughts after the interview. At the start of the interview former service personnel were presented with a list of counseling services available to them (The list of the hotlines is included in Appendix H). This was so that none of the participants interviewed misconstrued being presented with a list of counseling services as an indicator that they were individually at risk or that they had been singled out to seek counseling services. The participant was given the option to opt out of the study at any point should he wish to do so. The interview schedule was developed with the aim of exploring former service personnel’s experiences with mTBI. The questions explore the coping/healing process from the moment of the injury till present day. The schedule was not prescriptive but was more of a guide. The aim of the researcher was to converse with the participant(s) on their experiences with the injury and as such the questions were not necessarily asked in a set sequence. The researcher also asked the participant to think of a possible pseudonym for themselves and whoever else they described during the interview. This was done so that the participant felt included in the research as an active participant. The participant in the study wished to be known as Adam as he refers to the support group he joined as Noah’s Ark and the person who facilitated the support sessions as Noah.

6.2.5 Analysis

This study uses IPA to explore the former service personnel’s experiences from two epistemological positions of phenomenology and hermeneutics (Eatough & Smith, 2008). Phenomenology explores the relationship between the “noema and the noesis (that is the experience and the way it is experienced) (pp.11, Landridge, 2007). When exploring the relationship between noema and noesis, phenomenology research tended to employ a process of epoché otherwise referred to as bracketing (Landridge, 2007; Larkin, Watts & Clifton 2006). In the process of epoché the
phenomenology researcher brackets/ or blocks out their worldview of a construct so that their research is data driven as opposed to theory driven (Larkin, Watts & Clifton 2006). Furthermore, anything outside the realms of consciousness is not to be included by the researcher (Larkin, Watts & Clifton 2006). What this serves is that the phenomenology researcher constantly delves into the data, reflecting on it, examining changes and clarifying what they witnessed (Landridge, 2007). After the epoché process, phenomenology researchers tend to engage in phenomenological reduction (Larkin, Watts & Clifton 2006). After bracketing the preconceptions that the phenomenology researcher might have started out with, the phenomenology researcher proceeds to describe what they have witnessed.

Phenomenology appeals to the aims of the study as it assumes that there are multiple perspectives of a phenomenon which could yield different interpretations or views of life (Barker, Pistrang & Elliott, 2002). This can also be interpreted as phenomenology embracing/ encouraging epistemological pluralism (looking at a phenomenon from two or more theoretical traditions) (Frost, Nolas, Brooks-Gordon, Esin, Holt, Mehdizadeh & Shinebourne, 2010; Suri, 2012).

There are several types of phenomenological inquiry: descriptive, transcendental, existential and hermeneutical (Landridge, 2007). In this study, the researcher is interested in existential phenomenology. Existential phenomenology has two concepts: objectivity (living governed by principles laid forth by society) and subjectivity (making life’s choices freely, embracing a lived in experience) (Lanigan, 1991). The notion of embracing the lived experience is expanded by hermeneutics which delves into Heidegger’s Dasein, which is the essence of being or a study of one’s existence (Megill, 1985). Dasein, according to Heidegger socially interprets his actions and it is that interpretation of the self that is studied (Salem-Wiseman, 2003). Dasein evolves with the changes around the being. The being reconstructs its experiences in the face of new information and moves between different subject positions in recognition of the notion of the being in progress (Ortega, 2001). Within Dasein, lies the notion of time (temporality), factorial choice (facticity) and concern for the lived experience (care) (Megill, 1985). Being the sense of being, Dasein is grounded in the lived experience of a certain time frame. To
continue to engage in a sense of being, choices have to be made based on the environment (the factorial aspect). It is ultimately a person’s concern for their surroundings that leads to an expression of emotion as well as care (Eckartsberg, 1998; Langdrige, 2007). Heidegger’s Dasein is in essence what this study explores: the lived experience of former service personnel who had experienced mTBI. The researcher explores the experience of former service personnel with mTBI to access what mTBI in the military context means to them and how these meanings shift with time. The participants’ conscious perception of their experience of mTBI in the military could provide valuable insight into mTBI phenomenon or on the literature surrounding the injury in the British military. Within the group of former service personnel, the accounts of their experiences of mTBI might differ based on their recovery time, extent of injury, and quality of care and treatment. The situation (experiencing mTBI) might be the same but the interpretation of their experience might vary based on the being’s perception of its existence.

The data is analyzed using interpretative phenomenological analysis (IPA). Interpretative phenomenological analysis looks at the internal as well as external world view (Smith & Osbourne, 2004). It refers to different levels of a phenomenon, stating that realities are altered in the face of new information. Furthermore, a person’s speech and behaviour can be altered based on the shifts in realities (Fade, 2004). Interpretative phenomenological analysis looks at how meaning occurs as well as how life is experienced by people (Murray, 2004). IPA is therefore useful in dwelling on health issues (Brewer, Eatough & Smith, 2008). The inductive nature of IPA allows for the researcher to go beyond retelling the participants’ experiences towards framing the lived experiences within the existing literature on the phenomenon (Brocki & Wearden, 2006). The double hermeneutic aspect of IPA alluded to by Smith (2004) wherein a phenomenon is doubly interpreted when a participant first makes sense of the world around them and secondly when the researcher attempts to make sense of what the participant is attempting to make sense of world around them, appeals to the multiple perspectives aspect of the thesis. In addition to this, another aspect of IPA that appeals to the researcher is that interpretative phenomenological analysis views phenomenology from an idiographic standpoint (Eatough & Smith, 2008). By idiographic, the researcher refers to a study
of a specific situation or study of an individual’s experience (Larkins, Watts & Clifton, 2006). Interpretative phenomenological analysis therefore enables researchers to use a single case study to explore a person’s account of a situation (Fade, 2004; Noble, Nelson & Finlay, 2008). This is useful in the final empirical chapter of the thesis as there were difficulties encountered in recruiting participants for the study. The use of IPA in the final empirical study enables the researcher to explore the singular experience of lived experiences of a serviceman with mTBI. While it is difficult to know what the person’s experience with the injury was like from the onset, the former service personnel’s accounts engage with their memory of the ‘realities’. This complements SRT’s notion of representation evolving with time. In this study, the researcher employs SRT as a way of looking and IPA as a way of exploring the experience of the former service personnel with mTBI. Illness representations are also employed as part of the pluralistic approach of the thesis, to explore how a former serviceman with mTBI makes sense of his lived experience. The rationale for employing illness representations is that one of the aspects of illness representations looks at when the person is first aware of their condition (Harman & Clare, 2006). This helps in recounting the first memory of the illness/condition. This is relevant to the last empirical study as it explores the former serviceman’s lived experience of his illness from the moment he was aware of or made aware of a condition he has developed/sustained, when he receives confirmation of suspicions of the existence of a medical condition and how he goes about coping with the illness/condition. Such an account of his lived experience would require him to revisit past and present memories of his experience with mTBI. His experience of the memory is dependent on his interpretation of his memory and what he experienced.

IPA was employed to explore the experiences of former service personnel with mTBI. This study could have utilized thematic analysis instead of IPA as both methods explore themes in the data. However, thematic analysis as a standalone method would not be able to meet the aims of the study as it would only be able to list the broad themes without being able to harness the interpretation being offered. IPA however looks at the interaction between a person’s personal and social world and the meaning making that comes about as a result of this interaction (Smith &
Osborn, 2003). This study’s focus is on a person’s experience of the injury and IPA provides the structure with which to explore the participants’ experience, the coping mechanisms they employed and their perspectives on the injury months or years after they sustained the injury.

In the course of the analysis, the interview transcripts were read several times to ensure interpretations were grounded in the accounts presented. In the left hand margin, notes were made about interesting or significant comments the participant said. Through this, an initial set of themes were identified in the right hand margin. Phrases or sentences that highlight the themes were identified. Following this, themes were listed separately and the researcher looked for a connection between the themes identified. Some of the themes might be condensed into clusters to examine relationships between them with some emerging as superordinate themes (Smith & Osborn, 2004). Next, a list of themes that fall under each superordinate theme was produced. Alongside this, a final master table of superordinate themes and subthemes was drawn up based on the richness of the passages and how it helps shed light on the theme in terms of the overall account of the experience of mild traumatic brain injury. At the writing up phrase, the themes identified in the master table were expanded into a narrative with examples from the transcript to illustrate the account being presented. In the course of the narrative the researcher explored the social representations Adam (the participant whose experiences with the injury are described in this empirical study), constructs in his representations of mTBI. During the course of the analysis, the researcher observed how Adam anchors and objectifies his experience of mTBI and how he attempts to place mTBI in a category he is comfortable with.

6.2.6 Results

Two superordinate themes were identified during the analysis: Changes and no recognition. Within the changes superordinate themes are four subthemes, and within the no recognition superordinate theme there are two subthemes. These superordinate themes and subthemes serve to construct a narrative of the former serviceman’s lived experience with mTBI.
6.2.6.1 Changes

Within this superordinate theme of changes are three subthemes: Perceiving and embracing change, other’s perception of the injury and till death do us part. Adam harnesses his experiences with mTBI as changes. Within this, he talks about what changes he perceives and how he and his loved ones embrace the changes, other’s perception of the changes and the changing face of his ties with the military, his wife and family.

Perceiving and Embracing Change

Adam attempts his own construction of his illness as he talks about the changes he perceives and how he has come to terms with these changes. He describes the blast or what little he remembers of having woken from one, the physical, visible injuries he sustained, the symptoms he experiences (hearing and memory loss and a reduction in verbal communication skills). He gives the researcher an insight into how he copes describing his experience as an adventure. He makes repeated references to age, relating his experience with mTBI to Alzheimer’s and relating his hearing loss to something that he thought happens only to the elderly, while reflecting that he felt old.

Adam describes his early memory of his condition as something that did not warrant his attention.

I had dislocated my arm…from the impact I suppose. My head needed stitches. Other than that they said I was fine. (Lines 53-54)

Besides his head needing stitches and another physically visible injury, a ‘dislocated’ arm, nothing was amiss. He qualifies his perception that everything was fine by relying on those he refers to as ‘they’ saying it was fine. This is the first indication he gives to the relying on others for information on his wellbeing. This notion on relying on others for information shifts in the course of the interview when
Adam talks about some of the changes he perceives and memory (in this case the loss of it) seems to feature very often in his account.

I can’t remember things. I was supposed to meet my wife the other day and she said she was trying to reach me. I forgot and was walking around town, not knowing why I was there. It’s like you know. It’s like Alzheimer’s …. Scary at first but now it’s an adventure. I never know when I’m going to forget and what happens then. (Lines 199-203)

Adam talks about not being able to remember, describing the consequence of that, walking around town. However he embraces this change talking about how it was scary in the past but how he has now changed his perspective of it to taking it in his stride, as an adventure. Though he realizes it is still a challenge coping with changes he embraces the trip. By classifying mTBI as like Alzheimer’s he draws on all the anxiety attached to the Alzheimer label. Though he starts off labeling it as scary, he gradually shifts to describing it as an adventure and not knowing what would happen seems to appeal to his sense of adventure so that he turns this experience from a negative to a positive association. Despite the reduction in his faculties, Adam is still upbeat about the change in his circumstances viewing it as an adventure where he never knows what tomorrow holds and where allowances are made for him on account of the injury. Adam explores the changes he sees in himself and embraces some of them, especially since they are attached to positive emotions. He continues with the idea of things are good these days with:

Things are a lot better these days. I just treat it as a new adventure. My family knows it too. Friends know it as well.. Losing my memory means I get to be fashionably late…. Couldn’t do that before with the lads (Lines 232-234)

Adam seems to consider his experience with mTBI as a journey; things were bad once, now they are better. He constantly refers to his experience as an adventure, where there are bad and good tidings. He is upbeat about the adventure aspect of mTBI seeing an opportunity in his situation, where he can now turn up ‘fashionably late’ which he could not do earlier during his time in the military. That friends and
family knows his situation means they make allowances for his condition. This demonstrates how those around him relate to his injury.

I do get upset sometimes when I talk about the blast. The injury makes things difficult at times. I can’t do things I used to do before. (Lines 248-249)

Things are not always rosy and Adam does get upset when he discusses the blast. He attributes this to the injury and things being ‘difficult at times’. Adam describes the changes in his situation in relation to time frame saying how things are different post injury were he cannot do certain things he used to do in the past. Where he previously constructed how he could not be late earlier and how the injury has allows him to turn up late for his engagements, he now expresses frustration at the blast and the injury as he finds he cannot perform tasks he used to be able to do pre-injury. The reference to ‘at times’ here suggests that there are shifts here when things are not difficult because of the injury.

I’m slower now I guess…. I’m not that quick when I say things…. or when I reply. That’s what everyone says. (Lines 274-275)

Adam continues to dwell on the difficulties accorded by the injury. He reflects that he’s ‘slower now’ and he gets confirmation about the changes he perceived from others around him as they reflect his perceptions of what has changed in him. Adam constantly gravitates to how things were better in the past and is very aware of the reduction in his abilities to: remember, converse and hear.

It was shock… for the wife, our children and my friends. Me as well. I didn’t only have stitches from the injury, I couldn’t remember, and I couldn’t hear…. I felt old all of a sudden…you hear about hearing loss at old age but I didn’t think I’d get it now. (Lines 216 – 219)

Adam demonstrates yet again a shift in his experiences in the temporal frame where he shifts from past to present time. The first shift is from the notion of a few stitches on his head to a sense of shock from the realization of a loss of faculties
(memory and hearing loss). He therefore shifts from an implicit temporality (where he has a few physical scars) to an explicit temporality where all is not well. The second shift is from an adventurous spirit to one of feeling old. At this point, Adam perceives his experience of mTBI as a sense of feeling old with hearing and memory loss.

I’m like I’m not independent like before. My wife has to meet me when I go out and…. I can’t remember things. Uhhh… Not everybody understands that. (Lines 251-252)

This experience of losing parts of his old self continues with a loss of his selfhood. His identity changes from an independent person to someone who has to have his wife meet him when he goes out. As much as he tries grappling with this loss of self it is heightened by the notion that on a social platform not everyone understands his wife’s presence at his side when he is out.

You don’t think about the injury. At least I didn’t. I didn’t know brain injury then. If you got hit, you got fixed. That’s what I’d thought… I don’t think it’s so simple now. (Lines 264-266)

Now I know know that you don’t really get fixed…it gets worse instead. You’re left with questions that have no answers. (Lines 268-269)

These last two extracts in this subtheme illustrate the shift in Adam’s views. Adam reflected that in the past he did not think about mTBI. He did not have knowledge of the injury. He had not questions about it (before he was injured) and hence did not know any answers. He had thought that any injury in the conflict would be healed, that there was a solution for any injury. Through his own experience with mTBI he realized things were not as ‘simple now’ and that it was more complex. This conveys his own experience grappling with the complexities brought on by his injury. The use of the word ‘fixed’ suggests the notion of a quick fix while Adam from his own experience of memory and hearing loss knows that this
notion is just an illusion with things now getting ‘worse instead’. Now (post injury) he has questions but has no answers. Here Adam’s spatiality is illustrated by the changing of his previous view of quick fixes in the military to one where things are not so straightforward.

Adam’s perception of the changes he has experienced shifts with time. This shift is caused by his awareness in the changes he perceives over a period of time. These changes are sometimes positive and sometimes negative. His awareness of the changes in him affects his sense of self. Adam describes his experience of mTBI from his perception of how things changed for him. While he talks about his perceptions of self in this sub theme, in the next sub theme he focuses on his perceptions of how other’s perceive how he has changed post injury. Adam recounts his perceptions of how others perceive the changes in him and these matches with the changes he perceives in himself. In addition to this, he describes how he feels or reacts and what he thinks when he perceives how others perceive the changes in him.

**Other’s Perception of the Changes**

Here, Adam recounts how others perceive him or his perceptions of how they perceive him. Similar to the previous sub theme, Adam juxtaposes the good with the bad. Hearing loss is bad but his friends understand. He starts with the basic perceptions of change and proceeds to describe the complex aspect of the changes and how everything is not as simple now post injury.

Can’t hear. Used to hear very well now I… everyone has to talk loudly. It’s good that our friends are understanding and no one minds me not remembering things. (Lines 212-213)

On one level everyone has had to change how they talk, having to speak loudly because of his hearing loss. On another level, everyone shows their support and do not take it to heart that things have changed in their interactions with him. Similar to perceiving and embracing change, in this subtheme, perceptions of how
others perceive him shifts. There are days when everyone understands and other

times when Adam perceives changes in how people relate to him.

…….hmmm how…..I’m slower now I guess…. I’m not that quick when I say
things…. or when I reply. That’s what everyone says. Sometimes they don’t say
it…but they repeat stuff..to me I mean… little things like that…I may be
slower….but…I mean I’m not dumb so I pick up on their body language and
the way they have changed towards me.
(Lines 274-278)

Adam sees two different ‘realities’ before him. Adam describes how others
perceive him in terms of his processing skills and ability to converse at a pace others
are used to. He reflects that though his ability to process information and converse
has been affected, he is using another aspect of interpersonal skills, interpreting body
language to keep up with what the person is conveying during their interaction with
him. He is presented with two scenarios: the verbal speech of the person
communicating with him as well as the visual, what their body language is telling
him. He sometimes figures out that there is a disparity between the two and draws his
own conclusions from there to put together a third version of his interaction with the
person.

People look at you differently. They think you must be crazy or not fit in some
way (Lines 306-307)

While some people’s reaction to the changes in Adam was implicit, others
were more explicit in their reactions to Adam. Adam talks about how people think he
would not fit. The idea of not fitting in some way is jarring considering his earlier
view on how friends understand. Stepping outside of his safety net of family and
close friends, he encounters people who view him differently and whom he thinks
consider him crazy. This perception that people view him differently is not just on
the external sphere (strangers) but transcends into his internal network of close
friends or army mates.
Well…. they… they you see… it isn’t something they see elsewhere. If you’re not injured you don’t see it. You’re out there doing the usual, doing what we do. What I used to do…..anyway

(Lines 262-264)

Similar to lines 264-265 in the earlier sub theme, where Adam recounted not thinking about the injury till he experienced it personally, here Adam relates this to his army mates saying if ‘you’re not injured you don’t see it’. He juxtaposes this with what he ‘used to do’ stating a difference in their experiences now. Adam with his newfound knowledge due to his experience with mTBI, makes allowances for his mates not seeing things the way he views them now stating his current state is out of the norm of the ‘usual, doing what we do’. He portrays the out of sight out of mind notion stating the injury is not something his mates are conscious of. Here Adam constructs two representations of us and them. His own position shifts from once belonging to the ‘us’ category to now alone in the ‘I’ category and they the ‘us’ are now ‘them’. His own role shifts from the not injured to the injured category. His unique position as an injured person accords him the privilege of viewing the injury from a different lens, seeing things he did not see previously. While Adam seeks to come to terms with the different perceptions he and his mates have of the injury (in this mates’ case, they have no perception of the injury), the next extract suggests that though the injury was out of the norm, its nature led others to wonder if the worst was yet to be and that surviving death was not necessarily overcoming the worst out there.

Well, it.. got to the the point where my wife, well she wondered what else was new…. They were all very worried, the family and friends. Whether the worst was over after surviving death or was the worst on its way.

(Lines 221-223)

Adam’s close network of family and friends are left wondering if there was more bad news on the way. Adam does not leave any doubt as to the nature of new developments they worry about wondering whether the worst was yet to be. Adam categorizes surviving death as not necessarily a good thing. Here Adam anchors
experiencing mTBI as surviving death but being the worst for wear. The labeling of fearing what the future holds in terms of how else the injury manifests itself as worse than death categorizes the mTBI experience as an uncertain one, fraught with new challenges.

In summary, Adam perceives how others have changed towards him as well as the changes seen in him. He constructs his experience in terms of implicit and explicit temporality (described earlier in chapter 3). He shifts his constructions from when others understood of the change thereby resulting in him being comfortable (implicit temporality) and when others view him differently creating dissonance from his newly aligned comfortable state of being (explicit temporality). Adam’s engagement with his Dasein makes him aware of his environment and how people have changed towards him. He internalizes this to what he was like when he did not see the injury and rationalizes that it must be the same for those around him. In the next sub theme, Adam speaks about shifts in his perspectives on life and reflects on his perception of the changes in his ties with the military and with his family. The notion of ‘till death do us part’ shifts and the people he feels beholden to in that promise shifts as he perceives the shift in how others (the military and his mates in the military) view the ties he once shared with them.

Till Death Do Us Part

Adam’s experience with mTBI changed his perspective of his ties with the military and with his family. Before his injury Adam had thought he shared two conjugal bonds: one with the military and the other with his wife. Adam post injury evaluates these as he has experienced changes in the nature of his relationship with both partners (the military and his wife).

You know I’ve been in the military since 18 and I thought they’d be with me for life… sort of till death do us part (Lines 170-171)

Here Adam talks about how he had once viewed his relationship with the military. He had considered that his death would be what would end the relationship
he shared with the military. However when he returned alive but injured things changed as reflected in the next extract.

I mean I’ve been on tour and spend more time in Iraq than with my family… but then then… then all of a sudden I’m cut loose.. not told why or anything. They were not willing to help me…to to find out what was going on.. you know… with me. (Lines 173-175)

Adam felt this bond with the military since he ‘spent more time’ with them than with his other conjugal partner (his wife) and children. The sudden rift in the relationship is felt acutely as he is ‘cut loose’. His choice of words here describes the abrupt ending of the relationship as he had perceived it. He realizes the feelings of ‘till death do us part’ were not mutual. This forced separation is imposed on him and not one where he had a choice. Besides being ‘cut loose’, Adam is not given any reason for the exclusion. At this point in the transcript Adam has still not decided to leave the military so the notion of ‘cut loose’ is not that of leaving the military but being excluded from the right to know or to information on what was happening to him. It is this monopoly of information that Adam feels acutely as he is left to grapple with his changed circumstances alone. He is aware of his othering, using terms such as ‘they’ and ‘me’. This demonstrates how distant and aloof he feels the military has become post injury. The unwillingness to help and to find out what was happening with him; not being alongside him in his struggle to come to terms with the changes he perceived is juxtaposed with the time he spent with the military instead of with his family. While Adam feels he is ‘cut loose’ by the military he does not extend this to his mates in the military.

They haven’t changed totally. They’re still my mates… It’s just that our lives are now … like parallel….things are different. I’m not there anymore. I’m moving at a different pace I guess (Lines 280-282)

Adam maintains that the relationship he shares with his military mates is unlike the bonds he perceives with the rest of the military (those that cut him loose). He interprets their changes towards him (which he maintains is not total) as part of
the life he leads now. The idea of ‘parallel’ (line 281) lives reflects the differences created by his absence in their lives as he is ‘not there anymore’ (line 281). Adam processes this on two levels negotiating the change in terms of absence versus presence and the pace in which he moves. Adam views these changes in his self identity and internalizes the changes in how his mates in the military perceive him as something brought about by the pace he is travelling at. He therefore does not impose his own difficulties on them but seeks to make allowances for how they have changed towards him positioning his mates as the norm and himself as moving away from the norm which has caused them to change their perception of him. He maintains that despite the shift in norms they are still his mates since they have not changed totally. This notion that he has changed as a result of the injury is continued when he discusses his decision to leave the military.

I felt I couldn’t go back. I wanted to go. Be back with the lads… I mean these were my mates but I couldn’t do things like I used to. (Lines 318–319)

Adam demonstrates his struggles with objectivity and subjectivity. Despite wanting to go back to be ‘with the lads’ his knowledge of the impact of the injury on his ability to perform at the same pre injury level prevents him from going back to duty. His perception of the diminution of his abilities proves to be a stumbling block to his returning to work. The reduction of his abilities is not within his control and that impedes his going back to active duty. While he grapples with his awareness of the deficits caused by his injury, he is aware of his second conjugal partner, his wife’s emotions on his returning to serve his first conjugal partner, the military.

My wife thought I won’t make it back this time. I didn’t want to scare the kids and her again. This time was enough. I didn’t want them to worry. (Lines 319–321)

Adam shifts focus from the military to his wife and children. He is aware of his family’s feelings on his returning to work in the military. Adam talks about his decision here, saying he did not want them to worry. The decision came about
because of his awareness of their feelings on the subject and his own reaction to their emotions.

My family thought about that all the time. If you go, the next call might mean… you know…. Death.. didn’t want to do that to them. (Lines 333-334)

Here, Adam talks about the possibility of his death while on duty if he had chosen to remain in the army and been deployed to Iraq/ Afghanistan again. While he had supposed his relationship with the military ends with death, there is no such premise for that here in his relationship with his family as he reflects on what his dying while on duty would do to his family. Here, Adam equates returning to active duty as returning perhaps to answer Death’s call. Adam then makes the decision to leave the military.

I felt it was about time. I couldn’t be the old me. The me now couldn’t do what I used to. Quit while I still can. No point coming home in a body bag and upsetting everyone. (Lines 329-331)

In his decision to leave the military, Adam reflects on the ‘old me’ and the ‘me now’. Unlike lines 174-175 where he was ‘cut loose’ here, Adam is the decision maker. He decided when he was going to call it quits. Even though he demonstrates that he decided to quit, he suggests that this was motivated by the changes brought about by the ‘me now’. This suggests that the decision has been made for him in a way by the decline in his abilities. The notion of quitting while he ‘still can’ suggests that if he did not quit now he would be made to sooner or later due to the impact of his injury on his ability to perform in the military setting. Adam talks about wanting to continue in his current capacity and not wanting to risk returning in a ‘body bag’. This reflects his shift from ‘till death do us part’ stance with the military to not wanting his family to go through his death if he chose to stay on in the military.

In conclusion, his decision to quit before ‘death do us part’ is influenced here by his awareness of the changes he has undergone post injury. This is another factor
that weighed in on his decision to leave the military besides his family’s sentiments on returning to active duty. The military cutting him loose while not giving him any information also fuelled his decision since he was not being assisted in any way and had to cope with the impact of the injury by himself. While Adam is cut loose from one conjugal partner (the military), he is mindful of the second conjugal partner’s (wife) emotions and decides on a course of action that would bring about a resolution to the dissonance he has encountered as a result of the injury.

In this subtheme, Adam reflects on how he has changed and how others perceive these changes (or rather, his perception of their perception). He locates the changes he perceives in terms of past and present. He shifts in how he perceives the injury’s impact on him and those around him moving from positive associations (getting away with being fashionably late and having an adventure) to negative ones (such as being perceived as crazy). The decision maker changes through his discourse shifting from the military (cutting him loose) to himself (calling it quits).

In the next superordinate theme, no recognition, Adam shifts from the changes he experienced to what he was told or not told about the injury. Within the superordinate theme, the researcher identified two subthemes: They didn’t tell me and no formal support. Adam’s experience with not getting any recognition for his injury is located within the two subthemes.

6.2.6.2 No Recognition

Adam talks about his perception of the changes he experienced post injury, his perceptions of how other’s perceived changes in him and the evolving of his relationship with the military and his family in the first superordinate theme. This second superordinate theme on no recognition reflects the difficulties he faced in getting the military to recognize the changes he was experiencing as a result of the injury. Adam talks about not being given enough information and not being told what was happening to him in the first sub theme and in the second sub theme he talks about not getting formal support for his brain injury.
They Didn’t Tell Me

In this sub theme Adam constantly recounts not being told. At first he recounts it as not being told, but later in this subtheme he states that ‘they’ didn’t want to tell him he had brain injury (line 76), stating what he believed to be a deliberate choice on the part of those withholding the information. In this subtheme, Adam continues with the othering of ‘they’ and ‘me’. He begins his recount of not being told what was happening to him or what had happened to him from waking up from the blast in Iraq right up to his time in Headley Court Military Hospital.

They didn’t tell me when I was there or when I returned. (Line 64)

No that’s the thing. You’d think they’d tell you won’t you, they but they didn’t. They didn’t tell me at in Iraq and they didn’t tell me here when I got back (Lines 67-68)

In the two extracts above, Adam reflects on the times they could have told him about his injury. He draws on two different time periods (point of injury and when he returned to the United Kingdom) when they would have had the opportunity to inform him of his injury ‘but they didn’t’. ‘They’ here is used as a collective to represent the military. He once again engages in the notion of ‘them’ and ‘me’. He is not part of the group. He infers that the researcher (‘you’) would think ‘they’ would mention it. In lines 67-68, Adam constructs three tiers of knowledge: ‘they’ the holders of the knowledge, ‘me’ the person (that is Adam) trying to gain knowledge but not given any access and ‘you’ the researcher or consumer of this discourse.

They didn’t want to tell me I had brain injury. They just told me the headaches would go away. They didn’t (Lines 75-76)

Adam now shifts from them not telling him what was going on to them not wanting to tell him about the brain injury. He positions this not wanting to tell of the injury as an active choice on their part. He explicitly specifies the type of injury (brain). He then describes what they told him - about the headaches and that ‘they
would go away’. He dismisses the knowledge they imparted to him by delving into his own experience that they (the headache in this case) did not go away.

They didn’t tell me anything. I went back there three times in the next two years. (Line 89-90)

Here Adam seeks to quantify his experience when he talks about being hospitalized. Not being told anything keeps him in this state of limbo, neither here nor there. The time frame he was in limbo, and not in the know of the extract nature of his injury and what it entailed makes what he was going through more pronounced. He follows up on this construction with an explicit reference to his having “had a hard time: (line 92).

I had a hard time. My head ached. I couldn’t understand. Understand what was going on. Nobody told me what was happening. (Lines 92-93)

Not knowing what was going on and having his head ache made things difficult for him to comprehend what was going on. Adam refers to headaches elsewhere in the transcript (lines 75 -76). This repeated reference to his head aching suggests that all it not well. Juxtaposed alongside not understanding what is happening and not being told (line 92-93), Adam constructs a sense of uncertainty, not knowing and not being told anything. Adam struggles with the not knowing and not being told anything especially since he was looking for help to understand what he was going through.

I wasn’t told anything. None nothing at all. Not one thing. Just headaches will go away. They weren’t helpful. (Lines 123-124)

Here through the four part list, Adam once again constructs how he was not told “I wasn’t told anything. None nothing at all. Not one thing.” (Line 123). At this point Adam shares his thoughts on the level of assistance he receives. He explicitly states that they “weren’t helpful.” (line 124). The headaches not going away and head aching were constantly mentioned by Adam. Here, Adam positions himself as
the lone ranger (the ‘us’) and the authorities who were not telling him about his injury in another group (the ‘them’). He is in need of help and they were not forthcoming. Societal norms dictate that when in need one seeks help. In this case, Adam felt a need to seek assistance for the headaches that were recurring. The headaches were not being recognized or acknowledged by those he was seeking help from who dismissed them as something that will blow over or ‘go away’ (line 124). With no information being shared, he was alone in his experience and this served to fuel his perception of being alone and not being given any support. Adam then reconstructs his experience in this new light that he has to fend for himself. This reconstruction is continued in the next sub theme on no formal support which extends not being told to not getting any assistance.

No formal support

Adam’s sense of not being told and not being supported is fuelled by the media he watches. He draws comparison between American veterans getting help and feels the sharp contrast between his situation and theirs. His situation is made more acute with the ‘lots of help’ (line 124) his American contemporaries are getting as opposed to the absence of help he is experiencing. In the next two extracts Adam feels shortchanged: his American counterparts have a totally different experience, he has to ask for help while they get it easily.

You know how you hear about the Americans getting lots of help ..you read about it on their websites and on YouTube. (line 124-125)

The difference in the two (British and American) care networks is highlighted by Adam here. Here Adam positions himself in a different group. However, he divides the ‘them’ to two different groups: the American soldiers and the hospital support here in the United Kingdom. He positions the American soldiers as those with help where the hospitals do things to support them. He then reflects on his own situation and positions himself in a less privileged situation where things are not done for him. Instead he describes a sense of talk down approach where he is told by
the hospital staff presumably that what he is experiencing will go away. He is not
given more information such as the time frame it will go away by. Adam then
identifies who he can rely on for help: his buddies. This positions Adam as his own
problem solver having to seek help from his peers as opposed to his American
counterparts having the hospital do things for them. In times of need, his buddies are
there for him, getting all the information he needs to him.

Yes.. they talk about how they are helped, what the hospital did for them….
but…But there’s no support here. I’m told it’ll go away. That’s it. When though? I
had to rely on my buddies to get information on who to see and where.
(Lines 127-129)

Here there is a twist as Adam chooses to leave the hospital. From working up
notions of not being in control of his change in circumstances, Adam now seems to
take charge; he decides when he wanted to leave the hospital. However he meets
with yet another stumbling block, the lack of support he experienced earlier is
extended further from not providing information to now withholding information or
being reluctant to record his medical condition (lines 144-145). This echoes the
earlier sub theme of not telling him because they did not want to tell him about the
injury (line 76). The absence of formal recognition of his medical condition would
impede any hope he has of getting assistance for it.

Oh that… when I wanted to leave, they didn’t fill it in. They didn’t want to write
that I had brain injury.
(Lines 144-145)

The reluctance to put on record his brain injury has far reaching implications
for Adam. His injury cannot be recognized without proper documentation.
Furthermore, he would be unable to move forward without knowing what was going
on (line 151). Adam was expected to still ‘recover and move on’ (line 148) while not
knowing about his condition or being given adequate assistance for it. The
contradictory messages he was getting were not helpful to him. Adam was looking
for some concrete confirmation on what was happening to him, to be given
information on his condition so that he could cope with his injury.

They didn’t but I can’t seem to get recognition for it. Having a brain injury means
nothing. I was still expected to be able to recover and move on. They told me
about the injury, some papers but they didn’t write it anywhere else. No
confirmation. That was what I needed. I needed to know what was going on. I
mean… I needed to know for sure. To know what was going on
(Lines 147-151)

Adam constantly reiterates the lack of information given to him and that he
was left to fend for himself: to cope on his own. In the last extract below, Adam
realizes that was the extent of the help he would be rendered and that he was
expected to cope with whatever limited help he had been given and move forward.
Adam then embarks on his journey of recovery. Adam’s recovery journey appears to
be a solitary one with no support from authorities he was depending on. He had to be
his own catalyst and start actively looking for and seeking assistance for his
condition.

Some information, they had on brain injury. That was it though. There was
nothing else. I had to look for places by myself. (Lines156-157)

In conclusion, Adam shifts his position from depending on them for
information at the start, then hoping for information, to realizing it was not
forthcoming and then moving to getting his own information on his condition. In this
superordinate theme the reluctance to put Adam’s condition on record, the lack of
adequate information conveyed to him, the lack of formal support and lack of formal
recognition of his condition places Adam in a very awkward position of having to
shift from not knowing what was going on; to wanting to know what was going on;
to being presented with a total reversal of conditions for his counterparts across the
Atlantic; to meeting with stumbling blocks along the way and to eventually seeking
the information on his own terms. Through this journey of discovering more about
his condition, Adam learns how his expectations have had to change along the way and he learns to rely on his buddies and himself to move forward.

The researcher utilizes the two concepts of existential phenomenology: objectivity (living governed by principles laid forth by society) and subjectivity (making life’s choices freely, embracing a lived in experience) to summarize Adam’s construction of his experience. Having been in the military for a little more than a decade, Adam’s life revolved around the military to the extent that he felt he shared a conjugal bond with the military. However, post injury, he found that he had no control over the changes to this relationship. The change in his relationship with the military and their treatment of his health issues caused a further rift in the relationship. However, there are positive aspects to this change. He no longer had to keep time according to military precision and could now be fashionably late. Though he was faced with challenges due to the changes in his abilities, he coped with this change by looking at it as an adventure. Moreover, he realizes that his relationship with his military buddies has changed since they are not privy to his experiences post injury. He positions this as the norm since he had held the same views as his military peers before sustaining his injury.

7.3 Discussion

Adam constantly reiterated his experience of mTBI as a journey. However, within the course of the interview, his journey shifted subject positions: the journey started with confusion about what was going on and he discovered new things about himself as he coped with changes within him post injury. He viewed this journey positively for the most part, acknowledging its challenges but embracing them as a part of his life now. He coped with these changes by viewing them as an adventure he was on. Along the journey he reflected on his days in the military and his double conjugal vows and how he was now divorced from one conjugal vow and remained committed to the other. Adam’s shifted in allegiance to placing more emphasis on his relationship with his wife and family over his desire to continue in the military demonstrated an awareness of the shift in his own views of what was important to him. The military took a backseat post injury while the family took centre stage.
While Adam talked of his family and friend’s role in his coming to terms with and coping with the injury, he also stated that part of his journey was solitary with no companions or few companions. His quest to understand what was happening to him and to seek formal recognition and support was for the main part a lone journey with his buddies occasionally steering him in the right directions to receive the help he needed. Adam thus shifted from a man embracing adventure to a man forced by circumstances to be his own problem solver. Adam’s description of his journey is similar to what happens during illness constructions when people documented their experience from the moment they experienced the illness, through diagnosis, treatment and eventual recovery (Greenfield et al., 1998).

 Throughout the extracts, Adam described his efforts to come to terms with what he was experiencing. He acknowledged that he needed expert advice and support and sought it only to be fended off with little information or information that he felt was not true based on his experience of the injury (i.e. that his headaches would go away). Adam’s quest to know what was going on was in keeping with illness constructions where people needed to get through the ‘what’ aspect of their illness’ so they could begin the process of the ‘how’ part of rehabilitation and recovery (Abrahams, 1997). Adam also described a variety of emotions and situations: uncertainty, fear, shock, having to cope with how people look at him, bringing his wife along everywhere and being allowed to be fashionably late. He reflected that the injury took some things away from him: independence and that his ability to interact with people has been reduced in terms of his processing information. He contemplated the things he had gained from the injury: more quality time with his family, being given allowances to get to meetings late rather than having to be punctual previously and having a close knit circle of friends who knew about the injury and whom he could fall back on. Adam mentioned a shift in his perspectives on the injured in the military. Prior to his injury he had not thought about being injured. ‘If you got hit, you got fixed’ (line 265). After his injury he acknowledged that his uninjured peers probably viewed his injury in a similar vein since he had done so himself pre injury. In doing this as well as when making comparison to his American counterpart’s experience, Adam experiences resonated with Merleau-Ponty’s (1962) focus on different viewpoints on the same situation. He
now recognized the complexities in the fixing process while coming to terms with his
injury.

This case study explored a former service personnel’s dawning awareness of
the extent of his injury and his journey in coming to terms with his injury. Being a
case study based on a sole participant, the researcher recognized that others’
experiences of the injury may differ from Adam’s. The level of care and support
might also vary based on the extent of their injury, the information they have on the
injury and how actively the personnel worked towards being their own problem
solver. Furthermore, the analysis presented in this study was the result of double
hermeneutics where the researcher made sense of what Adam made sense of. Other
researchers may interpret Adam’s interview differently.

6.4 Reflection

Being my mother’s caregiver while she recovered from mTBI, I had to
bracket my own assumptions and experiences of the lived experience of mTBI. As
such, while writing up the interview schedule and pre – interview assessment I had to
be careful not to include questions that were leading or affirming my own care giving
experience or that of my perceptions of my mother’s experience with the injury. I
had to focus instead on writing up an interview schedule that reflected what I wanted
to explore about a former service personnel’s experience with mTBI. While
interviewing Adam, I had to pay attention to the type of questions I might have been
tempted to ask during the course of the conversation (such as questions that would
have either been regarded as leading or influencing his account of his experience).
The process of bracketing did not stop there and was extended to the analysis where I
had to be mindful not to choose themes that reiterated my views and my own
experience as a caregiver. I also had to be mindful to not be influenced by the
literature review on brain injury as well as the perceptions of the injury as expressed
by participants in the other empirical chapters of the thesis.

Another aspect of my experience conducting this study was the problems in
recruiting participants to the study. I had contacted veteran organizations in the
United Kingdom and found it difficult to recruit participants for the study. I had thought there were going to be more than one participant when I wrote the initial ethics proposal. I had envisioned 6-8 participants at first and then hoped for at least 4-6 participants. Veteran agencies I spoke to expressed problems in locating the former service personnel as they (the former service personnel) tended to move around and were not residing at the addresses on file. I then made changes to the recruitment drive including all other brain injuries besides mTBI as long as it was sustained while in combat. This latter inclusion of sustained brain injuries while in combat proved to be another stumbling block as most of those with brain injuries identified by veteran organizations were sustained during a domestic incident such as fights or motor accidents. I then sought assistance from Headway: The Brain Injury Association’s help in recruiting participants. I spoke to/ corresponded with all the branch representatives of Headway throughout the United Kingdom and they identified three potential participants. One of those identified said he did not feel he fit the criteria and was excluded from the study as the study is about the conscious lived experience of the injury. I spoke to two of the potential participants over the telephone and sent them information on the study as well as the consent form to review after the pre – interview assessment. I then called them to affirm their willingness to participate in the study and to schedule a time and place for the first interview. At this point I was working on the assumption that as former military personnel, if they said they (the first participant) would call after they had reviewed the information on the study I should wait for the call rather than disturbing them. This was a misconception on my part as I had not taken into account that the injury had resulted in memory loss which would mean they forgot they had spoken to me! After a week had gone by, I called him and as I was unable to reach him, I called the support group he went to and was told he had not attended the previous session or called to say he would be attending the next session. Thankfully, Noah, the facilitator of the support session told me that people with brain injuries tend to forget and that it was acceptable for me to call the participant and remind them of our conversation. He said it would not come across as hounding the potential participant (I later discussed this with Adam, the participant who agreed and said it would be okay for me to call him to remind him of the interview session). I then asked Noah if I could attend the support group and went to the session hoping to meet the potential
participant. He was not at the first support session but I managed to get in touch with him in the interim and he recounted that he thought he had had a conversation with someone but could not remember. We schedule the first phase of the interview and I called Adam a fortnight before the interview and again a week before the interview to remind him of the interview besides emailing him about the interview.

While the first phase of the interviews for both participants went well, I encountered an unexpected problem due to scheduling in the second phase of the interview. I had exercised caution in not upsetting the participant with my questions and had thought of dividing the interview into two phases so that the participant is given time to rest and not be emotionally or physically exhausted by the interview. However, I had failed to take into account that it might be difficult to get in touch with the participant after the first phase of the interview. Both the first and second participants had a period of time where they were not contactable. The support groups who identified them for the study during the recruitment drive also said they could not get in touch with them and that they had not attended the support sessions. While the second participant was still not contactable in early September 2012, I was able to get in touch with the first participant (Adam) and literally camped out in the area (staying in a bed and breakfast nearby) so as to be able to conduct the interview. I stayed in the town the participant lived in as the participant did not live in the Surrey region and it would take me six hours to travel to where he was to conduct the interview. I chose to stay in the same town as I was afraid that once I managed to get in touch with him through his mobile phone it would be difficult to arrange a time to interview him if I was travelling to the interview from Surrey and there was a risk that he might not be contactable again. However, if I stayed in the same town as him, it would be easier once he answered his phone to say that I am in the area and that I could interview him now if he was free. Thankfully Adam did answer the phone on one of my attempts to reach him and I managed to complete the second phase of the interview after three days of staying in a bed and breakfast.
Chapter 7. Discussion, Directions for Future Research and Conclusion

7.1 Introduction

In the thesis, the researcher explored how various social groups perceived mTBI in the British military. The researcher explored how team members of the final project team report on MTBI, the general public and a former serviceman with mTBI perceived the injury. In the first study, mTBI in the British military was perceived by the authors of the final project team report to be recoverable. It was constructed as an injury that was problematic to define and that caution should be expressed against labelling it as it has implications for compensation seeking. Despite the difficulties attached to the disorder, the authors of the report constructed it as an injury that has a care plan in place by the government. In the second study, the very labelling of mTBI was called into question. Its varied symptoms were presented as evidence to discredit and marginalize the consequences of mTBI. Those with persistent symptoms were constructed as having pre-existing conditions. All these served to construct a level of certainty of attaching too much significance to mTBI and served to align mTBI as a disorder that was manageable with little consequences. In the third study, there was a shift in terms of knowledge. The expert perceptions in studies one and two were cast aside here to access the layperson’s perception of the injury. Some participants constructed mTBI as something they had no knowledge of and something they never thought about before. The public perceived mTBI to be a trauma to the head, from hurting the head and/or brain damage. It was perceived as something caused by stressful events. Others felt it was not life threatening. Members of the public had diverse views on the long term effects of mTBI with some perceiving it to have long lasting effects while others felt it did not affect daily function and could be cured. Furthermore, members of the public felt mTBI in the British military was something the government should deal with and considered the injury an occupational hazard: a common injury in the military circle that service personnel knew about. In the fourth study the former serviceman with the injury perceived the injury to be life changing. It redefined his bond with the military. He felt he was on a journey post injury. He constructed his experience with the injury as one without recognition. However he
reflected that the injury gave him social privileges he did not have before and he viewed his experience with mTBI as an adventure.

7.2 Overarching Theme

Having looked at the four key stories of the empirical chapters, the researcher focuses now on the overarching theme of the thesis: the four empirical studies work up a sense of uncertainty about the injury. Similar to the heterogeneous aspect of the injury described in the literature review, the four studies constructed a wide range of symptoms displayed. The nature of the injury and the duration of its manifestation were also varied, ranging from short to long term. The four studies constructed varying degrees of uncertainties in terms of diagnosis and management. In the first study, the authors suggested that diagnosis was problematic because of the symptoms of mTBI being linked to other disorders. The second study suggested caution at the labelling of mTBI adding that addressing it under the brain injury category accorded it unwarranted importance in terms of its impact and consequences. The author of the project report sought to discredit any aspects of the injury that raised warning bells and chose to legitimate the care plans in place to address the injury instead. This served to project the perception that all aspects of the injury that did not align with their perspective of a mild carefree mTBI were marginalized, discredited and ultimately discarded. The third study provided a spectrum of causes suggesting that the injury might be short term or long term and that it may even be life changing with the onus on the government to ensure adequate healthcare provision for veterans. This study also suggested that not everyone was aware of what mTBI was and/or its effect on those with the injury.

While the first two studies demonstrated a certainty in terms of care plans and diagnosis in place for veterans with the injury, the last study’s participant suggested that this was far from the case. The last study provided an in depth insight into what the injury was like. This was to be expected as the last study was the only one of the four empirical studies that explored the impact of the injury on those with the injury. He struggled with formal recognition for his injury and had little support from within his army ranks. While other studies presented their perceptions drawing from
research, the media and social interactions, the last study’s participant continues to live with the injury and draws his perceptions from his lived experience with the injury. While the perspectives of those in chapter four to six appear to end after the studies the last participant continues to go on: what he describes as a journey, an adventure. In terms of the identity aspect of mTBI, the last study’s participant, Adam underwent a change in his circumstance that resulted in him being divorced from the military besides being unable to share his experiences with his peers in the military.

All the empirical studies seemed to suggest a sense of uncertainty attached to the diagnosis and management of mTBI. This was also reflected in the literature review in chapter 2 where mTBI had an array of symptoms, definitions and diagnosis. The main reasons for this uncertainty stems from the heterogeneous aspect of the injury with far too many possibilities in terms of type of injury, impact and management.

7.3 Links to Theory

The study employs SRT as the overarching framework of the thesis. Social representations look at how people perceive a phenomenon using anchoring and objectifying. In the empirical studies people described a concept that was either unfamiliar to their audience (in the case of the project report) or unfamiliar to themselves (the third study and to some extent the last study).

In the first study the discourses described a problem and also put forth its line of defence against the problem. They engaged in naming and shaming by aligning mTBI with stigmatised old wounds of war. The second line of defence worked up constructions of a care spectrum in place to deal with those with mTBI while the third line of defence described a consortium of collaboration between the United Kingdom and the United States of America’s military research teams. This third line of defence delivered a hidden punch alluding to UK supremacy on two levels: forging ahead working on neural markers linked to head injury, pioneering the diagnostic tool which had not been validated in the US military arena. This discourse
positioned UK as ahead of the game in identifying, treating and containing incidences of mTBI in the British military. In the second study, while the analysis highlighted the deflation of mTBI as a label of repute, it also brought to the forefront what the authors of the report chose to highlight: the efficacy of the care plan in place in action. Touted as superior to the US in some aspects, it suggested a high level of preparedness prior to the war on terror and during the war on terror. It invokes international gold standards of excellence by its reference to being in accordance with the World Health Organization (WHO). In the third study, the proportion of members of public who took part in the study provided a diverse range of interpretations of mTBI with some of the interpretations of symptoms, durations and impact of the injury almost resounding with some of the views in the literature review. Some mentioned it was very mild with little or no effect while others perceived mTBI to have life changing consequences for the service personnel. Using SRT alongside the critical realist position and thematic analysis, the researcher observed the shift in the multiple perspectives angle of SRT. In the fourth study, prior to sustaining the injury Adam had no knowledge of the injury and what it entailed. He believed it would be a case of find and fix and when that was not the case, he had to realign his beliefs to his experience. This shifting in his perspectives is something social representations theory alluded to when it described realities as being fluid (Moscovici, 1998).

7.4 Epistemological Comment

Using a pluralistic approach, the researcher explored several versions of ‘realities’. Beginning with social constructionism, the researcher was able to explore different accounts of a situation emphasising different areas of a situation. During the naming and labelling of mTBI the authors of the official report cited research studies and programmes on brain injury to solidify the viewpoints they are putting across. They wove together reports and programmes in place as well as the superiority of the United Kingdom’s action plans so as to project an image of everything being under control. Throughout the fourth chapter the authors used acts of persuasion to pointedly disregard or negate aspects of mTBI that they did not agree with and opted to place them in unfavourable terms. The authors of the report also engaged in
othering, creating a ‘us’ and ‘them’ positioning persuading readers of the report to align their views with the superior view of the experts (the authors of the MTBI final project team report). Still seeking to garner a deeper level of understanding of mild traumatic brain injury in the British military, the researcher shifted the focus of the thesis from official texts to embark on a study on public perceptions of the injury. The critical realist position accorded the researcher the scope to combine the social interactions with a version of reality. Using latent thematic analysis the researcher was able to locate the themes within the ideology of the critical realist framework to observe that the public perceived mTBI to be having various symptoms and that the injury was highly individualized, manifesting differently for each person. It was also classified as an occupational hazard that should be cared for by the government.

Study four shifted the focus from a public view to an individual view, using a phenomenological approach: IPA to look at the lived experiences of the injury. This accorded the researcher the opportunity to explore in depth the individual lived experience as opposed to a group’s lived experience. The former serviceman with mTBI shifted in the realities he experiences post injury from being separated from the military, to not being able to remember and feeling old. The key shift in his realities lay in the changed status of his relationship with the military as well as his observations of his experiences of the injury; as opposed to his perceptions of it pre-injury.

7.5 Methodological Problems

Besides the ‘realities’ harnessed in representations of mTBI by the social groups explored, the researcher acknowledged the methodological biases of the four empirical studies. For the first two studies, the researcher used a singular dataset. Most would caution against looking at a singular account to base the analysis. However the document analyzed was a final project report which based its findings on research in the area and located its constructions within these reports. As such it drew on other social structures at play when constricting mTBI. In addition to this, there were annex documents of past research in the area which were included in the final project team report which thereby strengthened the views constructed in the
report. Also, there were difficulties encountered in obtaining additional reports on mTBI in the British military as there were no British equivalents to the American army magazine reports on the injury. Besides using official tests to explore the final project team members’ constructions the researcher could have chosen to interview authors on the final project report team panel to get a sense of what they make of the injury. Moreover, the researcher could have interviewed the clinicians who diagnosed or worked with service personnel who have mTBI at Headley Court Military Hospital to get a sense of what mTBI meant to them. Alternatively the researcher could have interviewed both the authors of the project report as well as the clinicians at Headley Court Military Hospital to explore what mTBI meant to those in charge of making decisions of diagnosis and treatment. Such interviews would not only be more recent than the final project report in their constructions, in the face of new information they might perhaps have served to realign or discredit some of the constructions in the earlier report.

The third study encountered a different type of bias from the first two studies as it was administered online and offline. In the age of information technology, the internet is a major mode of communication and interaction and provides a platform for the individual to shine. Chat rooms, blogs and social networking sites connect people, services and information across the globe. As such, to get support or information on illnesses for example, one can simply go online and access information on support groups, hospital websites and forums online (Davison, Pennebaker & Dickerson, 2000). As information is readily available and not limited to the elite, more people are empowered to construct their own version of realities (Parker, 1996). Therefore using the data of participants who took part in the third study online could possibly result in those participants expressing the views of articles they had read or images they had seen on television/internet. This was not necessarily a bias as the critical realist position in chapter six looked at how people made sense of a phenomenon using an interaction of their own beliefs, social interaction and the action that contributed to those beliefs. Being able to access information from the internet enabled people to be more informed of the injury and its consequences. While the third study’s bias lay with the method of data collection, the fourth study’s bias was the result of an idiographic study on the experiences of a
serviceman with the injury. While IPA enabled the researcher to explore the individual’s lived experience, it would have been useful to conduct focus groups with current or former serviceman discussing coping post injury. There were difficulties encountered in obtaining participants for this study due to participants moving and not updating their information with agencies dealing with brain injury such as Headway and Headley Court Military Hospital. As such, though the fourth study only explored a former serviceman’s perspective, the use of IPA allowed for in depth analysis of the participant’s perspectives of the injury. The findings from the analysis were not however, generalizable to other individuals with mTBI as each mTBI has unique characteristics depending on where the injury is located and the impact of the injury.

7.6 Conclusion

The empirical chapters in the thesis enabled the researcher to explore how mTBI is perceived in official, public and individual domains. All the empirical chapters work up a sense of uncertainty about the injury in terms of diagnosis and treatment. In the official texts the diagnosis and treatment are constructed as problematic only to be realigned to not being a problem anymore due to the care plans in place. In the same text, the injury is constructed as inconsequential and symptoms and consequences of the injury that do not fit in with this (such as being symptom free after three months with no long term effects of the injury) are discredited and marginalised. In the public domain, the injury is perceived as having different shades where the symptoms are varied with short and long term effects while others perceive the injury to have no effect on functioning and a result of being in the British military. The public in the study perceived the onus of providing adequate health for veterans to be that of the government’s. In the individual domain, the former serviceman with mTBI, Adam, tended to view mTBI in terms of how it redefined his relationship with the military. He identified challenges he faced in getting proper recognition or support for his injury. However, Adam’s experience with the injury shifts from negative to positive when he describes it as an adventure that he is coming to terms with everyday.
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Appendix A
MILD TRAUMATIC BRAIN INJURY PROJECT TEAM

Final Report

25 March 2008
EXECUTIVE SUMMARY

1. Traumatic Brain Injury (TBI) covers a clinical spectrum from mild to severe. TBI is not a new phenomenon. The UK and the US have a long history in the clinical management of TBI although most of it has focussed at the moderate and severe end of the spectrum. Concerns have been raised in media and Government circles, on both sides of the Atlantic, that mild traumatic brain injury (mTBI) may be more prevalent than hitherto seen and that there is a cohort of sufferers with unmet clinical needs. A comprehensive literature search and historical review have added to DMS information on mTBI.

2. MTBI represents the milder end of the spectrum of TBI presenting with non-specific symptoms such as malaise and lack of concentration, symptoms difficult to differentiate from other post conflict conditions such as Post Traumatic Stress Disorder (PTSD).

3. The UK SG set up a mTBI project in June 2007 to undertake an extensive review of current clinical and laboratory research strands and develop a mTBI clinical pathway and surveillance system. The team consulted widely, with clinical and laboratory specialists, at home and overseas and analysed a wide range of evidence from around the World in order to inform the UK's position on mTBI and how it should be managed. Epidemiologically:
   a. The reported worldwide incidence of mTBI cases seen in hospital is 100-300/100,000 per year although the incidence in self-reported population studies is often more than 600/100,000 per year.
   b. The rate reported from the US is that mTBIs are sustained by 12-16% of all service personnel suffering injuries. UK data suggests that the mTBI rate is less than 2% of all injuries.
   c. 80% of all civilian brain injuries seen at UK A&E departments are mild and 80% of mTBI cases are symptom free after 3 months. The majority of mTBI symptoms resolve rapidly within 2 – 3 weeks of injury.

4. The headline conclusions of the project have been:
   a. There is no evidence that mTBI is having an adverse effect on operational capability within the UK Armed Forces.
   b. The incidence of mTBI within the military population remains unclear. However, there appear to be, as yet unexplainable, differences in the incidence of mTBI between UK populations and their US counterparts, the UK incidence being lower.

5. Key UK developments have been:
   a. The introduction into deployed theatres of a diagnostic and surveillance tool, based on the WHO classification of mTBI but aligned with the US
surveillance tools, sufficient to acquire prospective brain injury data to allow better understanding of incidence and disease patterns, and to inform health planning.

b. Educational material on mTBI for military General Practitioners, the Chain of Command and individuals. The material gives reassurance that for the majority of individuals, the symptoms are self limiting but if persistent, help is available. Further education material will be introduced into routine training.

c. The creation of the mTBI 4 level treatment programme based on education, initial counselling, outpatient assessment and possible inpatient management, centred on the Defence Medical Rehabilitation Centre (DMRC) at Headley Court.

d. The UK and US are closely aligned concerning taxonomy and classification of mTBI and are working together on a number of areas of clinical and laboratory research that will shed more light on mTBI.

6. DMS research will continue, concentrating upon:

a. The pioneering research into blood markers for neural damage indicative of mTBI, led by the research team at Dstl.

b. Ongoing assessment of the effectiveness of resuscitation strategies in survivors of head injuries.

c. Retrospective analysis of mTBI symptoms in UK servicemen and women.

d. The use of functional magnetic resonance imaging to investigate evidence of brain damage in mTBI.

7. DMRC Headley Court will provide the DMS Centre of Excellence for mTBI, re-enforced by ongoing epidemiological and research findings.
INTRODUCTION

1. Traumatic Brain Injury (TBI) covers a spectrum of injury from mild to severe. Such injuries are seen in both military and civilian populations as a result of exposure of the skull and brain to sudden changes in velocity. Road traffic accidents (RTAs), contact sports (such as rugby, boxing and American football), war fighting and other scenarios involving exposure to blasts can all cause individuals to be subjected to such changes in velocity and TBIs may be sustained as a result. TBI is not a new phenomenon and has been the subject of considerable investigation in the field of contact sports, particularly in the US where it came to prominence with the publication of a report to congress in 2003 that made recommendations into how national research was to be carried forward.

2. The US Defence and Veterans Brain Injury Centre (DVBIC), formerly the Defence and Veterans Head Injury Program (DVHIP) (established in 1991) coordinates military TBI evaluation and data collection. In 2005, mild Traumatic Brain Injury (mTBI) attained a high profile within Congress when data suggested that its incidence in the military was higher than previously suspected. In January 2007, the US Department of Defence (DoD) established a TBI Task Force, to undertake an assessment of the diagnosis, treatment, research and resources required to manage mTBI.

3. In the UK, Defence Medical Services (DMS) staffs have been involved in work on TBI for several years although more focussed on the moderate and severe sectors of the spectrum. The UK already routinely screens all the personnel who are admitted to the Defence Medical Rehabilitation Centre (DMRC) Headley Court with multiple injuries for signs of brain injury. In addition the Defence Science and Technology Laboratory (Dstl) Porton Down has been researching aspects of traumatic brain injury as a component of the combat casualty care programme. Dstl is undertaking world-leading research on neural markers subsequent to head injury and this work is of particular interest to the US.

4. Both the UK and US military medical communities face similar challenges concerning the clinical manifestations of mTBI (including the symptoms, signs, and results of special investigations that will define a case) and the management of cases in the short, medium and long term. This is particularly so at the mildest end of the spectrum where seemingly inconsequential head trauma might provoke disabling and enduring symptoms.

5. Consequent upon increasing concern at the potential incidence and significance of mTBI, the UK Surgeon General (SG), in June 2007, directed that a project be set up, to run for 6 months, to conduct an extensive review of the clinical issues and research being conducted in the areas of diagnosis and management of mTBI. The team consulted widely with laboratory and clinical specialists, in the UK and overseas, both military and civilian.

2 DMSD /16/1/03 dated 16 Jun 07. DMSD Mild traumatic brain injury project - terms of reference.
6. An interim report was delivered on 14 Sep 07 which outlined the direction of the project and recommendations for further work, including evidence-based interventions. The report formed the basis for discussion at a plenary meeting at the project mid-point when the future direction for the project was agreed.

7. Educational material dealing with awareness and early management of the symptoms of cognitive disturbance has been issued via the chain of command down to individual level. Separate advice has been promulgated to Service General Practitioners.

8. The diagnostic/surveillance questionnaire has been rolled out and staffs are being recruited to administer and run the mTBI enhancements to the Moderate Brain Injury Programme at DMRC.

**AIM**

6. The aims of the mTBI project were to:

   a. Bring together current knowledge on mTBI from national and international sources.

   b. Examine current UK research and that of NATO and other Allies, including civilian fields, and to recommend future DMS research.

   c. Consider potential interventions, both scientific (epidemiological) and clinical, to be implemented in advance of the results of research, with particular regard to force protection measures, in liaison with Dstl and the Defence Clothing Integrated Project Team (IPT), as required.

   d. Examine the impact of mTBI on operational capability and liaise with front line commanders.

   e. Make recommendations on future clinical activity.

   f. Develop health surveillance methods both to gather data on exposure to blast and other relevant injury, and to collate data on all head injuries, in conjunction with current information management activity in the Permanent Joint Headquarters (PJHQ), the Royal Centre for Defence Medicine (RCDM), the Defence Analytical Services Agency (DASA) and the Defence Medical Information Capability Programme (DMICP).

   g. Develop education requirements to inform the executive Chain of Command and medical personnel on the background, relevance and implications of mTBI and in liaison with the Defence Medical Education and Training Agency (DMETA) and Director General Training and Education (DG T&E).
h. Be mindful of the parliamentary and media impact of any emerging recommendations and liaise with Director Medical Finance & Secretariat (D Med F&S) in this area.

i. Ensure implementation of any recommendations endorsed by SG during the period of the work.

**BACKGROUND**

7. MTBI sustained during military operations is almost certainly not a new phenomenon. Shell shock during World War 1 and post-concussion syndrome (PCS) during World War 2 share striking symptomological similarities with mTBI. The historical context of these injuries is therefore critical to a complete understanding of mTBI's significance today and MoD commissioned a review from Professor Edgar Jones of the Institute of Psychiatry at Kings College, London (KCL) to address this. The full report is at Annex A with a summary below.

8. **A Brief Historical Context.** Professor Jones' report has looked at mTBI specifically from an historical context and his comments concerning labelling, aetiology and prognosis relate to the difficulty in using previous experience and knowledge in comparison with current practice. It is accepted that without a valid case definition (label) it is impossible to undertake any meaningful, contemporaneous research into aetiology, diagnosis, treatment or outcome of any medical condition. Prof Jones' report may be summarised as follows:

   a. Symptoms in both shell shock and mTBI are common and non-specific. As such they allow a range of hypotheses about causation and prognosis.

   b. Both shell shock and mTBI are naturally recovering disorders. The sub-population of chronic cases are, however, notoriously resistant to treatment.

   c. 'Shell shock' and 'mTBI' are purely descriptive labels, and do not assist in questions of aetiology or prognosis.

   d. There are good reasons for caution before endorsing a new label such as mTBI. Labels are often applied before an apparently novel disorder is properly understood. Those that strike a popular chord are often misleading and can inhibit understanding and effective treatment.

   e. The experience of shell shock and post-concussional syndrome has shown that it is impossible to draw clear distinctions between organic and psychological effects in the case of cerebral injury. Any injury involving trauma to the brain is likely to have psychological consequences.

   f. The psychological consequences of physical injury, including but not restricted to head injury, have in the past tended to be regarded as less important than organic effects. As a result, they have received less attention and have sometimes attracted pejorative connotations.
g. Chronic psychological disorders can be as debilitating and as resistant to treatment as some severe organic injuries.

h. Shell shock was addressed most effectively in specialist rehabilitation units where the clinicians had the better understanding of symptoms and prognosis. Treatment in general hospitals tended to reinforce the idea that the disorder was a serious medical condition.

i. Retraining before discharge, designed to restore morale and improve the serviceman’s transferable skills, plausibly reduced disability and dependency on the war pension system.

j. The lessons of shell shock teach us to avoid inappropriate diagnoses of mTBI; if these lessons are not learned then cases of mTBI may multiply and some individuals may become chronic.

METHODS

9. A scoping methodology was used to ensure adequate coverage of the subject\(^3\). The delivery of the aims of the project fell into 3 areas:

a. Understanding the current peer reviewed literature evidence base.

b. Identifying current and potential future clinical interventions by engaging clinical specialists at home and overseas.

c. Gaining insights into current and future laboratory research strands by engaging research specialists at home and overseas.

LITERATURE SEARCH

10. Search Strategy. A literature search undertaken through the Defence Medical Library Service (DMLS) of world-wide civilian and military literature (excluding those not published in English) generated approximately 200 references. The key words ‘mild’, ‘traumatic’, ‘brain’ and ‘injury’ were used and the search was carried out using the following sources:


f. References obtained personally following meetings with experts.

g. Work submitted for publication or in progress.

h. Grey literature (Internet, newspapers, other non peer-reviewed work).

11. Summary of the Literature Search. Abstracts were screened for relevance and 128 papers requested. Whilst there has been some published US military work, the majority is civilian. Of all of the literature reviewed, 2 papers have been highlighted of being of particular importance - Hoge et al. and an accompanying editorial. These 2 papers provide an excellent starting point for an understanding of the complexities of the subject. The full literature review is at Annex B. The key notes are:

a. Background Information.

(1) Traumatic brain injuries cover a wide spectrum of pathology and include both penetrating and non-penetrating brain trauma.

(2) Symptoms of mTBI are non-specific and overlap with other recognised disorders such as Post Concussion Syndrome (PCS) and post-traumatic stress disorder (PTSD). Recent literature has confirmed the strong association between mTBI and PTSD.

(3) Most brain injuries seen at UK Accident and Emergency (A&E) departments are mild (80%) and most of these (80%) will be symptom free three months after the injury.

(4) In civilian practice, more males than females sustain mTBI because they are more likely to participate in contact sports and undertake more risky behaviours. This is mirrored in the military population.

b. Military context.

(1) Current UK operations have generated an increase of all injuries sustained by service personnel.

(2) The nature of the current conflicts has led to an increase in the number of blast injuries being sustained by UK Armed Forces personnel.

(3) There is significant media and Parliamentary interest in mTBI in UK Armed Forces personnel.

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(4) Similar media and Governmental interest in the US has led to allocation of significant resources for mTBI research.

c. Definitions.

(1) The most widely used definition of mTBI (and that recommended to the World Health Organisation (WHO)) is:

(a) An acute brain injury resulting from mechanical energy to the head from external physical forces. Operational criteria for clinical identification include:

(1) 1 or more of the following:

- Confusion or disorientation
- Loss of Consciousness for 30 mins or less
- Post-traumatic amnesia for less than 24 hours
- and/or other transient neurological abnormalities such as focal signs, seizures and intracranial lesion not requiring surgery;

(b) GCS score of 13-15 after 30 mins post injury or later upon presentation for healthcare

(c) These manifestations of mTBI must not be due to drugs, alcohol, medications, caused by other injuries or treatment for other injuries (eg systemic injuries, facial injuries or intubation), caused by other problems (eg psychological trauma, language barrier or co-existing medical conditions) or caused by penetrating craniocerebral injury.

(2) Application of the above definition allows mild traumatic brain injury to be distinguished from either trivial or moderate/severe TBI.

d. Persistence and Overlap of Symptoms of mTBI.

(1) Persistent symptoms beyond 3 months have little correlation with the initial exposure itself but are strongly correlated with pre-existing psychiatric and social factors and compensation seeking.

(2) Persistence of symptoms after 3 months is seen in a minority of patients but such symptoms can cause significant functional

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impairment. The persistence of symptoms one year after injury is evident in about 1-2% of patients.

(3) A wide range of symptoms assigned to mTBI overlap with other recognised psychological disorders.

e. Epidemiology.

(1) World-wide the true incidence of mTBI is unknown.

(2) The reported worldwide incidence of mTBI cases seen in hospital is 100-300/100,000 per year. The incidence in self-reported population studies is often more than 800/100,000 per year.

(3) Unpublished data suggests that the mTBI rate seen in current conflicts is likely to be less than 2% of all injuries. However, the data that have generated this incidence have not been collected with a view to satisfying the Holm/WHO definition.

(4) The rate reported from the US is that mTBIs are sustained by 12-16% of all service personnel suffering injuries.

(5) 80% of all civilian brain injuries seen at UK A&E departments are mild.

f. Diagnosis and Taxonomy.

(1) Recent evidence points to the possibility that there is a physical basis to mTBI but a psychological element cannot be ruled out.

(2) There is only weak evidence for the validity of cognitive testing in making a diagnosis but there is some evidence (mainly from animal studies) for the potential of biochemical markers, such as serum proteins, to aid diagnosis.

(3) There is debate around the use of terminology such as 'mild' and 'minor', which are currently being used interchangeably by research communities. MOD is using the term 'mild'.

(4) There is evidence that a symptoms based diagnostic system is a more valid process.

g. Injury Mechanisms. The main injury mechanisms causing mTBI in civilians are road traffic accidents (RTAs), falls and assaults. Within the military population, occupational exposure from blast poses the greatest risk.

h. Pathophysiology of TBIs.

(1) Diffuse axonal injury following sudden changes in velocity resulting in brain shearing is thought to be the cause of mTBI.
(2) There is some evidence to suggest that limited accelerations may cause reversible brain injuries.

i. Concussion and Post-concussion Syndrome (PCS).

   (1) mTBI and PCS share many of the same symptoms although the mechanism of injury may, in some situations, be different.

   (2) Much effort has been put into developing practice guidelines to mitigate against the effects of sports induced concussions.

   (3) Persistent symptoms following mTBI and the symptoms of PCS are likely to be the same condition and may also share a common pathophysiology. Some researchers have stated that the term concussion is preferable to mTBI.

j. High-risk populations. Young males and those who participate in contact sports, persons involved in assaults or falls and any individual with a previous mTBI, are all at increased risk of sustaining a mTBI.

k. Treatment and Interventions.

   (1) Early educational intervention focussed on an expectation of rapid recovery and the normalisation of symptoms mitigates against persistent symptom development in the majority of cases.

   (2) The period of rest advocated by sporting governing bodies is variable depending on the sport undertaken and which set of guidelines are being followed.

l. Prognosis and Prevention

   (1) The evidence suggests that most symptoms resolve rapidly within 2-3 weeks of injury and most cases will be symptom-free within 3 months.

   (2) There is evidence that mTBI increases the risk of seizure up to 4 years after injury but the absolute risk remains very low.

   (3) There is good evidence that provision of information to normalise symptoms and raise an expectation of recovery is successful at reducing the likelihood of persistent symptoms.

m. Knowledge gaps

   (1) There is a requirement to identify predictor variables for long-term sequelae following mTBI.
(2) The threshold of imparted energy at which mTBIs are sustained is unknown.

(3) The true incidence in both UK civilian and military populations is unknown.

(4) The correlation of mTBI symptoms to functional images, as a potential aid to diagnosis, is currently in its infancy.

CLINICAL ISSUES

12. Several methodologies were scoped to set up a clinical management and epidemiological surveillance system to support the long term investigation and management of mTBI in UK service personnel. The literature review identified UK experts in the field who might add value to this area of the study. A list of contacts made and meetings held during the project is contained at Annex C. A methodology for defining mTBI based on blast exposure was scoped and discarded as it was not possible to estimate the exposure and it was felt that too many false positives might be identified which might lead to the development of a cohort of ‘worried well’ individuals.

13. A symptoms-based approach to the identification of clinical cases of mTBI was adopted, supported by published evidence, and based on the WHO definition for mTBI and interoperable with US diagnostic processes. This led to the development of operational criteria for the diagnosis of mTBI which could be used both in acute clinical settings and in the development of an epidemiological surveillance program and is fundamentally compatible with US diagnostic criteria.

14. Whilst much research effort is being expended into identifying clinical methods to aid diagnosis of mTBI, there is currently no peripheral marker available to aid laboratory diagnosis and no sufficiently sensitive imaging technique able to identify accurately and consistently cases of mTBI.

15. It is concluded, therefore, that the diagnosis of mTBI will remain problematic until such time as blood markers or agreed diagnostic imaging criteria are achieved. However, a clear case definition, accurate and timely symptom reporting and a detailed history of the circumstances and mechanism of the injury, affords the best chance of accurate case finding.
PROJECT FINDINGS AND DEVELOPMENTS

16. The findings and developments produced by the project team are summarised under the following headings:


c. Impact on operational capability.

d. Development of health surveillance methods.

e. Interventions.

CURRENT KNOWLEDGE

17. Current UK Military mTBI Issues.

a. Military mTBI Data.

(1) Despite an accurate incidence of mTBI amongst UK service personnel being unavailable, there is no evidence that mTBI is adversely affecting the operational effectiveness of UK forces. The experience of UK clinicians is that UK service personnel with probable mTBI (and even moderate brain injury) may only present to medical care many months after injury, often as a result of a change in working environment or personal circumstances that brings any cognitive dysfunction to fore.

(2) RCDM has identified 585 cases of traumatic head injury, of all severities, out of 36,000 admissions to deployed operational emergency departments (the OpEDAR database) in Iraq during the period February 2003 - November 2007. This represents only 1.6% of all medical presentations during the period. However, these data must be treated with caution as they predate the adoption of the WHO definition, and include any individual whose symptoms suggest that they may have had a traumatic brain injury.

(3) DMRC have to date been referred very small numbers of patients (single figures) suffering *de novo* mTBIs. DMRC have, however, admitted 48 brain injury patients during 2007, although these cases are moderate and severe injuries.

b. UK/US Comparisons. The incidence of mTBI sustained by UK military personnel appears to be lower than the US experience. The reasons for the difference in comparison to US figures are not fully understood.

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DMRC only see approximately 40 patients per year in total in their mild functional disabilities group (which accepts patients with brain injuries of all severities and all aetiologies).
c. **Awareness.** Unsurprisingly, awareness of mTBI within the UK military was, at the beginning of the project, generally poor. However, as the project has developed, clinical communication has improved and raised awareness of the issue. In parallel, information has been produced for service personnel and the chain of command to raise awareness.

d. **UK/US Alignment of Data Gathering.** Where the UK can align itself with the US in such areas as data collection, this will enable valid comparisons of experience and clinical outcomes. The UK has based its screening and diagnostic tool on the WHO definition of mTBI using the framework of the US Military Acute Concussion Evaluation (MACE). It must be noted that the MACE questionnaire has not yet been validated in a US military environment.

18. **US Perspectives.** There is much convergence between the current US perspective of mTBI and that of the UK although there are some significant divergences particularly in the policy and process for screening for mTBI. The following points summarise the current US position as at 17 Jan 2008:

a. There is concern about the potential long term adverse health effects that mTBI and repeat concussions might have on military personnel. The time taken to be fully deployable again after mTBI is unknown. The UK shares this concern.

b. The natural history of mTBI is not completely understood. Research is addressing the question of long-term consequences of mTBI in civilian and military populations. The US National Football League is considering the introduction of cognitive screening pre-season for professional players.

c. Whilst some form of screening is undertaken on pre and post deployed populations, there are multiple screening tools used with no overarching policy or process. Most screening tools are based on the Military Acute Concussion Evaluation (MACE) questionnaire but there is a danger that a great deal of data is being gathered without a valid analysis strategy. This opens up the possibility that statistically significant findings might be found by chance (Type 2 statistical error) which might result in incorrect conclusions being drawn. There is a wish to dispense with this screening programme once accurate diagnosis and documentation can be made in theatre. MTBI specific screening questions have been added to the periodic health assessment, pre-deployment health assessment and post-deployment health re-assessment programmes.

d. There is agreement with the UK view that mTBI cannot be diagnosed from a collection of symptoms recorded historically. There is an acceptance that the gold standard is to make the diagnosis as close to the time of injury as possible.

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h. There is agreement with the literature and the UK view that educational information provided close to the time of injury is likely to be beneficial in both reducing symptoms and preventing persistence of symptoms beyond 3 months.

i. In early August 2007 Secretary of the US Army outlined present and future priorities for the US Army. These included the development and rollout of a chain teaching programme on PTSD and mTBI and the establishment of a Center of Excellence for TBI and PTSD.

k. Concurrently the US military has been centralising some of its mental health care assets as part of an ongoing reorganisation programme. The Center of Excellence for Psychological Help and Traumatic Brain Injury was scheduled to have initial operating capability from 30 November 07 and should become fully operational within the next six months. The Center, to be funded by the Department of Defense, will involve the Veterans Agency and the U.S. Department of Health and Human Services and is to be located at the new National Military Medical Center at Bethesda.

CURRENT RESEARCH

20. UK Military mTBI Research Players. UK research in mTBI relevant to the military environment is being undertaken by Dstl, South Tees NHS Trust Emergency Department and KCL.

21. Dstl. Dstl are involved in three areas of work that are relevant to mTBI.

a. A programme to identify markers of neural damage in peripheral blood.

b. Identifying a series of measurements that could be recorded to assess the effectiveness of resuscitation strategies in survivable blast injuries. Maintenance of perfusion pressure to the brain could have significant consequences for the final clinical outcome of TBI patients and this may have relevance to cases of mTBI.

c. Commenting on the feasibility of using instrumentation in helmets to ascertain the level of blast experienced by service personnel on operations, potentially matching a research project is being undertaken utilising accelerometers in helmets by the US Army (see para 28). Dstl have outlined a number of issues related to the potential deployment of helmet mounted sensors. These are discussed in full at Annex E. The issues include:

(1) Whether data from such a study will produce either useful or interpretable data.

(2) Whether the function of sensor equipment may be compromised by the use of other electronic equipment currently in use in operational
theatres or indeed whether the sensor will compromise the performance of the helmet.

22. **South Tees NHS Trust Emergency Department.** Research is underway at James Cook University Hospital Middlesbrough, endorsed by the Surgeon General’s Research Strategy Group (SGRSG), into mTBI in adults seen in accident and emergency departments. Blood samples are being taken to assay a specific peripheral marker. The study is recruiting between 20-30 patients per month with a follow-up rate of about 50%. Initial data analysis is planned for Spring 2008. A precis of the project is at Annex F.

23. **King’s Centre for Military Health Research (KCHMR).** The KCHMR is an academic department within Kings College London (KCL), that receives funding from the MoD. KCHMR are working on 3 work strands as a result of collaboration with the project team:

   a. A retrospective analysis of mTBI symptoms in UK servicemen identified during the Operation TELIC cohort study (a subset of UK Armed Forces personnel already under investigation by KCHMR) has been submitted for publication. This paper provides evidence that whilst some mTBI symptoms are related to head injury, they are often non-specific.

   b. A planned analysis of personnel identified on the Operational Emergency Department Attendance Register (OpEDAR) database as sustaining head injuries during current operations. This work will cross-reference such cases to the TELIC cohort and matches will be analysed to determine if any psychological patterns appear. This work will be in collaboration with RCDM. Initial analysis of the data is expected to be available in Spring 2008.

   c. A prospective randomised controlled trial has been proposed requiring 300 service personnel (150 mTBI cases, 150 controls) and the use of high resolution functional imaging to investigate whether organic damage is identifiable. The proposal for this work, in collaboration with RCDM and DMSD, is contained at Annex G.

25. **US Research.** US DoD researchers are collecting significant amounts of data, which it is hoped will inform future work. However, there are concerns about the overarching strategy, policy and process regarding data collection. There is evidence that there is no single data gathering process. The priorities for further US work are:

   a. To understand the natural history of mTBI.

   b. To prevent mTBI through education.

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To define a natural marker to assist with case definition.

d. The management of mTBI and symptomatic treatment.

e. Of particular interest are the following projects:

28. **Automated neuropsychological assessment metrics (ANAM).** ANAM is a computerized measure of information processing speed, cognitive efficiency, and memory. There has been considerable Congressional pressure to introduce ANAM into the pre-deployment screening programme and 101st Airborne Division is currently being tested. However, there is concern as to how the data will be analysed. Furthermore, the ANAM tool has yet to be validated in a military context. There is currently no widespread base-lining of ANAM scores. The goal, however, is to determine whether personnel are fit to deploy in the first place and then whether they are fit to re-deploy if during an operational tour they sustain an mTBI. However, without a base line comparator it remains to be seen how this will be achieved.

28. **US Research into Blast Injuries.** The US Army is undertaking research using accelerometers, mounted in helmets, to register decelerations on impact. This is a pilot study in high risk groups. There are also research projects being developed that will use pressure wave sensors to investigate blast energy and potentially to attempt to correlate this data with overt brain injury or mTBI symptomatology.

29. **Canadian Research.** Key Canadian research initiatives are:

a. Diagnostic Assessment of Cerebral Impairment in Canadian Forces Operations – Phase I: FY 06, 07. This phase is:

   (1) Using the Hypoxic model, to assess readily available non-invasive and portable neural monitoring technologies (high density EEG and cerebral oximetry) in investigating exposures to transient concussion.

   (2) To establish a linkage or correlation between neurophysiological monitoring and cognitive performance capability.

b. Development of neurobiological models of mild traumatic brain injury and comparison of effective mTBI markers as a potential diagnostic tool in various models in order to:

   (1) Determine if diffuse traumatic axonal injury is a key contributor to poor neurological outcome and morbidity caused by primary traumatic brain injury using the blast model.

   (2) Validate and compare potential biochemical markers associated with diffuse axonal injury and other pathological consequences for appropriate identification and assessment of non-visible primary head injury.

This work links very closely to Dstl research into peripheral markers.
d. Investigation of the effects of closed head injury using neurophysiological, neuroimaging and neurocognitive assessment in order to:

   (1) Establish a linkage or correlation between neurophysiological monitoring and cognitive performance of closed head injury in the Canadian Forces operational or closely-matched civilian population.

   (2) Establish a linkage or correlation between post-traumatic stress disorder and objective measurements made using non-invasive neural imaging and monitoring technologies.

   (3) To establish a linkage or correlation between mild traumatic brain injury and objective measurements made using non-invasive neural imaging and monitoring technologies.

   (4) To gather data from a CF operational environment for further development of non-invasive and portable neural monitoring technology.

e. Investigation field deployable rapid diagnosis for mTBI. This work consists of 5 inter-related research areas that are broadly as follows:

   (1) Development of a common definition and scoring system for mTBI.

   (2) Recognition and detection of mTBI in soldiers.

   (3) Evaluation of neurophysiological and neuro-imaging techniques.

f. Understanding the underlying mechanism of TBI - Cellular neurophysiology of traumatic axonal injury.

g. Intervention strategies for mild traumatic injury.

30. Research Gaps. There are still many research gaps but all current research strands are attempting to answer three central questions:

   a. Identification and measurement of mild traumatic brain injury in various military deployment situations and how these measurements might be used to make triage decisions regarding re-deployment of personnel.

   b. What early interventions can be used to minimize the biological injury that arises from closed head trauma which includes both preventive physical measures and post-injury biological measures applied to blast-induced brain trauma?

   c. What is the relationship of mild traumatic brain injury to medium or long term neurological and functional outcomes and how can these sequelae be mitigated?
31. **MTBI Diagnostic and Surveillance Tool.**

   a. The UK diagnostic and surveillance tool has been developed from the US MACE questionnaire by RCDM in collaboration with DMSD and KCHMR. It is based on the WHO definition and comparable with US data collected using the MACE questionnaire and is at Annex H.

   b. The tool has been piloted in operational theatres and following refinement has been rolled out to the pre deployment HOSPEX brief for deploying troops from January 2008 and has been deployed into the field. The deployed version is at Annex H. Data collection will be coordinated by RCDM in the first instance with subsequent analysis undertaken by DASA as required.

**CLINICAL MANAGEMENT**

32. A treatment protocol has been developed by the project team in conjunction with RCDM and DMRC. The constituent parts of this protocol are the diagnostic tool (referred to above), a clinical algorithm for the acute management of mTBI cases and a 4-level programme of treatment, developed by DMRC.

33. **Clinical Algorithm.** A clinical algorithm for the management of mTBI cases in theatre or during peacetime operations and training has been developed and is at Annex I. The algorithm is evidence-based, utilising best practice for the treatment of acute head injuries and also the early management of mTBI patients accepted in the literature as reducing the likelihood of persistent symptoms.

34. **Treatment Plan.** DMRC has been engaged in the production of health information on mTBI and the development of a treatment plan for personnel who have sustained mTBI. Evidence of similar interventions used successfully for the treatment of mTBI by other researchers in a variety of situations and countries has underpinned the development of the treatment plan and an overview is contained at Annex J and includes the following four-level protocols:

   a. **Level 1.** Information will be given to all deployed Service personnel using a variety of media. The intervention is based on the rationale used in head injury warnings given in A&E departments in the UK and is aimed at enabling the individual to identify problems and providing advice on immediate actions. The information will also be available on web-based pages. The information aims to normalise symptomatology, to reassure the individual and provide useful information about mTBI and simple measures that will provide symptomatic support. Examples of level 1 fact sheets are provided at Annex K.

   b. **Level 2.** A centralised cell will provide telephone-based support for patients who remain symptomatic despite the information provided at level 1 or

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for those who have additional concerns. A clinical interview (either telephone or in the outpatient department) will form the basis of the assessment process. This capability will be fully in place from 01 Apr 08. Support and feedback to the patient’s medical centre will be provided. Level 2 material has been written and has been submitted for peer review by external medical academics.

c. **Level 3.** Patients experiencing symptoms beyond 3 months will have a formal outpatient appointment with the mTBI Programme treatment team at DMRC to determine the most appropriate management pathway. The management in level 3 is based around 3 week-long periods of treatment, repeated at approximately 3-week intervals, a phased return to work and the ability to return to full duties at any time, as improvement allows.

d. **Level 4.** Patients who remain symptomatic despite management at level 3 will be managed according to their individual needs. This may require admission for inpatient management, which is already available at DMRC. Those failing to respond to treatment will almost certainly be referred to a medical board.

35. **Resources.**

a. Clinical and administration staff have been recruited to implement level 2 of the clinical management pathway.

b. Whilst there has been a significant increase in inpatient capability at DMRC, the additional requirement for inpatient accommodation in order to deliver level 4 is currently being planned by DMRC, including looking into short term solutions. There are currently no TBI patients failing to be accommodated.

36. **Education.** In addition to the educational material rolled out with level 1 of the mTBI clinical management pathway, to the chain of command and to Defence General Practitioners, wider awareness of mTBI issues will be provided by adapting the education given in the Battlefield Casualty Drills programme that deals with Operational Stress Reactions.

**Annexes**

A Historical review  
B Literature review  
C List of visits and meetings  
D Dstl research report  
E Dstl opinion on accelerometer trials  
F South Tees research report  
G KCL/RCDM research proposal  
H mTBI diagnostic tool  
I mTBI clinical algorithm  
J mTBI treatment plan overview  
K mTBI treatment plan information examples
MILD TRAUMATIC BRAIN INJURY IN THE MILITARY: AN HISTORICAL EVALUATION

Edgar Jones
Professor of the History of Medicine and Psychiatry
King’s Centre for Military Health Research and Institute of Psychiatry, King’s College, London.

Executive Summary

1. The report may be summarised by ten key points:

a. Symptoms in both shell shock and mTBI are common and non-specific. As such they allow a range of hypotheses about causation and prognosis.

b. Both shell shock and mTBI are naturally recovering disorders. The sub-population of chronic cases are, however, notoriously resistant to treatment.

c. ’Shell shock’ and ’mTBI’ are purely descriptive labels, and do not assist in questions of aetiology or prognosis.

d. There are good reasons for caution before endorsing a new label such as mTBI. Labels are often applied before an apparently novel disorder is properly understood. Those that strike a popular chord are often misleading and can inhibit understanding and effective treatment.

e. The experience of shell shock and post-concussional syndrome has shown that it is impossible to draw clear distinctions between organic and psychological effects in the case of cerebral injury. Any injury involving trauma to the brain is likely to have psychological consequences.

f. The psychological consequences of physical injury, including but not restricted to head injury, have in the past tended to be regarded as less important than organic effects. As a result, they have received less attention and have sometimes attracted pejorative connotations.

g. Chronic psychological disorders can be as debilitating and resistant to treatment as some severe organic injuries.

h. Shell shock was addressed most effectively in specialist rehabilitation units not least because clinicians had a better understanding of symptoms and prognosis. Treatment in general hospitals tended to reinforce the idea that the disorder was a serious medical condition.
i. Retraining before discharge, designed to restore morale and improve the serviceman’s transferable skills, plausibly reduced disability and dependency on the war pension system.

j. If the lessons of shell shock are not learned then cases of mTBI may multiply and existing ones become chronic thereby reinforcing pressure for financial compensation.
INTRODUCTION

1. Mild traumatic brain injury (mTBI) is now claimed to be a ‘signature’ injury of the Iraq and Afghanistan conflicts. In both territories the widespread use of improvised explosive devices, together with conventional mines and mortars, has led to an increasing numbers of troops suffering head or neck injuries. Blast-related TBI can result in one of three ways: wave-induced changes in atmospheric pressure (primary), by objects put in motion by the explosion (secondary) or by people themselves being forcefully propelled (tertiary). There are two ways in which the brain may be injured by a blow to the head: a generalised effect in which the force is transmitted to the brain as a whole, which results in unconsciousness or concussion; and a localised bruising effect or contusion.

2. Not only does TBI affect service personnel in theatre, it also has the capacity to be an enduring concern for returned veterans. Taber outlined ways in which US troops in Iraq and Afghanistan are at risk from TBI. The study concluded that “the potential neuropsychiatric implications of such widespread exposure to blast are still uncertain”, though initial estimates are high. The Defense and Veterans Brain Injury Center reported that 50% of injured soldiers returning from these theatres suffered at least a mild TBI while in combat. We know from the example of shell shock that this has the potential to be a common disorder.

3. During the First World War, shell shock came to occupy a similar position of prominence, while post-concussional syndrome assumed an equivalent importance in the Second World War. The nature of these earlier disorders, their clinical presentation, military context, hypotheses of causation and issues of management, are explored to discover contemporary relevancies to the pressing issue of mTBI.

4. The following core themes are explored in this report:
   a. **Symptoms**: What are the core symptoms of mTBI and do they bear any resemblance to those found in earlier disorders such as shell shock, ‘commotio cerebri’ and post-concussional syndrome?
   b. **Labels**: Shell shock rapidly found favour amongst both servicemen and their doctors because it provided a ready explanation tied to the characteristics of trench warfare. Post-concussional syndrome has retained popularity from its first use in the late 1930s, though its meaning has changed over time. The report will explore whether effort directed towards diagnostic terms and issues of taxonomy were productive, or whether a focus on symptoms alone might prove more effective.
   c. **Organic/psychological dichotomy**: In both World Wars attempts to explain enduring disorders related to brain injury polarised between those who sought to limit justifiable symptoms to cerebral lesions and those who identified wider psychological effects. Whilst modern imaging techniques may identify neuropathology hitherto unknown, it is important to acknowledge that brain injury arising in a context of danger or risk is likely to have psychological consequences.
d. **Data:** In the past, military authorities encountered problems in obtaining reliable data. Commanders, aware of the stigma attached to neuropsychiatric disorders, tended to understate referrals, while military physicians charged with treatment found themselves under competitive pressure to return patients to active duty and often overstated recovery rates. Statistics collected during both World Wars have to be treated with caution and there is little reason to suppose that the biases that operated then have now disappeared. Currently, published rates of post-traumatic stress disorder (PTSD) are higher for US troops returning from Iraq and Afghanistan than for UK servicemen. This evidence poses the question, whether a similar difference will be found for mTBI and whether individual nations engaged in the same conflict report markedly different levels of battle casualties?

e. **Specialist units:** During both World Wars it became increasingly clear that assessment and treatment was more effective if entrusted to specialist units. For acute cases, forward neuropsychiatric units were established, while dedicated base hospitals were set up to treat severe or chronic cases. This report will explore whether there is any evidence for the utility of rehabilitation programmes designed to return service personnel to duty and whether any speciality was particularly effective.

f. **Retraining programmes:** To prevent the discharge of servicemen into chronic invalidity, retraining programmes were devised to assess aptitude and offer vocational courses. The report will explore their effectiveness.

**DEFINITIONS**

**Mild Traumatic Brain Injury**

5. Although head injury is a significant cause of disability and death in adults, the majority of cases (85% to 95%) are classified as "mild" to "moderate", and most of these recover within weeks to months without specific therapy. Mild traumatic brain injury (mTBI) is defined as a cerebral event that leads to loss of consciousness for less than twenty minutes or post-traumatic amnesia lasting less than 24 hours. Post-traumatic amnesia refers to the period of memory loss between the incident itself and the next fully remembered events. However, some US studies have changed the definition of "mild" to include loss of consciousness for less than one hour rather than 20 minutes. A wide-ranging literature survey concluded that for most cases there are no objectively measurable cognitive deficits attributable to mTBI beyond 1-3 months' post-injury, though self-reported symptoms are common. The disorder is accompanied by a range of common and non-specific symptoms: headache, dizziness, irritability or outbursts of anger, double vision, ringing in the ears, loss of concentration and forgetfulness. None of these are pathognomonic and can be found in a variety of neurological and psychological disorders. Although a study conducted in 1986 showed that most subjects recover within three months of injury (only 8% having significant symptoms at follow-up a year later), recent US investigations suggest a higher proportion with enduring disorders.
6. The wider spectrum of TBI includes serious and life-threatening conditions, which require that each case be carefully investigated. Diagnosis is not straightforward nor, in the absence of a simple test, can it be performed quickly. Indeed, observation of symptoms over time was considered important by military neurologists during the Second World War when attempting to distinguish between post-traumatic neurosis, post-concussional syndrome and significant brain lesion.

Shell Shock

7. There is no accepted definition for shell shock. The term was first used in a medical publication, the Lanoet, on 13 February 1915 by Captain Charles Myers. Nevertheless, he offered no definition and later admitted that he had not been responsible for devising the term. The Report of the War Office Committee of Enquiry into 'Shell-Shock', published in 1922, concluded that 'the cases divide themselves into three main classes:

a. Genuine concussion without visible wound as a result of shell explosion. All witnesses were agreed that cases in this class were relatively few.

b. Emotional shock, either acute in men with a neuropathic predisposition, or developing slowly as a result of prolonged strain and terrifying experience, the final breakdown being sometimes brought about by some relatively trivial cause.

c. Nervous and mental exhaustion, the result of prolonged strain and hardship.

8. Because of controversy surrounding its nature and the belief that it encouraged claims for compensation, in summer 1939, when war seemed inevitable, the British authorities reiterated the ban on the term shell shock, first introduced in 1917. It was not to be used as a diagnosis for civilians or service personnel and, in fact, the term is rarely found in medical records for the Second World War.

Post-Concussional Syndrome

9. Post-concussional syndrome is an imprecise diagnosis that has changed its meaning over time. In 1936, Schaller coined the term 'post-trauma concussion state' to describe on-going 'disturbance of consciousness with no immediate or obvious pathologic change in the brain'. This was not considered a functional psychological disorder and he sought to differentiate it from 'post-traumatic psychoneurotic state'; in other words he conceived it as an organic neurological disorder, albeit mild. He proposed 13 symptoms or behavioural characteristics that would enable a clinician to distinguish between the two disorders. In traumatic neurosis, Schaller argued, patients were mentally alert, often depressed, exaggerated in statement and behaviour, had repeated headaches and tended to deteriorate over time. By contrast, those with post-concussional disorder were aggressive, irritable, experienced amnesia. did not exaggerate, rarely had headaches. tended to improve with treatment and exhibited intolerance to heat and alcohol. Similarly, Russel generated a list of eight symptoms which he believed would enable clinicians to distinguish between organic paresis and 'hysterical hemiplegia', a key difference being the natural history of the two disorders. In the former, 'the paralysis is never
subject to changes’ whereas in the latter ‘the progress of the disability is capricious and variable’.\textsuperscript{19}

10. By 1941, the term post-concussion syndrome had caught hold, though clinicians still struggled to find a way to distinguish the disorder from the psychological effects of a traumatic experience. Wittenbrook argued that headache, dizziness, fatigue, tinnitus, memory impairment, poor concentration and nervousness alone could not reliably differentiate it from ‘post concussion neurosis’, a disorder where functional symptoms were the product of personality.\textsuperscript{20} Wittebrook thought that post-traumatic amnesia was a key indicator of cerebral pathology. Fulton, too, acknowledged the difficulty of distinguishing psychological cases from ‘organic concussion resulting from blast’.\textsuperscript{21}

11. Disagreement over aetiology followed a course already familiar from the First World War. Schaller believed that in post-concussional state a blow to the head or a blast effect led to ‘reversible changes of brain function, with demonstrable pathologic change’, whilst post-traumatic psychoneurotic state was due to the ‘precipitation of psychic complexes, following a period of medication, in patients presenting inadequate personality traits’.\textsuperscript{22} This hypothesis bears comparison with the contemporary idea that mTBI may reflect subtle or hidden cerebral pathology detectable only by advanced imaging techniques. Wilder Penfield, the distinguished Canadian neurologist, believed that subdural adhesions could be found in patients who suffered from post-traumatic headache, which sharply contrasted with the uncompromising non-organic explanation proposed by Colin Russel, head of a Canadian Army neurological hospital:

\textit{Whereas in the last war the soldier who cannot ‘stand the gaff’ considered himself a victim of ‘shell shock’… in this war he has learned that the complaint of headache following a blow on the head is apt to serve as entitlement to invalidism and discharge.}\textsuperscript{23}

12. Today post-concussion syndrome is no longer regarded as an unexplained organic consequence of cerebral lesion. Post-1945 studies by Lishman and others (see below) demonstrated that those with severe head injury also unsurprisingly suffered psychological consequences. Furthermore, they found that the number and severity of psychological symptoms was not associated with objective organic injury. As a result, post-concussion syndrome is now commonly characterised as a functional disorder relating to symptoms that endure after any cerebral lesion has healed. Indeed, a recent study identified the disorder in those who had experienced traumatic injury unrelated to the brain.\textsuperscript{24}

**SYMPTOMS**

**Shell Shock: military context**

13. During the First World War, British troops found themselves exposed to significant risk of head wound. The introduction of the steel helmet at the beginning of 1916 may have saved lives at the expense of increased rates of concussion. However, until 1917, 90% to 96% of soldiers with a penetrating head wound died, though this figure fell slightly thereafter.\textsuperscript{25} Engaged in static trench warfare, front-
line soldiers experienced artillery barrage and mortar attacks, together with the threat of devastating mines. It is estimated that 80% of deaths were caused by shrapnel. Lieutenant Colonel John Rhein, consultant in neuropsychiatry to the American Expeditionary Force (AEF), reported that 50% to 60% of soldiers with shell shock admitted to his base hospital claimed to have been concussed; "a man states that he had lost consciousness or memory after having been blown over by a shell". Furthermore, a study of 1,000 admissions to a British specialist shell shock unit between November 1916 and May 1917 found that only 16.8% had definite evidence of concussion.

14. Head wounds and brain injury following exposure to exploding ordnance were a significant cause of invalidity in the opening phase of the First World War. These casualties offered Gordon Holmes, consultant neurologist to the British Expeditionary Force (BEF), an unprecedented opportunity to test the localization of brain function. Cerebral trauma found itself at the cutting edge of military medicine. But what appeared to be a straightforward association between cause (shell explosion) and effect (head wound) soon became clouded and a cause of controversy.

15. Increasing numbers of servicemen who had been close to a detonation presented with symptoms that could not be ascribed to visible brain damage. They suffered from amnesia, poor concentration, headache, tinnitus, hypersensitivity to noise, dizziness and tremor but did not recover with hospital treatment. Diagnosis became problematic because their clinical presentation was similar in many respects to soldiers who had a head wound. The term shell shock evolved in an attempt to describe cases that arose in the context of exploding ordnance but where symptoms could not be explained by the presence of an obvious organic lesion. Shell shock entered the medical debate with the publication of a paper in the Lancet in February 1915 by Captain C.S. Myers, a specialist in psychological medicine.

16. In May 1915, following bitter fighting in the second battle of Ypres, the number of battle casualties rose significantly. Among them were growing numbers of servicemen with a diagnosis of shell shock but despite their increased incidence the military made no significant progress in understanding the disorder, still less in designing an effective management strategy. This was partly a question of priorities. In the context of a rapidly expanding army and a war of attrition, the British Army struggled to open sufficient hospital accommodation for the wounded in France. The growth of the BEF and unexpected levels of bacterial infection created pressing medical priorities, forcing shell shock to a lowly position on the military agenda for 1915. As a result, cases were transferred to base hospitals in France and the UK for observation in general wards. Without an informed treatment strategy, this puzzling disorder spread throughout the British Army. By autumn 1916, with manpower losses following the Somme offensive, the issue of shell shock finally came to the fore. The flow of casualties from the front had to be stemmed and an effective intervention devised to return combat troops to active duty.

Shell Shock: symptoms

17. Shell shock was characterised by a wide range of non-specific symptoms, which made it difficult to distinguish it from other post-combat syndromes such as soldier's heart, effort syndrome, rheumatism and some cases of non- ulcer dyspepsia.
A random sample of 1,856 veterans awarded a pension for a post-combat disorder arising in conflicts from the Boer War (1899-1901) to the Gulf War (1991) subjected to cluster analysis failed to distinguish between specific diagnoses. Ninety-four possible symptoms were collected for each individual and the 25 most common then analysed by clusters. The 249 cases of shell shock included in the study did not stand apart from other forms of war syndrome. Although 181 (84%) shell-shocked veterans fell into a neuropsychiatric cluster, this also included 130 cases of rheumatism from the Boer War and 218 cases of Gulf-related illness. The symptoms of shell shock were not exclusive to a particular conflict or to a particular diagnostic label. Because servicemen diagnosed with shell shock reported so many symptoms (which typically included palpitations, shortness of breath, chest pain, joint and muscle pain, fatigue, difficulty completing tasks, tremor, headache and dizziness), it was not a discrete entity.

18. Although clusters of symptoms may be of limited value in diagnosis, it has been suggested that specific symptoms or the progression of symptoms over time can help to distinguish between different categories of post-combat disorder. Emilio Mira, a psychiatrist who had treated civilians suffering from the effects of air-raids on Barcelona during the Spanish Civil War argued that the presence of amnesia was a powerful indicator of a cerebral injury. Yet, based on his experience of treating shell-shock patients during the First World War, Culpin argued that amnesia for many was the product of an unconscious process designed to block unpleasant memories, which could be recovered by hypnosis or suggestion. Indeed, Hadfield reported the case of an air-raid warden who had been concussed during the Blitz. In the immediate aftermath he suffered amnesia, wandering in a fugue state for four days. He subsequently experienced eighteen months of headaches, insomnia and severe neck pain, but as a result of psychotherapy was able to recall in detail the experience of being blown in the air and the districts he had walked through.

Post-concussional syndrome

19. Headache was identified by a number of researchers as a key symptom in post-concussional syndrome. Gutman found it in more than 50% of cases, Russell in 42% and Rowbotham in 80%. However, headache could not be regarded as pathognomonic and clinicians were agreed that it could not resolve any question of causation, being a feature of organic and psychological disorders.

20. Individual symptoms, suggested Derek Denny-Brown, professor of neurology at Harvard, did not hold the key but their timing and number could distinguish between severe head injury and post-concussional syndrome. In the opening phase of the Second World War, Denny-Brown worked at a British military hospital for head injuries and based this judgement on 18 months of clinical experience. In cases of organic damage, he argued, symptoms are immediate and severe with a trend to progressive recovery, while in the latter there was often a delay in onset and tendency to get worse rather than better. This observation had also been made by Schwab and Fenton in the aftermath of the First World War: “instead of passing away in a few days, as they normally do, symptoms begin after a comparatively free interval, become apparent again with a definite degree of persistence and exaggeration.”
21. However, this hypothesis was not supported by a number of clinical investigations. A follow-up study of 1,020 military personnel with closed head injury by Sir Charles Symonds led him to the conclusion that ‘the practice of dividing the post-convulsive cases into two groups, labelling the one organic and the other functional or neurotic’ was ‘unprofitable and misleading’. Indeed, Lewis in 1942 and Gutman in 1946 underlined the similarities in the presentations of head-injured and non-head-injured soldiers seen in army psychiatric units. They seemed equivalent in terms of family and personal histories of psychological disorder and even range of symptoms. Furthermore, a study of 200 US Army personnel exposed to high-explosive blast conducted by Barrow and Rhoads in 1944 identified significant psychological effects in those who survived without apparent physical injury: ‘these patients were listless and apathetic and they seemed overcome with fatigue and lassitude’. Although most recovered quickly from this state, others continued to report symptoms for which no organic basis could be found.

22. A study conducted by Captains Drayer and Glass at 43rd Station Hospital in the Italian campaign failed to identify any differences in symptoms between those soldiers admitted with battle exhaustion and those having been exposed to blast ‘as manifested by haemorrhage or rupture of an eardrum’. Both groups were ‘indistinguishable’ and characterised by ‘irritability, headache, tremor, battle dreams, startle reaction, and a phobia of further combat’. It appeared, therefore, that no clear-cut pattern existed that could reliably divide head-injured patients into those whose symptoms were primarily psychological and those that were organic in origin.

23. In addition, Denny-Brown concluded that the ‘relationship between the degree of initial traumatic damage done to the cranium in head injury and subsequent symptoms such as headache, dizziness, intellectual deficit and disability was “obscure”’. His study of 430 cases of head injury admitted to Boston City Hospital between July 1942 and December 1943 showed that severity of wound was not in itself a sufficient predictor of disability, though neuropsychiatric symptoms (headache, dizziness, difficulty in concentration, nervousness and insomnia) had the highest correlation with extended convalescence and difficulties returning to full occupation. In other words, it was difficult to predict outcomes even in those patients for whom there was objective evidence of contusion or concussion.

24. With this knowledge in mind, British military doctors largely abandoned any attempt to divide servicemen with post-concussional syndrome into different categories based on whether or not they had a defined head wound. Specialist neuropsychiatric units, such as Mill Hill and Northfield, adopted a pragmatic approach designed to avoid invalidity and promote morale and competence. They retained cases within the armed forces and offered occupational therapy and vocational training based on aptitude tests. Having observed the debilitating effect of the shell-shock label, the key, it was thought, was to return service personnel to purposeful activity without paying too much attention to causation.

25. Post-war investigations by Lishman showed that post-concussional syndrome was characterised by subjective symptoms not directly accessible to observers. In addition, a retrospective study of 670 World War Two servicemen with head injuries showed that 144 (21.5%) had marked psychiatric disability on follow-up one to five years later. Enduring symptoms included headache, dizziness, fatigue and
sensitivity to noise. Assessed by a range of criteria (depth of penetration of injury, amount of brain tissue destroyed or length of post-traumatic amnesia), 71 (10.8%) subjects consistently emerged as having the milder injuries. Lishman estimated that physical injury contributed little more than 7% of total disability and suggested that the emotional impact of the traumatic experience could precipitate psychiatric symptoms in those who are psychologically vulnerable.

26. In 1981 Trimble concluded that post-concussional syndrome was far from being a clear-cut diagnosis: 'there is considerable psychiatric morbidity following head injury... Neurotic symptoms are not only the prerogative of the mildly injured.'

27. A recent study by Meares et al compared symptoms in two randomly selected populations: 90 subjects with mTBI and 85 subjects who had suffered a traumatic exposure but not experienced brain injury. Although 43% of the mTBI sample had the symptoms of acute PCS at follow-up within 14 days of the traumatic injury, 43% of the non-brain injury controls also met the criteria. PCS (defined as the presence of three or more symptoms from a list of ten) was not found to be specific to mTBI, but could arise in those without brain injury. The term is perhaps misleading in that it implies that 'concussion' is a causative element. The symptoms of acute PCS are non-specific and common: fatigue, dizziness, poor concentration, memory problems, headache, irritability, malaise, mood swings-emotional lability and insomnia.

28. There is currently no way of knowing whether post concussional syndrome and shell shock are the same phenomenon. Because shell shock was a catch-all term (including concussion, cases of psychological trauma and even malingering), no one has ever attempted to compare the symptoms of the two disorders in a scientific manner. A major study by Jones et al (2002) which compared random samples of servicemen with shell shock and other disorders such as non-uro displacement dyspepsia, disordered action of the heart and so-called Gulf War syndrome, showed that there were important similarities but no exact matches - more like varieties of a species. To discover whether mTBI is the same, in terms of symptoms, as post concussional syndrome or shell shock would require us to re-run the experiment including a random sample of soldiers with PCS and a random sample of service personnel with mTBI.

LABELS

29. Diagnostic labels have proved popular in the past but often come with a cost. Shell shock itself rapidly gained acceptance amongst soldiers and military doctors. A compelling term, it succinctly expressed the experience of trench warfare and what a soldier subjected to artillery barrage might feel. However, many came to regard the label as inimical to treatment and recovery.

30. The term 'shell shock' was widely applied to military patients before the disorder was properly understood. Some servicemen sought a diagnosis of shell shock during the First World War because of the clear advantages it brought. During 1915 and 1916 it carried entitlement to a wound stripe and gave a soldier a valid claim for a war pension on discharge from the armed forces. As well as providing the patient with several months rest in a base hospital, a diagnosis of shell shock also offered a mantle of military credibility. Lord Peter Wimsey, for example, the fictional
detective of Dorothy L. Sayers was recorded as having been invalided from the Rifle Brigade in France with shell shock, a fact that did nothing to diminish his heroic status, but did explain some of his eccentricities. Because some had hypothesised that it represented the outward expression of a cerebral wound, the issue of psychiatric stigma did not apply. Initially, there was no shame attached to the disorder. As a result, servicemen admitted to specialist neurological centres in France when asked of what they suffered invariably answered, "shell shock sir." To the soldier's mind it was as much an entity as scarlet fever, with the further addition that, being incurable, shell shock was more to be dreaded.\footnote{31}

31. However, the battle of the Somme in summer and autumn 1916 led to a turning point in both understanding of shell shock and the way that sufferers should be managed. Increasing numbers of soldiers were invalided from the front and many were shown to have symptoms without having been close to an exploding shell. They, in particular, could not have experienced concussion and their symptoms had either to be psychological in origin or malingering.

32. By this time the label shell shock was well established among soldiers, the medical profession and the general public. Greater understanding of the disorder and the military need to discourage its indiscriminate use, led to a major policy change. Use of the term was to be strictly controlled and its status as a legitimate wound was questioned. In November 1916 Arthur Sloggett, Director General of Army Medical Services in France (DGAMS), authorised two new classifications: "effects of explosion (wound)" for those who were unable to perform their duties as a soldier as a result of direct contact with "a specific explosion... without producing a visible wound"; and "nervousness" for those whose symptoms were characterized by anxiety.\footnote{32} These descriptions were introduced to avoid use of label shell shock, which was now the subject of controversial dispute as to its status and effects.

33. The introduction of specialist units for the treatment of shell shock in December 1916 (initially known as "Special Medical Units") was accompanied by new regulations for assessment and treatment. Regimental medical officers were instructed not to use the term but to write 'Not yet diagnosed, nervous' on a soldier's casualty card together with a brief description of the context in which the breakdown occurred.\footnote{33} On arrival at a forward psychiatric unit, a specialist was required to assess whether the soldier was to be diagnosed as 'shell shock (wound)' or 'shell shock (sick)'. The former was to be used only for soldiers in combat who had been close to an explosion and therefore who might have suffered an organic lesion. Doctors were required to obtain corroborative evidence from the soldier's unit, though in practice this proved impractical during offensives. Such casualties were to be offered the treatment appropriate to a battle casualty. By comparison, those who reported symptoms in combat without having been close to exploding ordnance were to be designated 'shell shock (sick)'; they were to be treated with a degree of suspicion as there was no obvious cause of their illness.

34. In reality, these distinctions were rarely adopted by medical officers or specialists. Analysis of admissions to a forward psychiatric unit showed that the label shell shock (sick) was almost never used.\footnote{34} In part, doctors in the front line or close
to the battlefield rarely had the time to make such precise judgements and in the absence of corroborative evidence were largely reliant on the soldier’s self report. More than this, however, the term shell shock had become so well established that a set of new regulations made little impact on well established beliefs. Because of this, in April 1916, Lieutenant General G.H. Foulke, the Adjutant General to the British Armies in France, recommended that cases of shell shock should no longer be classified as ‘battle casualties’ but recorded as sickness.

35. Despite the efforts of specialists in psychological medicine and the military authorities, shell shock continued to be regarded as a legitimate medical disorder by most soldiers, the press, politicians and the general public. It was popularly conceived as a physical consequence of exploding ordnance and as such a lasting and debilitating disorder. Thus, a misconceived label, if applied early and allowed to establish itself, can plausibly inhibit understanding and treatment. Mild traumatic brain injury as a label possesses some of the characteristics of shell shock. A relatively new term (possibly introduced in 2004), in the UK it appears to have replaced the more neutral ‘mild head injury’ (MHI). Striking a popular chord, mTBI carries an implication of serious pathology and covers a wide range of non-specific presentations.

36. Our current state of knowledge does not permit us to conclude that labels make a difference to outcomes. In the past, servicemen treated in military and civilian hospitals were given a diagnosis so a control population without a label would be hard to find. A definitive answer to the question would involve setting up a random controlled trial of mTBI patients assigning them to two groups (one with labels and one without) before they entered treatment programmes. Ideally, it would also include follow-ups to see if any effects are sustained.

ORGANIC VERSUS PSYCHOLOGICAL EXPLANATIONS

37. Because shell shock was characterised by a wide range of common symptoms, this opened the door to multiple aetiological explanations. At first, it was considered that forces of compression and decompression caused a cerebral lesion, a form of “commotio cerebri”. Frederick Mott, then Britain’s leading neuropathologist and recruited by the War Office to discover the aetiology of the disorder, argued that in extreme cases shell shock could be fatal if intense commotion affected ‘the delicate colloidial structures of the living tissues of the brain and spinal cord’, arresting ‘the functions of the vital centres in the medulla’. Alternatively, it was speculated that carbon monoxide released by the partial detonation of a shell or mortar could damage the central nervous system. In other words, the disorder was formulated at the outset as an organic problem even though the pathology remained unclear.

38. However, research conducted by Myers, consultant psychologist to the BEF, during 1915 and 1916 led to a new hypothesis. Based on his own observations, an increasing appreciation of the stress of trench warfare and the finding that many shell-shocked soldiers had been nowhere near an explosion but had identical symptoms to those who had, Myers suggested a psychological explanation, even to the extent of characterizing them as ‘traumatic neuroses’. For these cases, the term ‘emotional’, rather than ‘commotional’ shock was proposed. This confusion
over the nature of the disorder subsequently encouraged the decision to introduce two categories of shell shock: ‘wound’ and ‘sick’.

30. Whilst this distinction possessed an internal logic, in reality it failed to work. First, a soldier might cease to function in a battle while not being close to a shell explosion. Strictly speaking, he should have been designated as ‘shell shock (sick)’ but analysis of admission books to a specialist unit, reveal that doctors almost uniformly used the ‘wound’ label for anyone referred from a front-line unit. Secondly, a soldier worn out by prolonged active service might break down while in a base area. If he were unable to report an instance where he had been concussed by an exploding shell, a doctor was required to label him as ‘sick’ whereas his symptoms were a direct consequence of battle.

40. The psychological explanation gained ground over the neurological in part because it offered the British Army an opportunity to return shell-shocked soldiers to active duty. Increasingly short of front-line troops, any initiative that promised to restore such cases to fitness was attractive. As a result, in November 1916 Arthur Sloggett, Director General of Army Medical Services, authorized two new classifications: ‘effects of explosion (wound)’ for those who were unable to perform their duties as a soldier as a result of direct contact with a specific explosion... without producing a visible wound’; and ‘nervousness’ for those whose symptoms were characterised by anxiety. In part, these descriptions were introduced to avoid use of label ‘shell shock’, which was now the subject of controversial dispute as to its status and effects.

41. In addition, four dedicated shell-shock units were set up in France close to the front line (so-called ‘forward psychiatry’) for acute cases: at 4 Stationary Hospital, near St Omer, to serve First and Second Armies, at 6 Stationary Hospital, Ploërmel, for Third Army, at 21 Casualty Clearing Station, Corbie, for Fourth Armies, and at 3 Canadian Stationary Hospital, Doullens, for Fifth Army. Furthermore, specialist base hospitals were established for those already suffering from chronic effects (notably Maghull, Craiglockhart and the Maudsley). Considerable resources were diverted towards the investigation and clinical management of this apparently novel disorder.

42. When the United States entered the war in April 1917, they too faced the same steep learning curve. A month later, Major Thomas Salmon was ordered to the UK and France to study the question of shell shock and make recommendations for US Army policy. In essence, he recommended a system of forward psychiatry supported by a large specialist ‘clearing hospital for mental cases’, Base Hospital No. 117 set up at La Fauche. Despite this careful planning, shell shock spread through the American Expeditionary Force and rose to rose to significant levels during the Argonne offensive.

43. Why, then, did the US Army fail to prevent an epidemic of shell shock amongst their troops? First, the imprecise nature of the term allowed it to become a catch all for any disorder that was either psychological or neurological. The nature of trench warfare made it inevitable that there would be head wounds, cases of concussion and soldiers suffering the effects of psychological trauma. If the US Army had a failing, it was not one of prevention but of management.
44. The idea that shell shock was at best a psychological disorder and at worst malingering gained ground during the interwar period and influenced planners before and in the early stages of the Second World War. To illustrate its true nature, in their Textbook of Psychiatry Henderson and Gillespie quoted the case of 2,500 US troops with shell shock awaiting passage to America when the Armistice was declared. It was claimed that all but 400 recovered within two days of the Armistice. The implication of this report was that most soldiers with shell shock had a functional disorder designed in the main to assist their transfer from the combat zone. There was scant recognition that some may have been worn down by prolonged exposure to intense stress or suffering the psychological effects of a concussive head injury.

45. In 1942, John Fulton, professor of physiology at Yale, recognised the difficulty of attempting to distinguish ‘psychogenic war neurosis [shell shock] from a case of organic concussion resulting from blast’. In the same year, Kurt Goldstein, professor of neurology at Tufts, had questioned whether indeed it was possible to distinguish between ‘psychogenic symptoms’ and ‘those organically produced’. In After-effects of Brain Injuries in War, which was based on his experience of treating German soldiers with head wounds during the First World War and peacetime research in a specialist unit at Frankfurt, Goldstein wrote that:

The whole dichotomy itself is probably at fault, for… the organic patient will react to his condition with functional symptoms also. Furthermore the functional symptoms may be no less disturbing to the patient than those organically produced.

46. Preliminary results of a study of UK troops returning from Iraq suggest a very strong association between the symptoms of mTBI and those of post-traumatic stress disorder (PTSD). Indeed, studies of civilians with mild head injury had shown an association with PTSD. It appears, therefore, that it can be difficult to distinguish between the effects of mild head injury and an exceptionally stressful experience. Even with the social acceptance of PTSD, service personnel still prefer to be labelled as suffering from mTBI than a psychological disorder. Shell shock too was largely free from stigma when used in the early phase of the First World War because it was perceived as a wound, or a neurological lesion. Raynor, a divisional psychiatrist serving with the AEF, recalled “with what tenacity men clung to a diagnosis of ‘shell shock’... something which was generally recognized as incapacitating and warranted treatment in a hospital”.

47. Although it may be better for self esteem and career prospects for a veteran’s symptoms to be attributed to mTBI rather than PTSD, it is also important to note that labels themselves affect prognosis. For example, a study of post-concussional syndrome by Whittaker et al. suggested that subjects who believe that their symptoms have lasting and deleterious effects are at heightening risk of experiencing an enduring disorder of this kind. In other words strongly held negative beliefs play a part in maintaining symptoms and functioning – exactly the reasoning which led the British Army to discourage use of the term shell shock in 1917.
DATA

48. Statistics for both World Wars are unreliable. Published data and official sources were contaminated by the need to preserve morale and to demonstrate military effectiveness. Battle casualties were played down and indicators of high morale emphasised or exaggerated. Not even scientific journals could be trusted during times of war. Even post-war studies have been clouded by such statistics when scholars have taken numbers at face value. For example, a history of military medicine during the Second World War, published by Oxford University Press in 2004, uncritically included exaggerated outcome measures (that 98% of patients were successfully returned to duty within three weeks of admission) claimed by Major Harold Palmer who had treated neuropsychiatric casualties from the Western Desert. At the time, contemporaries had been sceptical of this apparent success story. Unless statistics are retrospectively extracted from original records, they should be treated with caution.

49. A tantalising account appears in Death’s Men, Soldiers of the Great War, published in 1979, about numbers of battle casualties. In 1914, Winter claims, 1,906 cases of behaviour disorder without obvious physical cause were admitted to medical units of the BEF, a total that rose to 20,327 (9% of battle casualties) in the following year. Winter also claims that only 3% of service men diagnosed with shell shock had a discernible brain lesion. Sadly, Winter provided no source for these statistics and it has not proved possible to verify them. An official report compiled in December 1914 and quoted by Johnson and Rows suggested that between 7% and 10% of officers and 3% to 4% of men admitted to hospitals in Boulogne were invalided to the UK suffering from the effects of ‘nervous and mental shock, due to strain, stress and exhaustion’.

50. In October 1917, Salmon reported that shell shock was responsible for one seventh of all discharges from the British Army, one-third if wounds were excluded. By the end of 1918, the British government had awarded 32,000 war pensions for shell shock, a figure that was to rise dramatically once soldiers were discharged from the forces.

51. Shell shock had initially caught the popular imagination in part because it related to a genuine medical emergency, a head wound or neurological lesion. As Southard observed the term ‘compared with the more acutely terrible and life-in-the-balance thing we know as traumatic or surgical shock’. In 1917, however, when it had become clear that many cases were not directly related to a head injury, the medical authorities attempted to restrict use of the diagnosis. Disputes over its aetiology and management, further served to inhibit the design of an effective protocol. The involvement of the media and politicians, ostensibly to support the claims of individual veterans, added an emotive element that distorted policy and research. In November 1917, for example, Myers was refused permission by Sloggett to submit a paper to the BMJ on shell shock because orders had been issued to the press bureau that nothing relating to the disorder should be released to newspapers. Thus, a preoccupation with media relations is nothing new.
Data collection

52. Accurate statistics for disorders that are controversial or carry stigma are notoriously difficult to collect. First, servicemen are reluctant to report symptoms that may lead to such a label; commanders may suppress information or refuse to refer servicemen from their unit because their existence may imply a failure of morale or leadership; and doctors treating these disorders may falsify returns lest they be accused of lack of efficiency. All of these issues were encountered during the First World War when shell shock became a prominent battle casualty.

53. In 1919, Major Dudley Carmalt-Jones, who ran the ‘Shell Shock Centre’ at No. 4 Stationary Hospital, Arques, recalled that there had been ‘vicious’ competition between the four forward psychiatric units and between ‘rival methods of treatment for the return of patients to their units.’ Even Carmalt-Jones, who published the lowest return-to-duty rate (40%), was susceptible to these pressures. A re-evaluation of discharges from his Centre showed that the true rate was 17%.

54. Sloggett as DGAMS insisted on weekly reports of numbers suffering from infectious diseases. In a static trench war, an epidemic of dysentery could disable a significant element of the fighting force. He and his staff monitored levels of diphtheria, dysentery, enteric fever, venereal disease, trench foot and other contagious disorders. In February 1917, for example, Surgeon General W.W. Pike, director of army medical services for the First Army, sent out instructions to all doctors involved with such patients detailing procedures, diagnostic criteria and the need to keep accurate returns. Because shell shock could also spread rapidly through a unit thereby disabling it as a fighting force, Sloggett decided in July 1917 that weekly statistics should also be collected for this disorder. As a result, regimental medical officers were required to send returns to their medical commanders at divisional level where they were to be collated and passed to headquarters.

55. However retrospective study of the statistical returns presented to staff officers bore little resemblance to the numbers being admitted to specialist units. Surgeon General H.N. Thompson, Pike’s successor, kept weekly reports of the numbers of soldiers admitted and discharged from the specialist unit. Few other ranks or officers were recorded as being sent to base units and most appeared to return to active duty. Yet an examination of the medical records themselves reveals that the very opposite was happening. Over the ten months of its operation in 1917, 20% of discharged soldiers being sent to base duties, 27% to other hospitals and 35% to convalescent depots.

56. Even specific reports on shell shock undertaken by trusted physicians produced misleading statistics. During summer 1917, doubts about the effectiveness of these specialist shell shock units, based on the suggestion that discharged servicemen continued to circulate through the wider hospital system, prompted an investigation by Lt Colonel Gordon Holmes, consultant neurologist to the BEF. Having conducted an audit of the shell shock unit at No. 62 Casualty Clearing Station during August, September and November 1917 he reported that 57 (10%) their patients had a second admission for shell shock and only 15 (2.8%) had multiple
readmissions. However, his actions spoke louder than his words as he closed the centre at No. 4 Stationary Hospital in November 1917. Significantly, Holmes did not explore the possibility that those returned to combatant duties sought other routes from the front, including disciplinary offences, desertion and admission to other types of hospital. Other studies suggested that the re-admission rates reported by Holmes understated the true incidence of relapses. Of 150 cases of shell shock referred to No. 12 General Hospital in France in 1916, Wiltshire found that 27% were men who had ceased to function after an earlier breakdown. 

57. In April 1917, Colonel Sir William Herringham, consulting physician to the Third Army, was asked by Sloggett to assess the first three-months operation of the four shell shock centres. Although no copy of his report has survived, Herringham’s memoirs, A Physician in France, give a hint as to his findings. He believed that most of those admitted to shell shock units had a pre-existing vulnerability: a temperament, which either from an inborn predisposition, or from adverse circumstances, had a more likely to breakdown. Mild cases often recovered with ‘rest, good food and encouragement’. Although some admissions were returned to forward units, Herringham believed that ‘probably the greater part broke down again’, though he acknowledged that the circumstances of war prevented any meaningful follow-up study.

Statistical variance between United States and United Kingdom

58. Although deployed to the same war zones, Iraq and Afghanistan, reported rates of both mTBI and post-traumatic stress disorder (PTSD) appear to be significantly higher amongst US troops than their UK counterparts. For example, the Defense and Veterans Brain Injury Center reported that 59% of injured soldiers returning from Iraq and Afghanistan suffered at least a mild TBI while in combat. Furthermore, a study by Hoge et al found elevated rates of depression and PTSD amongst US troops returning from Iraq (15% to 17%) and Afghanistan (11%). However, it is perhaps too early to draw definitive conclusions about respective rates as a study by Fear et al of a random sample of 5,869 UK military personnel (4,928 regulars and 941 reservists) deployed on TELIC 1 (18 January 2003 to 29 August 2003, the war-fighting phase) found that 67% had at least one symptom of mTBI, and 42% had at least one moderate/severe symptom.

59. To discover whether any variance is a contemporary effect or more general across time, statistics for shell shock during the First World War were compared. In the post-war period the US Army Medical Department conducted wide-ranging studies of battle casualties. Official reports suggested that shell shock amongst US forces varied considerably according to different phases of battle. During offensive operations from July 1918 until the end of the war, rates rose as high as 9.5 per thousand men deployed and were typically around five per thousand. These levels are low when compared with those recorded for UK troops and US troops in the Second World War. In the Mediterranean theatre between 1942 and 1945, for example, neurological disorders were reported as being 7 per 1000 and psychiatric disorders at 41 per 1000 for US troops. Equivalent figures for the Southwest Pacific area were not dissimilar: 0.9 per 1000 and 44 per 1000 respectively.
It is not clear why reported rates of shell shock for US troops were low when compared with British figures. Entering the war late, the US Army had the opportunity to study British and French methods of treatment and to set up an integrated psychiatric service before the American Expeditionary Force (AEF) deployed in significant numbers and went into combat. There was also a limited measure of psychological screening before the AEF left for Europe. It is possible, therefore, that the specialist service devised by Major Thomas Salmon contributed to the low rates. Alternatively, research has shown that published official statistics for psychiatric casualties are rarely accurate.\textsuperscript{cix}

Currently, we cannot explain why there is a variance between US and UK mTBI rates. It could be because of differences in the types of troops being deployed (the proportion of part-time soldiers or reservists versus regulars), the nature of military exposure or simply a function of recording procedures. Furthermore, we cannot be sure that national disparities have not occurred in the past because of incomplete or biased evidence.

**SPECIALIST TREATMENT UNITS**

Herringham was pessimistic about treatment: ‘if these patients [shell shock] could not be quickly cured, it was very difficult to cure them at all’.\textsuperscript{cvi} It was recognised that the further a soldier was transferred from the front line, the less likely he was to return to active duty. At Maghull Red Cross Hospital, for example, 731 discharges only 21\% went back to military duties and very few to battalions at the front.\textsuperscript{cxvii} Gordon Holmes, consultant neurologist to the British Expeditionary Force, recalled that base hospitals situated in France achieved return-to-duty rates of 30\% to 40\%, while those in the UK were as low as 4\% to 5\%.\textsuperscript{cxviii} In response to these findings, Myers urged that all cases of shell shock be treated in France and in November 1916 proposed the creation of four specialist units located about ten miles from the trenches.\textsuperscript{cxix}

Although retrospective research has shown that only 17\% of those admitted to specialist units at the front were returned to active duty,\textsuperscript{cxi} to date no equivalent study of rear psychiatric hospitals has been undertaken. As a result, we remain reliant on contemporary estimates and anecdotal reports. Between January 1916 and December 1919, the Maudsley Hospital, the War Office’s principal neurological clearing centre, assessed 12,438 shell-shock casualties from France.\textsuperscript{cxii} Yet no analysis was made of outcomes or prognosis.

Once the Armistice had been signed care of veterans fell to the Ministry of Pensions which opened a network of out-patient clinics and specialist in-patient units. By December 1925, the Ministry had re-structured its in-patient facilities to a national network of ten hospitals: Castle Leazes, Newcastle; Harrowby Camp, Grantham; Ward Camp, Saltash, Plymouth; Coombe Park, Bath; Ewell, Epsom; Orpington, Kent; Craigieith and Edenhall in Scotland; Craigavon, Northern Ireland; and Leopardstown Park, Dublin.\textsuperscript{cxiv} According to official statistics, the number of patients treated by Ministry staff peaked in 1921 (2,951) and declined steadily during the interwar period, levelling off at 370 in 1935.\textsuperscript{cxv} However, as will be seen below, this progressive reduction in patient numbers was less a product of effective treatment rather than a policy of curtailing pension rights. Although officials reported that
hospital and clinic capacity consistently met the demand, the vast majority of veterans with psychological disorders were left to fend for themselves during the interwar period. There was considerable stigma attached to any form of mental illness and it appears that ex-servicemen were reluctant to attend Ministry facilities, while doctors became increasingly sceptical of their clinical value.

65. Given the costs of in-patient treatment, the Ministry conducted a series of investigations during 1925 and 1926 into the effectiveness of their clinical and occupational programmes at Saltash (450 beds) and Harrowby Camp (230 beds). The key problem was identified as the chronic nature of neurasthenic symptoms and the fact that most patients had not worked since their discharge from the army. Occupational therapy (brush making, house repairs, basket making, boot repairing and agricultural work) was designed to re-acustom men to employment. Termined 'hardening', it took the form of manual labour in workshops for not less than six hours a day. Yet the medical superintendents of both hospitals were pessimistic about outcomes. At Saltash, it was estimated that only 8% of patients were likely to become effective citizens and for a further 28% a possibility of improvement, while at Harrowby the most optimistic estimate was 15%. As a result, the Ministry's medical advisors concluded that the 'maintenance of this special class of post-war inefficient is likely to remain a public liability in some form or another for many years to come'. Nevertheless, these results were considered sufficient to justify the closure of the more costly specialist neurological hospitals in favour of institutions where the emphasis was on occupational therapy. Apart from Kirkburton, reserved for cases of major mental illness, the only neurological hospitals retained by the Ministry from December 1925 were Ewell for severe borderline cases, Leopardstown Park (136 beds), Latchmere (58 beds) and Rotherfield Court (40 beds), the last two treating only officers. Given that there were only 370 neurasthenic ex-servicemen being treated as in-patients by 1935, it appears that most may have been discharged to a life of chronic invalidity, supported by a war pension.

66. The general conclusion is that a chronic sub-population of shell shock cases existed and that these proved resistant to treatment even in specialist units. However, since the 1930s there has been considerable advance in treatment (both in terms of medication and therapies). The implication from these figures is that symptoms should be addressed as soon as possible to prevent them from becoming established and multiplying.
RETRAINING

67. Some military doctors went so far as to state that the disorder was environmentally or contextually determined. Others also believed that the way in which healthcare and latterly compensation were organized served to reinforce both symptoms and disability. A vigorous debate ensued between the various schools of thought that led to a series of novel managerial interventions designed to limit what had become an epidemic of patients and war pension claims.

68. By early 1941, it had become apparent that many servicemen diagnosed with functional or psychological disorders, who had responded well to treatment, relapsed on return to their original units and duties. As a result, they were often discharged to civilian life where, if their symptoms endured, they were a burden on the state. At the suggestion of Dr Aubrey Lewis, the clinical director at Mill Hill Emergency Medical Services Hospital, the so-called 'Annexure Scheme' was introduced by the War Office in May 1941. This involved making an assessment of a soldier's abilities and skills so that they could be assigned to a job within their capacities, thereby preventing further breakdown or discharge from the armed forces. Training and occupational therapy were provided. A follow-up investigation in 1943 found that 80% of those who had been treated for psychoneurosis and who otherwise would have been invalided were retained under the Annexure Scheme and of those 83% had performed satisfactorily in their new military roles. Rees observed that the programme had helped to maintain the manpower of the army and to ensure that certain jobs are well done by men whose employability is limited, so releasing other fitter men, but also it should be of some value to us in planning for the treatment and disposal of the chronically neurotic men and women in civilian life. Around 10,000 servicemen were retained in the forces under the scheme, which was ended in August 1945.

69. Lewis was able to conduct one of the few detailed follow-up studies of the war. In an attempt to discover the lasting effects of treatment at Mill Hill, he led a team of psychiatric social workers who visited 120 servicemen six months after they had been discharged from the forces. Lewis described the results as 'disturbing' as the men had gone downhill as a group: 'they were less usefully employed than before, earning less, less contented, less tolerant to live with, less healthy'. By June 1942, 12% of the 120 were unemployed and only 50% could be classed as 'socially satisfactory in respect of work and otherwise'.

70. A further investigation was carried out in 1943 by Dr Eric Guttmann and E.L. Thomas, a psychiatric social worker. They followed up a sample of servicemen discharged from the army with diagnoses of neurotic disorders. Although only 8% were found to be unemployed, they too reached a pessimistic conclusion:

They form a population with a high incidence of neurotic complaints and neurotic illness 15 months after their discharge. A large proportion of them find it difficult to return to civilian occupation, as shown both in delay in taking up work and the frequency of job changes. There is high rate of absenteeism due to sickness requiring a considerable amount of medical attention.
71. These studies suggested that the psychological problems experienced by servicemen were not as amenable to therapy as many contemporaries had claimed.

CONCLUSIONS

72. The following clinical description is taken from the First World War but could equally apply to a case of concussion suffered in Iraq of Afghanistan:

_The lieutenant under my care told me… he felt a great pressure against him; it was soft but sufficiently powerful to knock him down unconscious. He did not know how long he was unconscious, but thinks it must have been an hour. When he recovered consciousness, he got up and was helped away. His head felt as if it would burst and ever since he has had a whizzing in his left ear and dizziness._

73. In terms of mTBI, there are similarities between the current conflicts in Iraq and Afghanistan, and the British Army about to begin the Somme offensive of July 1916. Head wounds and concussion were common battle injuries and potentially life threatening. Yet diagnosis was problematic and it was often unclear what aetiology related to specific symptoms, especially in cases that had become chronic. Shell shock, like TBI, had caught the popular imagination and also the attention of the media. They have both become high-profile disorders without obvious stigma. The British Army struggled to define shell shock and without a clear understanding of what it constituted failed to produce a coherent management plan. The post-war ramifications were catastrophic with escalating war pension claims and a series of costly initiatives designed to treat chronic cases. So troublesome had been the disorder that the term shell shock was proscribed on the outbreak of the Second World War and draconian policies introduced to try to prevent its reappearance.

74. Cases of mTBI should be examined critically. During the First World War doctors eventually accepted that the symptoms of both physical and emotional injury overlap. Favoured one set of uncertain aetiological constructs over another has certain advantages and in particular may reduce stigma and improve help seeking. But, on the other hand, it may distract attention away from more easily treatable disorders, such as post-traumatic stress disorder, and if the results of Whittaker et al. at to be believed, impact negatively on outcome.

75. The First and Second World War generations believed that future research would assist in distinguishing between the physical and psychological causes of ill health in soldiers exposed to blast. The Report of the War Office Committee of Enquiry into “Shell-Shock” recommended that evidence be sought to limit the term to those cases in which a “causal connection” existed between “the effects of the explosive force and the symptoms resulting from the shock to the nervous system.” So far that hope has yet to be realised, though recent advances in neuro-imaging, not available to the shell shock doctors, may assist. A recent assessment of structural and functional neuroimaging concluded that further studies of the mild to moderate population were needed to establish whether these techniques could contribute information to guide clinical management and help determine prognosis. Currently, the heterogeneity of the population in terms of extent, type and location of the injury cause problems particularly in the acute phase.
when agitation and confusion often interfere with cognitive assessment. Even then, it will remain the case that symptoms alone are both common and non-specific. Furthermore, a clear-cut distinction between physical and psychological injury is unlikely to be realised, not least because the two co-exist.

78. At the time of writing enthusiasm for the mTBI concept, linked to an admirable and genuine desire to help our armed forces, is at a high just as shell shock rapidly gained in popularity when first introduced. The painful experience of battle led doctors in the First World War to reassess this earlier enthusiasm and in particular to conclude that shell shock was neither a signature injury nor simply a consequence of cerebral damage caused by exposure to blast.

Acknowledgements

77. The comments of Professor Simon Wessely on an earlier draft are much appreciated, as is a discussion with Professor Ian Palmer of the Medical Assessment Programme, St Thomas’ Hospital.
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LITERATURE REVIEW

Background

1. Traumatic brain injuries (TBI) cover a spectrum of injury from mild to severe, including both penetrating and non-penetrating brain injuries. Brain injuries are often described as ‘non-visible’ compared with obvious physical damage. Such injuries are seen in both military and civilian populations as a result of exposure of the skull and brain to accelerations. Road traffic accidents (RTAs), contact sports (rugby, boxing and American football), war fighting and involvement in blasts expose individuals to such accelerations and TBIs may be sustained as a result. More males than females sustain TBIs because the military population is predominately male, particularly in the infantry units, and males are more likely to participate in contact sports. Females report both more symptoms and an increased severity of symptoms following TBI than males (Mc Carroll J., Gunderson C., 1990).

2. A large body of medical literature exists on TBI and mTBI, based primarily on sports-related injuries. However, mTBI still has a poorly developed case definition and there is an incomplete understanding of the injury process. The wide range of non-specific symptoms seen in cases of mTBI overlap with other recognised disorders such as PCS and PTSD (Alexander M., 1995). Additionally there is very little data on the management of mTBI within a military operational setting, where there may be constraints that complicate the diagnosis and treatment of injured personnel.

3. Civilian data reveals that brain injuries seen at UK accident and emergency departments are mainly mild (80%) with the remainder being in the moderate and severe categories (Medical Disability Society, 1988; Drake A., et al 2000). Worldwide civilian incidence rates based upon hospital attendances range from 100 – 300 per 100,000 of general population per annum (Holm et al 2005). This may be an underestimate as many people with a minor injury do not attend for treatment. There is a growing awareness within the UK of a high level of disability following minor/mild head injuries and this is presenting a major challenge for neuro-rehabilitation services (NICE 2007).

4. The natural history of mTBI in a civilian setting is that most (80%) will be symptom-free by 3 months post-injury with the majority symptom-free within 2 weeks of the injury (Barth J.T., 1980; Levin H.S. 1987). Persistence of symptoms beyond 3 months is unusual but can have a profound effect on cognition, memory and personality and may cause significant functional impairment. One study (Thornhill 2000) showed that patients admitted for mild head injuries were more likely to experience persistent sequelae at one year than those with moderate head injuries.

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12 Acceleration is a change in velocity and can be a positive or negative vector quantity. A negative value would indicate slowing down.
The reasons for this are not clear but it may be that mild head injuries cause more morbidity than at first thought.

5. A large UK study reviewed the outcomes of patients attending a minor head injury clinic. This study showed that of the 639 patients who originally attended with minor head injuries, 56% were not back at work two weeks post injury and some 12% had not returned by the six week point. Many still exhibited persisting symptoms including headache (13%), memory loss (15%) and concentration problems (14%) (Haboubi 2001).

Military context

6. The current operational tempo has lead to an increase in the number of all injuries sustained by service personnel, both during training and on deployment (SPEG 2007). Head and brain injuries constitute some of these injuries; the pattern of military injuries has changes due to improvements in body armour and excellence of modern resuscitation techniques in the field. In addition the natures of the conflicts in Iraq and Afghanistan have led to an increase in the number of blast injuries being sustained.

7. There is some emerging evidence of neuropsychological problems seen within US troops returning from Operations Iraqi Freedom and Enduring Freedom and it has been has been cited as one of the four the ‘signature illness’ by commentators on these US operations. Work by the DVBIC suggests that 50% of injured personnel had experienced a TBI whilst on deployment (Warden 2005). Naturally this has heightened concerns and debate about the short term and potential long-term effects of mTBI in the UK service personnel. The most recent paper by Hoge et al (Hoge 2008) reveals that some 16% of US soldiers returning from Iraq reported an injury that had caused alteration of or loss of consciousness.

8. The UK figures available suggest that head injuries are far less common than those for US personnel for mTBI and UK experience is that most service personnel being treated for TBI have sustained a moderate or severe injury (Pers Comm 2007†). This may be due to differing levels of engagement, lack of recognition at the time of injury or because service personnel suffering mTBI continue to operate at a level that, whilst suboptimal, goes unnoticed for a variety of reasons. There is evidence that UK service personnel with probable mTBI (and even moderate brain injury) may only present to medical care many months after injury, often as a result of a change in their working environment or personal circumstances. However with the increase in the mTBI case load noted in the US, mTBI is taking on a high public profile in both Government and the media.

Definitions of mTBI

9. The World Health Organisation (WHO) Collaborating Centre for Neurotrauma Task Force on Mild Traumatic Brain Injury defines mTBI as follows:

mTBI is an acute brain injury resulting from mechanical energy to the head from external physical forces. Operational criteria for clinical identification include:
a 1 or more of the following:

(1) confusion or disorientation
(2) LOC for 30 mins or less
(3) Post-traumatic amnesia for less than 24 hours

and/or

other transient neurological abnormalities such as focal signs, seizures and intracranial lesion not requiring surgery;

b GCS score of 13-15 after 30 mins post injury or later upon presentation for healthcare

These manifestations of mTBI must not be due to drugs, alcohol, medications, caused by other injuries or treatment for other injuries eg systemic injuries, facial injuries or intubation), caused by other problems eg psychological trauma, language barrier or co-existing medical conditions) caused by penetrating craniocerebral injury (Holm et al 2005).

10. Mild traumatic brain injury was defined by the American Congress of Rehabilitation Medicine in 1993 as head trauma with loss of consciousness lasting less than 30 minutes, a GCS score of 13 or more, and posttraumatic amnesia lasting less than 24 hours.

11. The Department of Defense/Department of Veteran Affairs Traumatic Brain Injury (TBI) Planning Conference (June 2007) proposed the following definition:

A traumatically induced structural injury and/or physiological disruption of brain function as a result of an external force that is indicated by new onset or worsening of at least one of the following clinical signs, immediately following the event.

a. Any period of loss of or a decreased level of consciousness;

b. Any loss of memory for events immediately before or after the injury;

c. Any alteration in mental state at the time of the injury (e.g., confusion, disorientation, slowed thinking);

d. Neurological deficits (e.g., weakness, balance disturbance, praxia, paresis/plegia, change in vision, other sensory alterations, aphasia.) that may or may not be transient;

e. Intracranial abnormalities (e.g. contusions, diffuse axonal injury, hemorrhages, aneurysms).

12. Despite the variations there is consensus within definitions that the patient must have suffered some degree of ‘concussion’, allowing mTBI to be differentiated at the lower threshold from trivial brain injuries where no concussion is experienced.
There is already a clear distinction between mTBI and moderate traumatic brain injury.

Epidemiology

13. Epidemiology papers examined show that approximately 80% of all treated civilian brain injuries are mild (Wade 1997, Linnos 2006). The best evidence suggests that there are no objectively measured cognitive deficits solely attributable to mTBI beyond 3 months in most cases. There is strong evidence that persistent symptoms are more likely to be attributable to psychological and social factors rather than the mTBI itself (Holm 2005). Persistence of symptoms after 3 months is seen in a small sub-population often referred to as the ‘miserable minority’ (Ruff 2005) and such symptoms cause significant functional impairment. Kashuba S., (2007) noted that those with persistent symptoms may be predicted soon after injury on the basis of greater symptom reporting early on, pre-morbid psychological issues and compensation seeking behaviour.

Prevalence and incidence

14. The prevalence of mTBI is not commonly investigated and the accuracy of studies that have been conducted is questionable. In most cases individuals with mild head trauma tend not to present at medical facilities and therefore potential cases of mTBI remain undocumented.

15. World-wide the true incidence rate of mTBI is unknown. Published studies report an incidence range of between 100-300/100,000 per year for hospital treated mTBI (Medical Disability Society 1988) and more than 800/100,000 per year in self-reported population studies (Holm et al 2005). Recent evidence from the Centers for Disease Control and Prevention (CDC) show a significantly higher incidence of mTBI than earlier estimates had suggested (Langlois 2005).

16. The heterogeneity in reported incidence rates may be attributed to one or more of the following factors:

   a. at the mild end of the TBI spectrum many patients do not have their injury documented as they are not hospitalised (Holm et al., 2005);

   b. symptoms are masked by more serious non-brain injuries (Stulemeijer et al., 2006);

   c. diagnosis is confounded by variations in inclusion/exclusion criteria and;

   d. patients may present later at primary healthcare facilities with residual deficits in cognitive, behavioural or physical symptoms and these are not linked with their initial trauma.

17. An accurate incidence of mTBI amongst UK service personnel is currently unavailable. Analysis of the 26,000 recorded admissions to the emergency departments on Op TELIC revealed 578 head injuries (mild, moderate and severe)
an incidence of approximately 2.2% (Hodgetts unpublished 2007). The incidence reported in US service personnel is in the range of 12-18% of all injuries (Pers omm2 2007).

It is however difficult to make direct comparisons with US data because of critical differences in the definitions and inclusion/exclusion criteria utilized. Additionally the questionnaires used to define cases by each study are slightly different. The US has still to validate a questionnaire that identifies mTBI cases at the time of injury. In this last respect, the UK are probably as far advanced as the US, if not slightly further ahead as piloting of the UK instrument to identify mTBI is currently being undertaken in both major operational theatres.

Taxonomy

Debate around the use of terminology with 'mild', 'minor' and 'minimal', being used interchangeably within the research community is noted within the literature. The definitions used by different specialties are often different, as are inclusion criteria and an additional confounding factor is that the term head injury has been used synonymously with brain injury. The WHO Task Force on mTBI (2004) notes "that the literature would greatly benefit by common criteria".

Injury mechanisms

In the UK the top three causes of TBI are assaults (30-50% of the total) falls (22-43%) and road traffic accidents (~25%). TBI incidence in the civilian population has decreased significantly in the last few years following introduction of safety measures (eg seatbelts, helmets) (Dischinger 2007). Alcohol consumption however remains a major factor in many TBIs, is often associated with the common causes of TBI and may be implicated in up to 85% of adult head injuries (NICE 2007).

Within the military context land transport accidents (DASA 2006), particularly exposure to blasts and IEDs, pose additional threats for Service personnel. There is some circumstantial evidence of neuropsychological problems after blast exposure (Okie 2005. Belanger et al. 2005 Lew 2005).

There is evidence of neuronal injury but the mechanism is unclear (CernAK 2001a,b). Potential mechanisms of injury from blast include exposure to primary blast where possibly the CNS micro architecture is especially vulnerable, in tertiary blast resulting in very rapid head movements or brain injury secondary to other causes for example hypoxia due to blast lung or cardiovascular disturbances (Kirkman E., Watts S., 2007 unpublished). Research into this area continues.

Pathophysiology of TBIs

The neuropathology of mTBI is thought to be as a result of diffuse axonal injury due to sudden decelerations causing the brain tissue to shear (Oppenheimer 1968). The greater the applied force the larger the resultant structural injury and more permanent the loss of axonal function. Some limited accelerations result in potentially reversible physiological injury.
Alexander (1995) suggested that the extent of axonal injury is related to the duration of loss of consciousness or of posttraumatic amnesia and the GCS score. Areas of axonal shear injury may be demonstrated on CT or MRI scans as petechial haemorrhages that result from concomitant disruption of small blood vessels. Secondary injuries may be attributable to further cellular damage caused by the effects of the primary damage. Brain concussion, cortical contusions, intracranial haemorrhage, and axonal shear injury may occur within both open and closed head trauma in mTBI.

Diagnosis

24. A major area of contention within the literature is related to the wide range of symptoms assigned to mTBI and the overlap with other recognised disorders such as PTSD and depression. This makes the comparison of papers difficult because the diagnosis is not consistent (Trudeau 1998). Additionally the literature acknowledges the tension between whether mTBI is purely organic or partly psychological in nature (Taber 2008). At present there appears to be only weak evidence for the diagnostic validity of cognitive testing in making a diagnosis (Holm 2005).

25. There is growing evidence (mainly from animal studies) that biochemical markers, such as serum proteins, aid the diagnosis of brain injury. The serum protein S100b has been identified as having most potential as the marker of brain injury. A number of studies have shown that it can be a sensitive marker of brain injury, correlates with severity of the injury and may have prognostic value (Savola 2004 and Townend 2003). In addition a normal S100b value appears to have a high negative predictive value. However Dischinger (2007) reports that S100b is not exclusively associated with mTBI and may not be a reliable predictor of mild brain injury. Additionally in the paper by Begaz (2006) he concludes that no biomarker has consistently demonstrated the ability to predict PCS after MTBI. The paper also suggests that 'a combination of clinical factors in conjunction with biochemical markers may be necessary to develop a comprehensive decision rule that more accurately predicts PCS after MTBI'. Sensitive diagnostic tools that correlate with symptom reporting are still lacking (Borg 2004).

Concussion

20. Typical features of concussion are confusion and amnesia, often without preceding loss of consciousness. Early symptoms may include headache, dizziness, nausea, vomiting, slurred speech, imbalance, and lack of coordination. (Kelly 1991) Signs of confusion may include vacant stare, disorientation, delayed verbal or motor responses, and poor concentration or limited attention span. Confusion and memory dysfunction may be seen immediately on presentation following trauma, (Fisher 1966) or evolve gradually over several minutes (Yamell P.R., Lynch S 1970).

27. Historically with mTBI no structural brain injury was evident either on early diagnostic magnetic resonance imaging (MRI) or computed tomography (CT) scans. Additionally limited structural axonal injury may have been present but not always evident on CT or MRI scans (Povlishock J.T., et al. 1983; Povlishock J.T. 1992). However, it is important to note that brain concussions may be complicated by coexistent contusions or development of intracranial haemorrhages that are clearly seen on imaging. Research into comparing pre and post injury psychological
symptoms with functional imaging studies are still at an early stage, but, will hopefully contribute to increasing the evidence base in this area when concluded.\textsuperscript{13}

28. Transient neurological deficits are reported occasionally, including, hearing loss and blindness, possibly due to vascular hyper-reactivity or trauma-induced, and similar to those symptoms seen in migraine (Yamamoto 1988; Haas 1988). Cumulative neuropsychological deficits can result from multiple brain concussions over months or years (Gronwall D., 1975; Uterharmscildt F., 1970).

29. Repeated concussions occurring over a short period, such as during contact sports, can result in "secondary impact syndrome" (Saunders R.L., 1984). This term describes a concussion that occurs while an individual is still symptomatic from an earlier one, resulting in loss of cerebro-vascular auto-regulation and progressive cerebral oedema (Kelly J. P 1991; Kelly J.P. Rosenberg J.H., 1997). Cerebro-vascular congestion as a result of the secondary impact syndrome may be detectable on brain CT scans (Kelly 1991). An increasing awareness of the cumulative effects of repeated concussions, and of secondary impact syndrome, has resulted in the development of practice guidelines to assist with standardizing assessment and management of concussion in sports (Kelly J.P., Rosenberg J.H., 1997; Quality Standards Subcommittee 1997; McCrea M., et al 1997).

Post-concussion syndrome

30. The aetiology of post-concussion syndrome (PCS) following mild traumatic brain injury (mTBI) remains the subject of debate. This debate focuses around the inability of routine neuro-imaging techniques to detect cellular level structural changes in brain tissue that may account for persistent symptoms. Some authors believe that psychological factors best explain an individual's ability to manage post-concussion symptoms. However it must be noted that PCS symptoms are not exclusive to mTBI patients. They are commonly found in those who suffer from chronic pain, the general population and those who are depressed. A recent well designed study by Mears et al (2007) supports the above findings and concludes that "There is a high rate of acute PCS in both mTBI and non-brain injured trauma patients. PCS was not found to be specific to mTBI". More recent work (Hoge 2008) suggests that symptoms of mTBI and PCS are in fact the same.

High-risk populations

31. Some population sub-sets are at an increased risk of sustaining TBIs; namely young males, those who participate in contact sports or persons involved in assaults, falls and any individual with a previous mTBI(Putukian 2006). Identification of those susceptible to symptom development post mTBI may in part be explained by organic factors. For example, individuals who have a genetic predisposition, or initially present with headaches or dizziness, or with poor initial performance on neuropsychological testing, or who have abnormalities seen within the first few days on cross sectional imaging and those who have pre-existing neurotransmitter deficiencies (Dawodu 2007) lower neural reserves (Dawson 2007), appear to be at increased risk.

\textsuperscript{13} A research proposal for an investigation of this kind has been submitted by KCL/RCDM.
Treatment

32. Treatment regimes for mTBI have in the main been informed by the sports medicine community and as such reflect the recommendations of suspending training and not participating in sport for a defined period post-insult. The period of rest is variable depending on the sport undertaken (Collins M.W., Hawn K.L., 2002) and which set of guidelines (American Academy of Neurology (ANN) 1997) are being used. The AAN paper also notes that concussion is a highly individual injury and is therefore often misdiagnosed with subsequent consequences that treatment regimes advocated are not always appropriate (Kelly 1991).

Interventions

33. There are few trials on treatment interventions for mTBI and most are limited by the small population sizes. There is evidence that early educational intervention and normalisation of the symptoms mitigates against persistent symptom development in the majority of cases (Ponsford J., et al 2002; Wade D., et al 1998; Turner-Stokes L., et al 2005; Mittenberg W., et al 1993).

34. Those suffering from mTBI may have a decreased work performance, become less efficient, make mistakes and exhaust themselves trying to keep up (Van Zomeren 1981). The paper comments that ‘the development of effective techniques for stress management, such as the provision of information and assistance in developing more adaptive coping strategies, could be an important component of treatment programmes for the mild head injured patient’.

35. Barth, Macioci and Diamond (1999) recommend that interventions need to be early in the recovery phase to prevent development of dysfunctional adjustment. Interventions consist of education about symptoms and the normal recovery from such symptoms combined with gradual introduction back to normal life/work activities. Involvement of family and carers is also noted to be important in the recovery process.
Consequences

36. Consequences of mild traumatic brain injury can be grouped into three main categories:
   b. Physical.
   c. Emotional or behavioural.

37. Cognitive impairments may include short-term memory loss, decreased ability to process information, inability to multi-task, spatial disorientation, impaired judgement, difficulties in initiating, completing or concentrating on tasks.

38. Physical symptoms associated with mTBI are often described as follows: headache, dizziness, double or blurred vision, nausea and vomiting, aversion to bright light or loud noises, changes in ability to smell and hear (Thuman et al., 1999).

39. Emotional or behavioural consequences may present as increased levels of anxiety, depression, mood swings, impulsive behaviour, increased agitation, anger and irritability as well as egocentric behaviour (Parker, 2000).

Prognosis

40. There is consensus in the literature that the majority of patients with MTBI will be symptom free within 3 months (Barth 1998, Levin H. S 1987). The WHO Task Force on mTBI (Holm 2005) identified a number of factors associated with poor outcome. It has since been established that patients likely to exhibit persistent symptoms at 3 months following injury may be identifiable at an early stage, on the basis of the severity of initial self reported symptoms, premorbid psychological issues and involvement in compensation seeking (Kashluba 2007). In addition post-traumatic amnesia and early post concussion symptoms have been found to be useful predictors of outcome in mTBI group studies (Wenden 1998). The importance of psychological factors in predicting outcome may also explain why victims of assault sustaining mTBI have a worse prognosis (Wenden 1998).

41. There is evidence that mTBI may increase the risk of seizures up to 4 years following injury but the absolute risk remains very low (Wenden 1998, Holm 2005).

Prevention

42. It has to be accepted that service personnel exposed to war fighting at close quarters will sustain blast injuries and non-blast head injuries as a consequence of their duties. Battle injuries therefore may only be mitigated. Non-battle injuries such as RTAs, trips and falls offer some scope for prevention. Adherence to normal health and safety procedures, risk assessments and education on the use of appropriate personal protective equipment are all important. Developments in helmet and body armour design may reduce the severity of injuries but at the same time may simply change the type of injuries being sustained. Exposure reduction may be achieved by
deploying troops differently and employing new technologies such as unmanned aerial vehicles.

43. Preventative strategies following injury are aimed at reducing the likelihood of the development of persistent symptoms. There is good evidence that provision of information to normalise symptoms and raise an expectation of recovery is often successful (Ponsford 2002, Wade 1997).

44. Adherence to injury prevention policies has been shown to be advantageous in the military environment (Ivins 2000). The US Army Medical Surveillance Activity publication (2007), notes that ‘prevention measures should focus not only on countering the effects of blast injury but also on safety before and after deployments.’

Current evidence gaps

45. There are the following evidence gaps:

   a. Research to identify predictor variables for long-term sequelae following mTBI.

   b. Threshold at which a ‘knock/bump/blast’ induces an mTBI.

   c. True incidence in both UK civilian and military populations.

   d. Identification and correlation of mTBI with functional imaging procedures.
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http://napas.org/issues/tbi/soldierswithTBI%202006.pdf


970;1:863-864
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<th>SER</th>
<th>Date</th>
<th>Key worker/unit</th>
<th>Information sought/meeting details</th>
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<tr>
<td>1</td>
<td>12 Jun 07</td>
<td>Prof Simon Wessely Liaison psychiatrist KCL</td>
<td>Current thoughts on mTBI; crossover with other psychological disorders; utility of KCL TELIC cohort database; thoughts on US MACE questionnaire.</td>
</tr>
<tr>
<td>2</td>
<td>20 Jun 07</td>
<td>Dr Simon Fleminger Neuropsychologist Brain injury unit Maudsley Hospital/KCL</td>
<td>Current UK view of mTBI; pointers to seminal literature; thoughts on US MACE questionnaire.</td>
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<td>3</td>
<td>22 Jun 07</td>
<td>Col Tim Hodgetts Lead consultant A&amp;E ADMEM RCDM</td>
<td>Definition of mTBI to be used; discuss current HI database; use of MACE-type questionnaire in theatre; possibility of combining work with KCL and cross-referencing cases.</td>
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<td>4</td>
<td>3 Jul 07</td>
<td>Col Jerry Tuck ADClin DMSD</td>
<td>Update on DOD/VA TBI planning conference 25/26 Jun 07 in DC.</td>
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<tr>
<td>5</td>
<td>4 Jul 07</td>
<td>Doreen Rowland, Anne Brannigan &amp; Kit Malla Neurological rehabilitation team DMRC Headley Court</td>
<td>Current thoughts of DMRC on mTBI; extent of current problem; suggestions for interventions/further work.</td>
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<tr>
<td>6</td>
<td>5 Jul 07</td>
<td>Simon Wessely, Nicola Fear, Tim Hodgetts</td>
<td>Meeting to co-ordinate liaison between KCL and RCDM, specifically to begin analysis of OpEDAR database and develop UK version of US MACE questionnaire.</td>
</tr>
<tr>
<td>7</td>
<td>6 Jul 07</td>
<td>Dr Emrys Kirkman Mr Paul Dearden Dstl</td>
<td>Overview of dstl Combat Casualty Care Programme - haemorrhage, blast and resuscitation.</td>
</tr>
<tr>
<td>8</td>
<td>12 Jul 07</td>
<td>Doreen Rowland, Anne Brannigan &amp; Kit Malla Members of the neurological</td>
<td>Discussions on development of a clinical algorithm for functional mild disability patients and infrastructure</td>
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<tr>
<td>No.</td>
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<td>Participants</td>
<td>Description</td>
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<td>-----</td>
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<td>9</td>
<td>31 Jul 07</td>
<td>Nick Blatchley, Issy Bray, DASA Health</td>
<td>Discussion on the OpEDAR database and whether it was suitable for analysis by KCMHR.</td>
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<td>10</td>
<td>31 Jul 07</td>
<td>Dr J Hacker-Hughes, Head of Defence clinical Psychologist, DMSD</td>
<td>Discussion on psychology input to mTBI project and MACE questionnaire. Interaction with and support for DMRC.</td>
</tr>
<tr>
<td>11</td>
<td>01 Aug 07</td>
<td>Doreen Rowland, Anne Brannigan &amp; Kit Malia Neurological rehabilitation team, DMRC Headley Court</td>
<td>Discussions on refining development of information/education material. Identification of requirements for this work to progress.</td>
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<tr>
<td>12</td>
<td>07 Aug 07</td>
<td>Calum McArthur DACOS Med, Ian James SO1, J4 Med Cell</td>
<td>Brief to J4 Med cell on project. Agree support and help for in theatre implementation.</td>
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<td>13</td>
<td>07 Aug 07</td>
<td>Capt J Anderson RMP SIB PJHQ</td>
<td>Identification of exposure data.</td>
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<td>14</td>
<td>13 Aug 07</td>
<td>Prof Simon Wessely Liaison psychiatrist KCL</td>
<td>Update on project team progress and KCMHR bid submission.</td>
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<td>15</td>
<td>17 Aug 07</td>
<td>Dr Simon Fleminger Neuropsychiatrist Dr Seb Potter Neuropsychologist Brain injury unit Maudsley Hospital/KCL</td>
<td>Discussion of threshold levels for mTBI. Discussion on interventions for mTBI and their value.</td>
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<td>16</td>
<td>20 Aug 07</td>
<td>US Red Cell POC Robert Labutta DVBIC POC Mike Jaffrey</td>
<td>Discussion and liaison meeting on US mTBI work</td>
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<tr>
<td>17</td>
<td>20 Sept 07</td>
<td>Doreen Rowland, Kit Malia (Neurological rehabilitation team) &amp; Wg Cdr Jones DMRC Headley Court</td>
<td>Discussion on business case development and review work in progress for management of mTBI.</td>
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<tr>
<td>18</td>
<td>27 Sept 07</td>
<td>RCDM, KCL, DMRC, South Tees Hospital, dsi and DMS representatives</td>
<td>Core stakeholder consensus meeting to agree UK wide definition for mTBI, review evidence available and overview of research strands. Agree next steps in project.</td>
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</tr>
</tbody>
</table>
| 19 | 01 Oct 07 | Prof D Wade  
Professor in Neurological Rehabilitation and Clinical Director, Enablement Directorate, Oxford Centre for Enablement, Windmill Road, OXFORD OX3 7LD | Discussion on civilian head and brain injury work in Oxford. Review proposed patient care management drawing on Prof Wade's clinical and research experience. |
| 20 | 12 Oct 07 | Dr Jamie Hacker-Hughes  
Head of Defence clinical Psychology DMSD | Update on mTBI Treatment protocol |
| 21 | 14 Nov 07 | Lt Steve Brodie  
ADMEM Trauma research nurse & Mr Kit Malia, cognitive therapist, DMRC. | Review of mTBI diagnostic questionnaire and discussion to agree clinical algorithm. |
| 22 | 5 Dec 07 | Lt Steve Brodie, Mr Kit Malia, Col Tim Hodgetts, Dr Jamie Hacker-Hughes | Finalise and agree questionnaire, clinical algorithms and treatment protocol prior to deployment Jan 08 |
Neuronal injury as a consequence of blast exposure

E Kirkman & S Watts
Biophysics & Trauma (Surgical Science), dstl Porton Down

Aim

1. To determine whether exposure to blast leads to neuronal injury in the absence of external signs of head injury, and if so to determine the mechanism of injury and assess potential biomarkers of brain injury. Information regarding the mechanism of brain injury is essential for the development of protection systems while identification of biomarkers will help identify casualties at risk of developing brain injury.

Background

2. This study was conducted as collaboration between dstl Porton Down and a group from the University of Florida and Banyan Biomarkers (US). The collaboration was facilitated by TTCP HUM TP12. Following approval by the annual Combat Casualty Care Stakeholders’ meeting and endorsement by SGRSG (Aug 2008) the work was incorporated as part of the Combat Casualty Care Programme at dstl Porton Down. This UK/US collaboration involved in vivo studies conducted at Porton Down and the resultant biological material (brain tissue, cerebrospinal fluid, CSF, and serum) being assayed for a range of biomarkers of neuronal injury at the University of Florida and Banyan Biomarkers.

Progress

3. Ethical review of the proposed in vivo studies was completed at dstl Porton Down and subsequently a Project Licence was granted under the Animals (Scientific Procedures) Act 1986. Contractual agreements were made with the University of Florida and Banyan Biomarkers.

4. A pilot study has been completed. This pilot study was designed as a proof of principle to determine whether exposure, predominantly of the head, to a blast shock wave only (primary blast injury) results in neuronal damage that can be detected by measuring establishes markers of brain injury in tissue, CSF and serum. The markers assayed were breakdown products of all-spectrin (SBDP 145, 150, predominantly indicating axonal damage) and MAP-2 (predominantly indicating dendritic damage).

5. The study was conducted on terminally anaesthetised male Sprague Dawley rats allocated randomly to two groups: blast exposure to the head (n=7) using a compressed air device to produce a shock wave or sham blast (n=7). The experiments were conducted between January and March 07 and the samples sent
to the US in March 07. The animals were anaesthetised with halothane (since it has minimal neuroprotective effects) in oxygen. The use of oxygen resulted in high arterial oxygen tensions and eliminated hypoxia as a cause of neuronal injury. Exposure to blast caused small reductions in arterial blood pressure and very short duration apnoea, eliminating cardiovascular and respiratory disturbances as a cause of brain injury in this study. Furthermore the blast apparatus did not produce any fragments and there was no gross displacement of the head eliminating secondary and tertiary blast injury as a source of brain injury in the present study.

0. All of the animals survived for 4 hours after blast exposure and were killed humanely with an overdose of anaesthetic. Blood samples were taken before exposure to blast and at 2 and 4 hours after blast exposure. CSF samples were taken 4 hours after blast exposure and brain tissue was collected immediately after death. Preliminary results for brain tissue and for CSF SBDP have been received. The results for blood analyses have not been received yet.

7. Blast injury was associated with increases in SBDP 145 and MAP-2 (Figure 1) in brain tissue. There was also evidence of elevations in SBDP 145 and 150 in CSF. None of these effects have achieved statistical significance yet (P>0.05, independent t-test). The clearest difference was seen with MAP-2, suggesting that dendrites may be especially vulnerable to blast injury.

![Figure 1](image)

**Figure 1** a) SBDP 145 and b) MAP-2 expression in the cerebella of two groups of rats (n=7 in each) subjected to either a single blast shock wave focused on the head or sham blast. Values are mean±sem.

Conclusions

8. These data provide preliminary evidence that exposure of the head to a shock wave (primary blast injury) can result in neuronal damage, detectable by assay for biomarkers of neuronal injury. Final statistical analysis and conclusions await the reporting of the complete dataset by our US colleagues.

Further work

9. Work will now progress with the reminder of the study to determine pressure changes within brain tissue, assess methods of protection against the shock wave and determine the blast overpressure/neuronal injury relationship. Further studies will examine interactions between the effects of primary blast injury to the brain and other consequences of blast injury including hypoxia and hypotension.
Update November 2007

10. The report we sent you in September is still current relating to the pilot (rat) study of brain markers following exposure of the head to blast. The results we have received to date from our US collaborators have been for brain tissue and CSF. We are still waiting for the serum results.

11. Since September we have identified a series of measurements (blood and CSF markers) that we could perform within an ongoing blast injury/resuscitation study conducted on terminally anaesthetised pigs. Samples are now being collected. These will allow us to determine the brain-injury effects of a measured whole body exposure to blast complicated by additional blood loss. The level of blast injury is survivable and the study will allow us to assess the effects of different resuscitation strategies on the degree of neuronal damage, assessed by the release of markers into blood and CSF.

12. Of particular note is the use of hypertonic saline dextran (HSD) and recombinant activated factor VII (rFVIIa) which are being used in two separate groups. HSD, when given early in a clinical study, was reported to attenuate brain damage after blunt head injury so it is possible that it may also ameliorate any blast-induced brain injury. rFVIIa has been shown to attenuate brain injury (oedema) after haemorrhagic stroke. Again, early treatment with this may also attenuate blast-induced brain damage. The impact of these findings is likely to be for blast-injured casualties who may suffer mild TBI coincident with more severe injuries elsewhere.

13. Finally, we are organising ourselves to collaborate on the King's/ADMEM study of casualties (looking at blood borne markers in blast-exposed patients and correlating these with the psychological and fMRI assessments. As part of this we have identified an UK capability gap in conducting the assay for blood borne markers, which is important we address to process samples from UK casualties. An additional benefit of developing the assay at dsi will be a faster turnaround for our animal studies. We will, of course, continue to work with our US colleagues to identify new markers and to contribute to their studies.

14. Both of these developments (the resuscitation and the clinical studies) were viewed as high priority by our Stakeholders and endorsed by SGRSG in September.
DSTL - OPINION ON PROPOSED ACCELEROMETER TRIALS.

1. Here are my views on the practicality of the deployment of helmet mounted sensors. I have tried to keep this brief but have, on occasion, delved into some technical detail to provide background to my reasoning.

2. As you are aware I only received the contact details for the US team the day before yesterday and so my thoughts do not take into account any background material from the US. Given that you have already had briefings from the US then you may find some of my questions have already been resolved by our colleagues.

3. I have broken these notes down into 4 sections:

   a. The UK approach to developing protection.
   b. Practicalities of the deployment of helmet mounted sensors.
   c. Summary.
   d. Recommendations.

The UK approach to developing protection

4. A common approach adopted by the UK in developing protection measures is:

   a. Identify the threat.
   b. Determine the mechanism of injury.
   c. Determine a dose response model of the body.
   d. Develop appropriate physical/numerical models.
   e. Develop a protection to mitigate energy transfer.

5. It may also be necessary to develop a technique to identify those personnel that may have been exposed to a potentially injurious level of energy transfer where the injury is not immediately obvious, but this hasn’t been standard in the UK.

6. An example of where this latter measure is appropriate is primary blast lung injury. In this case, the UK approach is to inform the trauma teams of the clinical signs. Interestingly, one approach adopted by the US was to develop a ‘patch’ that could be worn that would change colour when a particular blast load was exceeded. To the best of my knowledge this patch has not been deployed.
7. I suspect that the US deployment of the helmet mounted sensor is in aid of this additional measure — to identify (probably in the future) those that may have had some level of blast loading that may lead to the development of mTBI(blast).

Identify the threat

8. The first question is how significant a problem is mTBI(blast) it. As we are aware there is a significant body of work already addressing this question. We would usually prefer to have the answer to this before proceeding further.

Determine the mechanism of injury

9. I believe this to be a critical step. From the perspective of physical protection it is essential to understand the mechanism of energy transfer from the weapon to the point of injury. Depending on the nature of the insult it may be appropriate to measure linear acceleration, rotational acceleration, stress waves, pressure waves, temperature, etc. Knowing the energy transfer mechanism enables the development of the protection to be clearly focused and optimised. A good example of the need for this critical step is again primary blast injury. Just adding more armour does not improve protection — however the addition of a relatively thin, lightweight de-coupler can provide a high degree of protection to the blast wave. To the best of my knowledge we do not yet know the mechanism of injury for mTBI (blast).

Determine a dose response model

10. Once the mechanism of injury is determined then it is possible to identify a physical parameter to measure and then determine a dose response model. Staying with the primary blast injury example, knowing the mechanism to be stress wave transmission enabled us to measure peak body wall acceleration under various loading conditions and determine the levels at which lung injury could be expected to occur. At this time I do not believe there is any ‘dose response’ information available for mTBI (blast).

Develop appropriate physical/numerical models

11. Developing appropriate physical and numerical models to either replace animal models or to complement them is another key step on the way to developing protection, but again it is essential to understand the mechanism to develop the models. Such models are widely used to also assess vulnerabilities to our own forces.

Develop a protection to mitigate energy transfer

12. The models mentioned above are the main tools that are used to develop concepts for protection that are specifically focused on particular energy transfer modes and means of mitigating them. Once these concepts are developed they are then passed to industry for their incorporation into future armour systems.

13. The approach described above is, to some degree, idealised but has been proven to work on numerous occasions in the past and is considered to be a cost
effective approach.

Practicalities of the deployment of helmet mounted sensors

14. There are a number of issues that should be considered if the UK was to consider the deployment of sensors mounted to the helmet.

Objective of deploying the sensors

15. At present, I believe the most compelling reason to deploy helmet mounted sensors would be to obtain data that could, at some time in the future, be used to identify those that have been exposed to a blast wave that may, in the future, go on to develop mTBI (blast). However, in my view it is important to know exactly what you should be measuring to ensure that data is of value in the future. If the deployment of the sensors is to gather data on what pressure/acceleration levels may lead to mild TBI (blast) then this would need very careful consideration. In particular the balance between investing resources in understanding the problem (mechanism of injury) versus investing resources in sensors to collect data in the field (with some risk that it may be the wrong form of data).

Selection of sensors

16. The big question here is what should be measured. To answer this question with some degree of confidence, it is prudent to know the mechanism of the injury, in particular the means by which the energy gets into the body to cause the injury. Historically, and for good technical reasons, acceleration and pressure have been measured to correlate with various forms of blast injury. Therefore, the US selection of both acceleration and pressure appears sensible but is not (to the best of my knowledge) linked to the mechanism of injury.

17. In order to capture data from a transient blast event, the sensors need to be able to respond to changes very quickly (high frequency response) – this is a known fact and also drives the requirement for data capture equipment to be able to sample the output from the sensor very quickly (typically every 10 microseconds). The sensors also need to be able to respond predictably over a known range. Accelerometers are available that work reliably over a wide range of accelerations; pressure gauges are more limited in their workable range. Accelerometers measure acceleration in one plane, therefore I would expect the US to be deploying tri-axial accelerometers (3 planes, x, y and z) to allow the helmet motion to be resolved. This would result in a minimum of three accelerometers and one pressure gauge, signal conditioning, 4 channel data capture a power source, that would need to be integrated and miniaturised. I suspect if the sensors are to be deployed in December that this has been completed – probably at some considerable expense.

Selection of trigger level

18. It is not sensible for the output from the sensors to be data logged continuously (the data files could be in the order of 0.5MB per second), therefore a trigger is needed to tell the data capture to hold the data for the duration of the event. Technically this is simple to do but you need to know at what level of
pressure (or acceleration) to capture the data. Triggering off the accelerometers could lead to false triggering since even small knocks to a helmet can result in high acceleration within the helmet. Triggering from the pressure gauge would seem preferable but what pressure level do you select? I do not believe this is know therefore there is a risk that if the trigger is too high then potentially important data is lost, if it is too low then there could again be false triggering problems.

Is the helmet the right piece of equipment to instrument?

19. Under blast loading, the motion of the helmet does not match the motion of the head. Instrumenting the helmet only gives information on what happened to the helmet. During blast loading the inner padding on the helmet, helmet restraint systems and helmet deformation will all modify the energy transmission through to the head. Therefore, potentially high accelerations seen on the helmet may not equate the accelerations experienced by the head. In the field of motor racing there have been concerns over the loads experienced by the drivers – instead of instrumenting the helmet the motor racing field developed sensors to go in the ears to allow the motion of the head to be measured rather than the helmet.

20. The selection of what to instrument should be driven by the understanding of the injury mechanism to ensure that data collected can be correlated (to some degree) with the injury. That said, adding a sensor to the helmet does have practical appeal.

Analysis of the data records

21. Data downloaded from the sensors (presumably after an IED incident) will need to be analysed. I do not believe at this point in time we would know what to look for in an accelerometer-time profile or indeed a pressure-time profile. Historically peak pressure has been used in conjunction with the duration of overpressure to correlate with primary blast injury. It does not necessarily follow that the same correlations can be used for mTBI(blast). An understanding of the mechanism of injury will help identify what to look for on pressure and acceleration profiles.

22. There are more issues that I could raise: however I believe the same underlying theme to be relevant to each of the issues. I have not made comment on any of the human factors issues that also need consideration.

Summary

23. Now that I have the contact details for the US researchers I can now make contact and find out more about the approach the US have taken. This may answer some of the questions I have raised above.

24. At this time I am not clear on the specific objectives of the US programme to deploy sensors on the helmets of 2 brigades. The most compelling reason for them to do this appears to be to collect data that could, in the longer term, be used to identify individuals that may go on to develop symptoms of mTBI(blast).
25. I would expect that our US colleagues have invested substantial resources in the development of these sensors, and their procurement. At this time there is little information available on how they are going to analyse and use this data.

26. In my view there is a moderate degree of technical risk that the data being collected from the helmet sensors may not correlate to mTBI(blast).

27. The UK approach, initially understanding the scale of the problem and then determining the mechanism of the injury should help define the requirements for the capture of data from such sensors. This information may have significant value to our US colleagues and may well complement similar research they may have in place.

**Recommendations**

28. dstl to pursue the links with the US programme leaders to get a clearer understanding of the objectives of the US programme, technical developments and how the US plan to use the data.

29. The UK should continue with their proposed programme of work which includes the determination of the mechanism of injury. The need for the UK to pursue a similar programme to the US is not clear.

30. Once the information from the US programme has been reviewed then it may be prudent to review this position.

---

Paul Dearden
Principal Engineer
Biomedical Sciences
dstl
SOUTH TEES RESEARCH REPORT

Predictive factors for the development of psychosocial and neurocognitive dysfunction following mild traumatic brain injury (mTBI) in adults: a prospective cohort study.

Progress to date:

1. Patient identification is continuing by prospective identification on site in the emergency department and by short-term retrospective identification from emergency department records following which patients are contacted by telephone to confirm if they are willing to participate. This has improved identification and recruitment rates within the limitations of agreed study protocol.

Comment:

This has been necessary due to the lower than expected immediate identification from the emergency department (see point 3 below).

2. As of 01/09/2007 9 patient blood samples have been drawn, 1 of which cannot be included, as the patient has withdrawn consent following initial involvement. The first batch of samples is currently being analysed by Kings College London. The storage and transport arrangements have proven to be reliable and effective.

Comment:

A relatively small proportion of patients are being identified and subsequently recruited directly from the emergency department. Of these, very few are willing to have a blood sample taken as part of their initial participation to the study. This is expected although a larger number of samples should be possible if immediate identification rates in the emergency department can be improved.

3. Overall, the project is continuing well with an expected incidence of head injury presentations to the emergency department within criteria. However, identification and subsequent recruitment rates have been lower than expected for two main reasons:

a. Emergency department support is limited by pressures of service provision.

b. Education and knowledge of the study due to regular staff turnover.

Comment:
Improved identification rates are expected with staff changes and a larger amount of clinical time by main investigator regular presence in the department from August 2007. Initiatives for education and introduction sessions to involve clinical staff are also planned from August 2007. Other ways to improve departmental cooperation could be explored.

4. Primary Care centre co-operation has not yet been confirmed from Catterick Garrison. Initial enquiries have suggested that the number of head injury presentations to primary care is too small to justify recruitment from that location. However, further information and confirmation of this will be required to explore whether pursuit of primary care recruitment is justifiable.

Comment:

Further Primary Care support is required and senior primary care advisors should be involved to obtain head injury incidence and subsequently explore methods of identification and recruitment.

Patient recruitment numbers:

As at 01/09/2007:

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</table>

* Identified by the ED but later review reveals patient does not meet inclusion criteria.

Comment:

There is a 'lag phase' of at least 1 month from identification to first follow-up and subsequently for 'recruitment', as formal consent is taken at first follow-up.

Planned data analysis:
5. No data analysis has been undertaken as yet as numbers are insufficient. However, with current rates of symptom reporting, and a sufficient number of participants at initial follow-up to 3 months, primary analysis should be possible by February 2008. If the data demonstrates trend according to expected variables this should enable the second phase of the study to begin at that time. If not, further data collection will be required.

South Tees research update November 2007

6. Recruitment is proceeding at a rate of approximately 20-30 patients per month; this is less than the anticipated rate of 2 – 3 per normal working day (around 60 per month).

7. Follow-up rates are currently approximately 50%; this is as expected.

8. Blood sampling for S100b assay estimation is proceeding slowly due to patients being unwilling to take part in blood testing for what they perceive to be minor injuries requiring relatively short emergency department assessment and treatment.

9. Overall, the project is continuing well with an expected incidence of head injury presentations to the emergency department within criteria. However, identification and subsequent recruitment rates continue to be lower than expected for two main reasons:

   a. Patient ‘apathy’ and lack of willingness to co-operate with, or remain with the study.

   b. Emergency department support is limited by the pressures of service provision.

Patient recruitment numbers:

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Identified</th>
<th>1-month follow-up (recruited)*</th>
<th>3-month follow-up</th>
<th>6-month follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>JCUH</td>
<td>103</td>
<td>42</td>
<td>21</td>
<td>5</td>
</tr>
<tr>
<td>Friarage (MDHU)</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

* Note there is a 1-month lag phase from identification to recruitment.

Problems:

11. Most patients with minor head injuries are unwilling to commit to even the relatively minor disruption caused by this study. Factors include alcohol intoxication at time of presentation and time limitations to fully explain study during busy periods in the department. There are also difficulties in contacting patients following discharge and options to improve this are being currently investigated.
Planned data analysis:

12. Initial primary analysis and data review is still planned for February 2008.

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Research Fellow in Emergency Medicine
James Cook University Hospital, Middlesbrough
ANNEX G TO
DMSD/16/1/03
DATED 25 MAR 08

KCL/RCDM RESEARCH PROPOSAL

MRI and Clinical Predictors of Psychiatric and Functional Morbidity
Following Mild Traumatic Brain Injury (mTBI):
A Controlled Evaluation of UK Servicemen

BACKGROUND

1. Mild traumatic brain injury (mTBI) is common in the general population. Incidence rates, typically based on individuals attending emergency departments in hospitals, range from 180 to 500 per 100,000 of the general population per year (Kurtzke & Kurland, 1993; Bazarian et al. 2005). Military personnel in particular may be at greater risk for sustaining a TBI of any severity, even in peacetime (Ommaya et al. 1996; McLeod et al. 2004). mTBI has become an increasingly high-profile battle injury. Work by the US Defense and Veterans Brain Injury Center (DVBIC) suggests that 50% of injured US soldiers returning from Iraq or Afghanistan who are being treated at the Walter Reed Medical Center suffered a TBI while in combat (Okie, 2005).

2. All definitions of mTBI demand that the patient has at least suffered some degree of ‘concussion’ (Caveness and Walker 1966). This therefore distinguishes mTBI from what might be called a trivial head injury, in which there was a blow to the head, but with no subjective effects on the mental state or neurological function. Whether or not a person can suffer a TBI in the absence of a blow to the head, simply on the basis of acceleration / deceleration forces transmitted to the head eg. in a whiplash injury, or as a result of blast injury, is uncertain. The World Health Organisation (WHO) Collaborating Task Force (Carroll et al., 2004) offered the following definition of mTBI:

"mTBI is an acute brain injury resulting from mechanical energy to the head from external physical forces. Operational criteria for clinical identification include:

a. One or more of the following: confusion or disorientation, loss of consciousness for 30 minutes or less, post-traumatic amnesia for less than 24 hours, and / or other transient neurological abnormalities such as focal signs, seizure, and intracranial lesion not requiring surgery;

b. Glasgow Coma Scale score of 13–15 after 30 minutes post-injury or later upon presentation to healthcare.

These manifestations of mTBI must not be due to drugs, alcohol, medications, caused by other injuries or treatment for other injuries, caused by other problems (eg. psychological trauma or coexisting medical conditions) or caused by penetrating craniocerebral injury."
3. Interestingly, the presence of loss of consciousness is not critical to outcome (eg., Sharma et al. 2001; McCrory et al. 2000). On the other hand comparing those with GCS scores of 15 with those whose GCS is 14 or 13, there is a gradient of effect (Hsiang et al. 1997) with lower GCS leading to worse outcome.

Blast injury

4. The role of blast injury and its possible effects in terms of TBI are of special interest given the use of explosives, in particular improvised explosive devices (IEDs), in modern warfare and terrorism. Effects of blast injury can be differentiated into primary, secondary and tertiary injuries, covering changes in atmospheric pressure due to the blast, projectiles put in motion by the blast striking an individual, and individuals themselves being put in motion by the blast, respectively. The extent to which the brain may be vulnerable to barotrauma, i.e. the air pressure waves from the primary blast itself, is uncertain (Taber, Warden & Hurley, 2000). Animal models have found behavioural and pathophysiological changes consistent with TBI (Moolchala et al. 2004; Cernak et al. 2001; Axelsson et al. 2000).

5. Individuals following primary blast injury may describe disturbances in level of consciousness including retrograde and/or anterograde amnesia, along with subsequent symptoms including severe headache, tinnitus, hypersensitivity to noise, and tremors (Gondusky & Reiter, 2005). In one study of veterans with post traumatic stress disorder (PTSD), individuals with a history of mTBI in the context of blast injury also showed evidence of EEG abnormalities and greater self-report of attentional difficulties (Trudeau et al. 1998). However, human studies are somewhat limited as it may be difficult to identify cases in which only primary blast injury has occurred. There are few data on the prognosis of blast injury, compared with other causes of TBI.

Cognitive impairment

6. VanderPloeg et al. (2005) followed up over 4000 Vietnam veterans 15 years after discharge, to look at the effects of mTBI sustained since discharge. Those veterans with a history of mTBI, on average 8 years before testing, were slightly impaired on just one test of working memory. Systematic reviews (Frencham et al. 2005; Schretlen & Shapiro, 2003) have plotted the time course of neuropsychological outcome based on the effect size (ES) comparing mTBI cases, recruited at the time of injury, with control subjects. For studies where the assessment was < 3 months post injury there was a statistically significant difference with an average ES of about 0.3 (injured more impaired). But even for speed of information processing (ES 0.47) which was the most sensitive measure of injury, the data imply that there was a large overlap between the scores of injured and controls. For studies after 3 months, no significant differences could be found, with ESs in the two reviews of 0.11 and 0.0. A third systematic review compared studies of unselected cohorts, recruited at time of injury, with studies of cohorts recruited from clinics (Belanger et al. 2005). Much larger ESs were seen in selectively recruited clinic cohorts, and these cohorts showed very little effect of time since injury (ES for studies more than 3 months post injury was 0.74). The assessment of neuropsychological impairment after mTBI is therefore very vulnerable to ascertainment bias; subjects should be recruited as close as possible to the time of injury.
7. In summary, mTBI may lead to some disturbances in cognitive functioning shortly (i.e. in the first few days or weeks) after injury, with these impairments typically most apparent on tasks with an attentional and/or processing speed component (Cicerone & Azulay, 2002). However, evidence for persisting impairments following mTBI from prospective, longitudinal studies is weaker. There is a caveat. Work by McAllister et al. (1999) using fMRI showed that regional activation during a working memory task was abnormal 1-month after mild or moderate TBI despite subjects’ performance being in the normal range, i.e., individuals after mTBI may achieve normal performance yet still show abnormal cognitive processing.

Post concussional symptoms (PCS)

8. Estimates of the proportion of people who suffer mTBI who have significant post concussional symptoms (PCS) vary widely. According to the review by Jacobson (1995), persistent complaints are observed in 25% – 65% at three months, 21% - 24% at six months, and 14% – 18% at one year. High rates of symptoms may be found as long as 5 years post-injury (Jakola et al. 2007). Typical PCS include headache, dizziness, fatigue, intolerance of noise and light, emotional instability, and difficulty with concentration. Anxiety and depression are seen in many and other common emotional symptoms include phobias and PTSD. This is an especially important confound in our studies of UK military personnel who have served in Iraq (Hotopf et al. 2006; Fear et al. under review) where a high degree of overlap was found between the symptom clusters of mTBI and PTSD. Hence we intend to evaluate PTSD-specific symptoms and analyse separately cases with PTSD identified following our diagnostic interviews (see below). PCS typically show similar factor structures involving physical, cognitive and affective symptoms (Potter et al. 2006). Symptoms rather than cognitive impairments discriminate between individuals who do and do not return to work after mTBI (Nolin & Heroux, 2005). Nevertheless those who are symptomatic are more likely to have problems with speed of information processing, and divided and sustained attention, both in the first few months and one to two years after injury (Gronwall and Wrightson 1974; Laninger et al. 1990; Bohnen et al. 1992a; Chan et al. 2003; Iverson et al. 2004; Sterr et al. 2006).

9. As noted via à via PTSD, “post concussional symptoms” are not specific to people who have suffered a head injury. They are found commonly in those with chronic pain (Iverson & McCracken 1997), and even the general population (Chan 2001), particularly those who are depressed (Aloia et al. 1995; Iverson & Lange 2003). Various studies have examined symptoms and disability after mTBI compared with controls, usually trauma patients without a head injury (Jurkovich et al. 1995; Freidland & Dawson 2001; Bryant & Harvey 1999; Hanks et al. 1999; Paniak et al. 2002; Smith-Seemiller et al. 2003; Mickevičiene et al. 2004; Kraus et al. 2005). In general mTBI patients do suffer more symptoms, weeks and months after the index event, but the effect is not large. However, a recent well controlled study by Meares et al. (2007) showed that patients with mTBI and similar non-head trauma patients presenting to a hospital emergency department had almost identical levels of acute PCS (43%) and cognitive dysfunction. It is therefore vital that any study of symptoms after mTBI has a control group.
10. Estimates of the proportion who are left with significant disability one year after mTBI are surprisingly diverse: e.g., < 10% (Hsiung et al. 1997), 12% (GCS 13 or 14) (van der Naalt et al. 1999), 30% (Deb et al. 1998), or 47% (Thornhill et al. 2000). Some of the variability is probably due to different rates of pre-injury morbidity (see Symonds and Russell’s classic study (1943) of servicemen). The 10% - 20% of patients who do badly after mTBI are likely to fulfill diagnostic criteria for post concussional syndrome (PCS)/(ICD-0) or post concussional disorder (DSM IV); though the DSM IV diagnosis is more stringent, agreement between ICD-10 and DSM-IV criteria is otherwise good (Boake et al. 2004).

Predictors of symptoms

11. Organic factors partly explain who develops symptoms after mTBI. These include risk genes (S-100B), the presence of dizziness or headache in casualty (De Krujik et al. 2002; Savola & Hillbom 2003), poor immediate neuropsychological test performance (Bazarian et al. 1999), CT brain scan or SPECT abnormalities within the first 3 days (Gowda et al. 2006), and the presence of the dopamine D2 receptor T allele (McAllister et al. 2005). It is possible that a normal HMPAO-SPECT scan within 4 weeks of mTBI excludes poor outcome at one year (Jacobs et al. 1998). In those with persistent PCS, several studies have found evidence of abnormal cerebral metabolism or blood flow particularly involving frontal lobes (Ruff et al. 1994; Varney et al. 1995; Kant et al. 1997; Bonne et al. 2003). However such effects are not always found (Chen et al. 2003) and may reflect depression and PTSD rather than brain injury (see Markowitz et al. 1998). Emotional factors also predict poor outcome, particularly when symptoms become more persistent. For example those who blamed their employers for their accidents (Rutherford et al. 1977), or those who fear that they had sustained serious brain damage (i.e., illness attributions) (Lidvall et al. 1974; Whittaker et al. 2007) do worse. Greater anxiety, depression and PTSD symptoms early post injury predict worse outcome (Bryant & Harvey 1999; King et al. 1999; McCauley et al. 2001; Rapoport et al. 2003); those who do badly after mTBI are sometimes described as the “miserable minority” (Ruff et al. 1996). Pre-traumatic factors, particularly psychiatric problems, are also relevant (Keshavan et al. 1981; Ponsford et al. 2000). In the study of veterans with mTBI after discharge from the military (see above; Luiz et al. 2003) the best predictors of PCS included earlier psychiatric conditions such as anxiety or depression, and lower IQ.

12. Organic factors are better at explaining who has symptoms in the first few weeks (e.g. Bazarian et al. 1999), whereas psychological factors may be more important in those with persistent symptoms at six months and beyond. A plausible model to explain the interaction is that of Lishman (1988); the cerebral dysfunction produced by head injury results in a group of symptoms, headache, dizziness and fatigue being prominent among them. The norm is for these symptoms to recover over time, but psychological factors may jeopardize a healthy recovery and result in long lasting symptoms. At the later stages, evidence of cerebral dysfunction is usually absent. Various studies have examined the psychological processes leading to chronicity. These include diathesis stressor models (Kay 1993; Wood 2004), “windows of vulnerability” (King, 2003), or maladaptive attempts to compensate for cognitive difficulties (Van Zomeren et al. 1984; Marsh & Smith, 1995). Subjective stress (Gouvier et al. 1992; Hanna-Pladdy et al. 2001) and personality variables eg.,
perfectionism (Ruff et al. 1996) or styles of coping (Bohnen et al. 1992b) may be important.

**Evidence for permanent damage to the brain in mild TBI**

13. Rarely, evidence of significant focal brain injury, eg., intracranial haematoma, is evident clinically or on neuroimaging following an apparently mild TBI (see Fabbri et al. 2004). However, an important question is how many people, post mTBI, suffer diffuse axonal injury (DAI), perhaps invisible on neuroimaging, which nevertheless explains some of the post concussional symptoms? Definite post traumatic MRI abnormalities were found in 5 of 80 patients with mild head injury, and questionable abnormalities in a further 21 in one study (abnormalities on MRI did not predict outcome, except for early attentional problems (Hughes et al. 2004)). But a normal MRI scan does not rule out the possibility of DAI. Anecdotal studies describe evidence of DAI at post mortem in patients who have had a mild head injury and died shortly after from other causes (Peerless & Rewcastle 1967; Oppenheimer 1968; Bigler, 2004). These are backed up by animal studies (Povlishock and Coburn (1989) in which mild fluid-percussion injury in cats led to no residual signs at one day and few macroscopic findings but widespread evidence of DAI, particularly involving long tracts.

14. If Lishman’s model is correct those with persistent post concussion symptoms will have had both early cerebral dysfunction / brain injury and the psychological factors necessary to impair a healthy recovery. Those without chronic symptoms will either never have had early cerebral dysfunction, or do not have the psychological factors, or both. If patients with persistent symptoms are assessed at 1 year or more, evidence of the early cerebral dysfunction that was the foundation for the symptoms, may have disappeared. All that is left are the psychological factors that explain why symptoms failed to recover. Therefore what is needed is a method of determining who did in fact suffer early cerebral dysfunction or brain injury. Prospective assessment using neuropsychological testing is not adequate for this purpose because of lack of specificity for brain injury. A low score may be found because the person has suffered brain injury or because they reflect pre-injury levels of functioning or current depression. Further, a normal score may hide underlying cerebral dysfunction (McAllister et al. 1993). With the latest MRI techniques, which are much more sensitive to evidence of brain injury and DAI, we now have a better chance of identifying those who did in fact have early brain injury and whom we hypothesise will therefore be at risk of developing persistent symptoms.

**Magnetic Resonance Imaging (MRI)**

15. Newer MRI techniques have the potential to reveal abnormalities which are invisible to conventional MRI: studies in epilepsy patients (Rugg-Gunn et al. 2002; Salmenpera et al. 2007) by the applicants, for example, have revealed abnormalities in “MRI negative” subjects, that are not apparent even on very high quality conventional scans (although specificity is often low).

**Diffusion Tensor Imaging (DTI)**
16. Diffusion-weighted (DW) MRI permits the measurement of water self-diffusivity in vivo, and as a consequence of the interactions between water molecules and obstacles that hinder their motion, gives information about the size, orientation and shape of cellular brain structures. In particular, due to the oriented microstructure of white matter, the diffusion of water is more greatly hindered across than along the axis of major white matter tracts, a phenomenon known as anisotropy (Beaulieu & Allen, 1994). The most complete simple description of the diffusion process is the diffusion tensor, and the measurement of this by DTI (Basser et al. 1994) yields a number of outcome measures reflecting both the degree and principal direction of diffusion. The two most commonly used are the mean diffusivity (MD), the degree to which water molecules are diffusing within tissues and fractional anisotropy (FA) which reflects the directionality of water molecules within the tissues and hence microstructural order (Basser & Pierpaoli, 1996). If highly ordered structures such as white matter (WM) tracts are disrupted, reduced barriers to diffusion across the tracts lead to an increase in MD and reduction in FA. Other measures, such as the degree of diffusion parallel and perpendicular to the principal diffusion direction (often denoted $\lambda_1$ and $\lambda_2$) can also be calculated, which may be more sensitive to pathological processes (eg., Song et al. 2002).

**DTI and TBI**

17. DTI promises to be one of the most useful of all the new imaging techniques in mTBI (see Levin, 2003; Belanger et al. 2007 for reviews). In terms of TBI in general, a mouse model of histologically verified axonal injury following moderate impact injury was found to correlate with regional abnormalities in DTI parameters (axial diffusivity and relative anisotropy) while conventional MRI failed to detect abnormalities in the same regions (MacDonald et al. 2007). Studies in children (Wilde et al. 2006) and adults, (Xu et al., 2007) with severe TBI have been able to detect WM abnormalities in major tracts such as the corpus callosum (CC) and internal capsule with significantly higher sensitivity than conventional MRI. Furthermore, where focal pathology was obvious, DTI changes were correspondingly more prominent. Nakayama et al (2003) employed DTI scans in 23 patients with TBI all of whom had been in coma for a mean of 7 days, who manifested cognitive impairments but no obvious neuroradiological lesions to compare with healthy controls. DTI after 14 months showed a decline in FA in parts of the CC. Other examples of the usefulness of DTI in complications of TBI include work by Gupta et al (2005) on late post traumatic epilepsy. FA and mean diffusivity ratios were calculated in 14 patients with and 11 without epilepsy and 11 age-matched controls. The mean regional FA ratio was significantly lower in the epilepsy group than the TBI controls. The tissue volumes with low FA were also higher in the epilepsy group in the absence of gross pathology. Other studies (eg Huisman et al. 2004) have examined more heterogenous groups with acute (within 7 days) TBI. 20 such patients and 15 controls were imaged using DTI to measure FA at multiple locations. FA was reduced in the internal capsule and posterior CC. Furthermore, FA values correlated strongly with clinical ratings such as GCS at $r > 0.85$ (see also Ptak et al. 2003).

18. Afranakis et al (2002) were the first to show DTI abnormalities following mild TBI in 5 cases acutely post injury, which declined at 1 month follow-up. Benson et al (2007) studied 20 TBI patients of whom 6 had mTBI (GCS >12). The main DTI
measure was scalar histograms of FA of whole brain WM. The distribution of the graphs was abnormal in comparison to controls demonstrating a reduction (left shift) in FA. FA measures were again found to correlate with GCS and PTA at r=0.47 and 0.64, respectively. The mean injury to scan interval was 35 months; however, overall mean GCS was 7.8. Of interest is the study by Inglese et al. (2005) which concentrated on mTBI. 46 such patients and 29 controls had an extensive MRI series including DTI. There were 2 subgroups; in 20 imaging took place 4 days post injury while in the other sub-group imaging was on average 5.7 years after injury. Histogram and region of interest (ROI) measures were taken. Unlike patients in Benson et al’s series, whole brain histogram measures did not discriminate between the groups or controls – but the authors did not separate WM from grey and CSF. However FA measured in CC, internal capsule and other regions did reveal abnormalities in cases versus controls, scanned both early and late. The authors conclude that focal DTI changes may be an early and stable indicator of brain damage.

19. Finally Kraus et al (2007) in the most recent published study compared 20 adult mTBI cases to 17 moderate-severe TBI cases and matched healthy controls. Detailed DTI measures were taken along with a neuropsychological battery. Cases were all scanned >6 months after injury (93 months for the mTBI group on average). The number of WM ROIs found to have abnormal FA was significantly greater in the m’sTBI group than the mTBI group. Across the groups WM pathology measured by DTI correlated with neuropsych measures with the mTBI group contributing to the correlation although they differed from the controls only on a single measure – commission errors on the continuous performance task (possibly related to impulsivity) while the more severe TBI patients had extensive cognitive deficits. Psychopathology (eg PCS) was not recorded. The authors make the distinction between axonal damage – which may occur in mTBI and axonal plus myelin damage, which appeared to be restricted to more severe head injuries.

DTI and PCS?

20. The Kraus et al., study may be taken together with Kurca et al. (2008) who found that only mTBI patients with true (acute) as opposed to ‘non-traumatic’ lesions on conventional MRI, were likely to show neuropsychological deficits. PCS symptoms did not segregate in this way. As noted above, such symptoms are generally best predicted by previous minor psychiatric morbidity. Hence we can conclude that even mTBI may be associated with visible lesions, detectable using DTI; such lesions may not be extensive but may be enduring (or may resolve only partially) and are probably associated with cognitive deficits (which may be subtle). PCS on the other hand seems to be related only non-specifically with mTBI and cognitive dysfunction. As McCrea (2008) concludes his up-to-date review, PCS may after all be associated with “transient neurologic effects of mTBI but maintained by a combination of psychological and social factors in the overwhelming majority of cases” (as in Lishman’s model). Conventional MRI does not provide strong evidence of a relationship between brain lesions and PCS symptoms although this relationship has not been tested using the more sensitive DTI techniques. To do so will be an important aim and an innovative element of the proposed study.

OBJECTIVES
21. To study the neurological, cognitive and psycho-social consequences of mTBI sustained during military operations.

22. Specific Aims: There are three related aims of this study of mTBI in UK servicemen:
   a. To determine the rates of post concussional symptoms, cognitive impairment (particularly slowing of processing speed and reduced sustained attention) and neuroimaging abnormalities in a consecutive series of UK servicemen suffering mTBI, and compare these with 100 uninjured military controls. The associated hypothesis we will test is that all three elements will be significantly increased in the mTBI group.

   b. To determine, in those with mTBI, whether neuroimaging abnormalities, in particular white matter abnormalities, predict symptoms and/or cognitive impairment. We will use voxel based volumetric methods and DTI, the latter being highly sensitive to white matter disruption. We will then compare mTBI cases with and without abnormalities. We predict that participants with DTI abnormalities (global and regional reductions in fractional anisotropy (FA)) will have significantly greater symptoms and cognitive impairments than those without.

   c. To determine whether the cause of injury, in particular blast injury vs. blunt trauma and/or acceleration-deceleration injury, predicts the likelihood of developing post concussional symptoms or cognitive impairment or neuroimaging abnormalities. We will carry out sub-group analyses to test for this hypothesis.

23. In addition the study will determine:
   a. the rate of disability, particularly in terms of fitness for duty, associated with mTBI up to 1 year post injury (again, our prediction is that a significant minority of the mTBI group will show enduring problems in comparison to controls);

   b. whether there are other predictors, including pre-injury factors, of poor outcome.

RESEARCH STRATEGY

Sample: ‘Exposed’

24. All UK servicemen who report to a field hospital in Iraq/Afghanistan with a suspected mild brain injury are now screened as part of a pilot study, using a paperless tool (based on the MACE checklist - US Military Acute Concussion evaluation - [http://www-nehc.med.navy.mil/Postdep/docs/Web_Military]) as recommended by the DVBIC Working Group in their mTBI clinical practice guidelines. This yields screen positive and negative mTBI cases according to the WHO collaborating task force definition (see above). Potential cases will be screened mostly at Role 2 Enhanced facilities (Regimental Aid Posts and Field Hospitals) in theatre. The study will cover all three Services. The database formed by such screens will comprise our sampling frame and is kept by Col. T Hodgetts (Royal Centre for Defence Medicine, Birmingham, UK) and will be passed on to the Defence
Analytical Services Agency (DASA) which will 'tag' individuals by service number and date of mTBI. The majority of those at risk will come from the Army, but there will also be a substantial contribution from the Royal Marines (which in the UK are integral to the Royal Navy), and also some members of the Royal Air Force.

25. We have decided not to include women since the numbers are likely to be low and inclusion would introduce an additional level of heterogeneity.

26. Before recruitment to the study, we will retrieve their TBI screen. Those individuals whose PTA persists beyond 24 hours or who develop intra cranial complications will be excluded — as they fulfill moderate/severe TBI criteria. We anticipate that some individuals will have multiple injuries amongst which the mTBI is a relatively minor element (eg limb injuries due to mines). Major injuries are routinely classified and coded using the Anatomical Injury Severity Score-Military.05. Such cases will be included unless there is reasonable evidence that the individual suffered a period of cardio-respiratory difficulties or major blood loss (ie requiring resuscitation, mechanical ventilation etc). All deployments are 6 months or less so that we should not miss any cases 6 months post injury due to continuing deployment (although a very few may have returned and been redeployed within a 6 month time-frame). Thus, at the start of recruitment, consecutive cases screened positive from 6 months previously, will be expected to have returned and be available for assessment.

Sample: 'Unexposed'

27. We will ask DASA to provide a list of age-matched servicemen from the same Unit and deployment, for each person identified with an mTBI. They will be recruited in the same way. Non-responders will be substituted until an equal number of exposed and unexposed participants are recruited.

Estimates of Incidence of mTBI

28. These have been difficult to obtain hitherto. Using the upper end of the range in civilian populations (see Background) — which must obviously be the lower limit of the incidence of such injuries in the field - we would expect 50 cases per year in the UK military given around 13,000 serving personnel on Ops Telic (Iraq) and Herrick (Afghanistan). This would easily give us 100 cases over our study period including our set up time and actual assessment period of 18 months. Recruitment will stop when we have reached our target. Data from DVBIC at Walter Reed Army Medical Centre (Warden et al., 2005) on 493 patients with TBI are helpful: 68% were due to blast; 88.5% had a closed TBI; 79% had loss of consciousness < 1 hour. UK military attendances for head injury were recorded on the Operational Emergency Department Attendance Register (OpEDAR) in Basra, Iraq (1/2/03 – 31/3/07). Of about 26,000 episodes, 578 were head injuries of which 323 (55.9%) were classified as 'neurosurgical'. 112 (19.4%) of TBIs were related to explosions (including IEDs and rocket propelled grenades (RPGs)) and 52 (9.0%) were vehicular related. These 578 are likely to include all TBIs from mild to severe – however, the majority will be mild.

Recruitment:
29. The Kings Centre for Military Health Research (KCMHR) has established links with the UK military forces administration. KCMHR receives monthly updates from the DASA, which provides up to date contact information for serving military personnel within our studies. In addition, KCMHR has obtained approval from the Security and Confidentiality Advisory Group (SCAG) via the National Strategic Tracing Service to access the addresses of ex-Service and reservist participants held in primary care records. This has allowed additional methods of contact for study participants, ensuring that a minimal number of participants are lost. We anticipate that a small proportion of participants (~10% per annum) will leave the forces over the life of the study but we emphasise that these will remain in the study. Address information will be provided from DASA linked by service number collected in theatre. The address provided will be the most current military address or if the participant has left, the civilian address that they gave to their unit on discharge. Initially an invitation pack will be sent to this address informing the participant of the study. In this pack there will be an invitation letter, an information sheet and a contact form with a self-addressed envelope. Participants will be asked to return the contact form with their address and phone numbers. If after two weeks there is no response, the research team will contact the unit directly. KCMHR staff will confirm with either the Adjutant or the Chief Clerk that the participant is part of the Unit and get a telephone contact number. If the person has left the Unit, contact details will be obtained and contact will then be established. When contacted by phone, confirmation of receipt of the information pack will be requested and again an opportunity to opt in or out of the study provided. At this point an invitation to participate and attend the centre will be made and their visit arranged at a time/date convenient to them. Participants will be reimbursed for travel and overnight accommodation (arranged by the study team) and they will receive a small reimbursement. Those choosing not to participate and those we are unable to contact will be classed as "non-responders". We have data suggesting that participation is relatively unbiased (Iversen et al. 2006) by eg., health status or medical downgrading (fit for operational deployment) (Tate et al. in press).

30. It will not be practical or indeed ethical to obtain consent for our study in the immediate setting of the acute TBI in theatre. Furthermore, the data collected at that stage is all clinically relevant and necessary for clinical care. Instead, consent to join the study will be obtained on return post deployment. We have already shown a high degree of co-operation in all studies of military health, with the principal barrier being inability to trace the individual. Outright refusal is uncommon (see Iversen et al. 2006). We will compare non-responders and responders in terms of simple demographics as a check for selection bias. We anticipate that participation rates will however be high (around 80-90%) given the natural curiosity regarding the outcome of TBI even in the asymptomatic individuals and proximity (and hence salience) of the investigation to the index events. In our previous neurological studies following the 1991 Persian Gulf War the overall participation rate by cases and controls (who were veterans of peace-keeping operations in Bosnia), in a two day series of assessments, including invasive procedures such as serum analysis, nerve conduction and EMG studies and muscle biopsy was as high as 110/140 (77.5%), some 7-8 years after the conflict, with more than half having left the services (Rose et al, 2004; Sharief et al. 2002). The response rates were slightly lower in those who were asymptomatic (50-60%) but nevertheless, the degree to which altruism and a willingness to contribute to the understanding of problems in fellow servicemen
motivated participants, was impressive. An additional incentive is also an officially sanctioned day’s leave in Central London.

Clinical Interview

31. This will begin with general questions on current health problems, functional status and recollection (if any) of the index mTBI (cases only). We will also obtain information on any previous or subsequent possible TBls. Depression and anxiety disorders and past psychiatric history will be assessed by a trained clinician using the WHO Schedules for Clinical Assessment in Neuropsychiatry 2.1 (SCAN; Wing et al. 1990) and diagnoses (e.g., PTSD) generated from computer algorithms based on the Diagnostic and Statistical Manual of Mental Disorders–IV and ICD-10, as used in previous studies of UK service personnel (Ismail et al. 2002). Separate analyses will be carried out with and without cases fulfilling criteria for DSM-IV Axis 1 psychiatric disorder (in particular PTSD) — although at present rates are relatively low (Hotopf et al. 2006; Ismail et al. 2002), but early indications from our ongoing studies are that regrettably these rates are rising, particularly in Afghanistan. We will not attempt to get attitude related or subjective reports of psychopathology dating back prior to the injury or index deployment period because of the likelihood of recall bias (see Wessely et al. 2003). We will however consider as a separate pilot study the correspondence between recall of the mTBI and our contemporaneous records of the event.

Assessments

32. Self-completion Questionnaires. These will begin the assessment, the most important being the: Rivermead Postconcussion Symptoms Questionnaire (RPQ) (King et al. 1995). This is a measure of severity of 16 cognitive, emotional and physical symptoms associated with postconcussion syndrome, asking individuals to compare current symptoms over the past 24 hours to those prior to their injury (the wording will be modified for the non-mTBI control group, who will be asked to compare current symptoms with any being experienced six months before the present - a time comparable to pre-injury for the mTBI group).

33. We anticipate that RPQ scores will be strongly associated with the following measures of psychopathology, illness perception and attribution and general functioning:

34. Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983)
This rates the presence/severity of these symptoms over the previous week.

35. The Post Traumatic Stress Disorder Checklist (PCL-C) is a well-validated self-report screening measure for PTSD. A total score (range: 17-85) can be generated; a cut-off of 50 yields a sensitivity of 0.79 and a specificity of 0.86 for a diagnosis of PTSD (Blanchard et al. 1996). This scale is being used in all our studies of the health of current UK servicemen and women, and also provides comparative data for the equivalent US studies, such as those conducted by Walter Reed Army Institute of Research (WRAIR).
36. Cognitive Failures Questionnaire (CFQ) (Broadbent et al. 1982). This is a self-reported questionnaire consisting of 25 items looking at everyday subjective cognitive failures (previously used in our Gulf War studies (David et al. 2002) and shown to correlate with mood symptoms rather than objective cognitive scores).

37. Illness Perception Questionnaire – Revised (IPQ) (Moss-Morris et al. 2002). This self-report questionnaire (cases only) includes 38 items relating to psychological representations and reactions to illness or symptoms (e.g., consequences and likelihood of cure), as well as the perceived cause of illness or symptoms.

38. The Multidimensional Perfectionism Scale (MPS) (Frost et al. 1990); a 35-item self-report scale.

39. Alcohol Use Disorders Identification Test (AUDIT) score (Babor et al. 2001). Heavy drinkers have been defined as those having an AUDIT score of 16 or more and will be analysed separately.

40. General Health Questionnaire-12 (GHQ-12) (Goldberg & Williams, 1988; Goldberg et al. 1997). A measure of symptoms of common mental disorders and distress. We have used this in all our epidemiological studies of military health, and it provides a benchmark to compare samples/populations.

41. 36-item Short Form health survey (SF-36) (Ware & Sherbourne, 1992; McHorney et al. 1993). We will measure general health perception as an index of general wellbeing.

Neuropsychological assessment

42. Tests will be administered by a research assistant with a graduate degree in psychology: they will receive supervision on administration and scoring of the materials by a clinical neuropsychologist (SP). The purpose of the battery is to assess cognitive areas relating to IQ, memory and attention, and uses a range of neuropsychological tests that are commonly used in clinical practice. To increase the sensitivity of the battery to possible effects of mTBI, the focus of a number of tests is towards aspects of attention and executive functioning; particularly those with a speed of processing component (cf. Cicerone & Azulay, 2002):

43. Wechsler Adult Intelligence Scale – Third Edition (WAIS-III) (Wechsler, 1997). An abbreviated version of this will be used to calculate Verbal Comprehension Index (VCI), and the Perceptual Organization Index (a measure of nonverbal reasoning). The age scaled score on the Digit Symbol subtest will be used as a measure of processing speed and the Digit Span and Letter-Number Sequencing subtests will be used as measures of verbal working memory.

44. Wechsler Test of Adult Reading (WTAR) (Wechsler, 2001). This reading test provides an estimate of premorbid IQ.
45. The Adult Memory and Information Processing Battery (AMIPB) (Coughlan & Hollow, 1985). To assess verbal and non-verbal learning of material over five learning trials (A1-A5) as well as proactive (B) and retroactive interference (A6).

46. Paced Auditory Serial Addition Task (PASAT) (Gronwall & Wrightson, 1975). A test of auditory attention and working memory. Participants are asked to add each digit to the one that comes before it and to give their answer aloud before the next digit had been presented.

47. Sustained Attention to Response Task (SART) (Robertson et al. 1997). A computer administered vigilance task (Go- no-go task). A score representing the number of errors of omission is calculated. Also, mean reaction time (RT) for correct responses is calculated. We have previously used this to study psychopathology in servicemen (Farrin et al. 2003) and found that those with low mood tended to respond inadvertently to ‘no-go’ items and showed marked slowing post error, suggesting heightened awareness of cognitive failures which would tend to lead to negative attributions. We will study whether those with PCS following mTBI show a similar pattern.


49. Trail Making Test, Parts A and B (Army Individual test Battery, 1944; Reitan, 1992). A test of psychomotor sequencing and set shifting.

50. Controlled Oral Word Association Test (COWAT) (Ruff et al. 1990), a test of verbal fluency, (a frontal/executive function). Interpretation of neuropsychological assessments typically assumes that individuals have used optimal levels of effort in their approach to the various tasks. Hence, we will add the following:

51. The Test of Memory Malingering (TOMM) (Tombaugh, 1990). This is a forced choice visual recognition test of 50 items presented over two learning trials and then tested on a third optional retention trial. A cut-off score of 45 or below on Trial 2 is often taken as a sign of sub-optimal effort. Underperformance on the TOMM has been demonstrated to remove the relationship between severity of TBI and its impact on cognition (Moss et al. 2003).

52. Reliable Digit Span (RDS) (Greiffenstein et al. 1994) from the WAIS-III Digit Span. This will be taken as a supplementary measure to assess effort to task (cf. Axelrod et al. 2006). RDS scores of less than 7 have been associated with a false-positive error rate of <10% in non-malingering brain-injured patients (e.g. Heinly et al. 2005) and general clinical populations (Babibikian et al. 2006).

Follow-up

53. Six months after the above assessment (having obtained the necessary consents), we will contact all mTBI cases and controls (at their preferred contact address) and ask them to complete the RPQ, GHQ, PCL-C, SF-36 once more and indicate their current level of social/occupation functioning (all should take only around one hour to complete). As the UK currently has a policy of a maximum tour
length of six months, this means that all those who have been assessed with a potential head injury will by then have returned to their home bases.

**MR Imaging Acquisition Protocol:**

54. MRI will be performed on a 3T HDx system (GE Medical Systems, Milwaukee, USA), providing high-resolution structural brain data with good signal-to-noise ratios. After collection of localiser images, oblique axial T2 weighted fast spin echo and fast FLAIR (FLuid Attenuated Inversion Recovery) images of the whole head will be collected for qualitative assessment to rule out any substantive underlying pathology or congenital abnormalities. Following this, isotropic 1.1mm\(^3\) 3D inversion recovery prepared spoiled GRASS (IR-SPGR) images will be collected using a protocol which gives whole brain coverage in 5mins 40sec. Sequence parameters (TE=2.8ms, TR=7.1ms, TI=450ms, flip angle=20\(^\circ\)) have been optimised to provide the necessary grey/white matter contrast for segmentation of the resulting images, while maintaining a short scanning time to maximize subject compliance and thus minimize any potential motion related artefacts.

55. Diffusion Tensor Imaging (DTI) data will be collected using a peripherally gated, doubly refocused, spin echo echo planar imaging (EPI) sequence, giving isotropic voxels. Based on that described by Jones et al. (2002) using our 1.5 Tesla facility, the protocol makes use of the enhanced signal to noise ratio at 3.0 Tesla to reduce scan time to between 8 and 15 minutes, depending on the subject's heart rate. The body coil will be used for RF transmission, and an 8 channel head coil for signal reception, allowing a parallel imaging (ASSET) speed up factor of two. Each volume is acquired from 60 contiguous near-axial slice locations with isotropic (2.4 x 2.4 x 2.4 mm) voxels. The echo time is 104 ms while the effective repetition time varies between subjects in the range 12 and 20 RR intervals. The maximum diffusion weighting is 1300 s mm\(^{-3}\) (optimised for precise measurement of the diffusion tensor in parenchyma) and at each slice location, 4 images are acquired with no diffusion gradients applied (Jones et al. 1996), together with 32 diffusion-weighted images in which we have shown, gradient directions are uniformly distributed in space to ensure statistical rotational invariance (Alexander & Barker, 2005; Jones, 2004).

**Image Analysis – Overview**

56. For the current project, we have chosen to focus on two complementary techniques: conventional T1 weighted imaging can reveal 'structural' differences between subjects including regional atrophy and subtle or diffuse abnormal grey or white matter localisation; DTI, meanwhile, can provide information on the 'integrity' of apparently normal tissue.

57. Three dimensional ('volumetric') MRI can give images of the brain with voxel sizes of the order of 1mm in scan times of less than 10 minutes. In addition to being appropriate for radiological assessment, such images allow comprehensive assessment of volume and morphology of the brain. Automated (and therefore operator independent) analyses can be performed using Voxel Based Morphometry (VBM (Ashburner & Friston, 2000; 2005; Good et al. 2001a; 2001b)), which map the datasets into a standard space and then perform statistical tests on a pixel by pixel basis to highlight regions which differ between groups, or (within groups) correlation
with measures such as severity of injury. These analyses also allow the calculation of total grey and white matter volumes, potentially revealing subtle atrophy (the applicants have considerable experience of this methodology in conditions without a clear neurological signature (Shapleske et al. 2002)). Furthermore, it is necessary to have the best possible volumetric images to provide the context against which measures of DTI can be evaluated.

58. The parametric maps calculated from DTI data (FA, MD, $\lambda_1$ and $\lambda_2$) are appropriate for a number of different analysis techniques, falling into three main group - Region of Interest (ROI) based methods (eg Arfanakis et al and Kraus et al - see below); histograms; and group mapping methods. Each have pros and cons: ROI methods are potentially highly sensitive, but often very operator dependent and time consuming; histogram analyses are sensitive to global changes (although their overall sensitivity may be low) and have little or no operator dependence, but give no information on location of abnormalities; voxel based (group mapping) approaches are useful when no a priori hypothesis exists about the location of pathology or the disease process is known to be diffuse as they are sensitive to global and local changes, but may have lower overall sensitivity than ROI based methods. All three approaches will be used in the current project.

59. Group mapping analysis of the DTI data will be performed using methods derived from VBM, transforming FA images into a standard space and then performing statistical tests on a pixel by pixel basis. Such an approach was used to demonstrate otherwise invisible abnormalities in two of the earliest papers (co-authored by one of us) to apply the DTI technique to patients with TBI (Wieschmann et al. 1999; Rugg-Gunn et al. 2001). In these initial case studies, data from individual subjects were compared to a ‘database’ of normal control cases; in the current study we propose instead to use this technique at a group level, comparing subjects with and without TBI and, in those with TBI, correlating pixel by pixel FA values with clinical measures. This type of analysis has been applied in other diseases where there may be subtle or diffuse white matter changes, including epilepsy (eg Rugg-Gunn et al. 2001) and multiple sclerosis (eg Cercignani et al. 2001). In TBI, group mapping of FA data will allow us to survey the whole brain for potential damage. We will also use histogram based analyses since, as noted, they have been used in diseases where diffuse change is expected eg., Multiple Sclerosis (Cercignani et al. 2001), and TBI (Benson et al (2007)) showing both changes in mean FA and in the shape of the FA distribution (see below).

**MR Imaging Processing and Analysis: Group mapping of IR-SPRG data.**

60. VBM processing involves segmentation of the IR-SPGR images into parametric maps representing the different tissues types, normalisation of these maps into a standard space, optional smoothing of the data (see below), and finally statistical testing for group differences. This will be performed using Statistical Parametric Mapping software (SPM5, Wellcome Department of Imaging Neurosciences, University College London, UK; see also Good et al 2001a; Ashburner & Friston, 2005). Following segmentation in this manner, grey and white matter probability images are ‘modulated’ (to compensate for the effect of spatial normalisation, by multiplying each voxel value by its relative volume before and after warping); these modulated results are referred to as ‘tissue volumes’ below. For
further processing within the SPM package, the tissue volume maps must then be smoothed to ensure they meet the assumptions of statistical tests used (based on Gaussian Random Field theory). Given that structural brain changes are likely to extend over a number of contiguous voxels, however, test statistics incorporating spatial information such as 3D cluster mass are generally more powerful than other possible test statistics, which are informed only by data at a single voxel (Bullmore et al. 1999). As no parametric distribution is known for cluster mass, permutation testing is used to assess statistical significance in the analysis. Between-group differences in grey and white matter volume will be estimated by fitting an analysis of covariance (ANCOVA) model at each intracerebral voxel in standard space. Permutation based testing, implemented in the BAMM package (Brain Activation and Morphological Mapping, a joint development of the Brain Mapping Unit, University of Cambridge and The Institute of Psychiatry, London, http://www-bmu.psychiatry.cam.ac.uk/BAMM/index.html), is used to assess statistical significance at both the voxel and cluster levels (Bullmore et al. 1999 and http://www-bmu.psychiatry.cam.ac.uk/software/docs/xbamml).

Preprocessing of DTI data.

61. The diffusion-weighted images are initially corrected for the effects of residual eddy-current induced distortion and subject motion using in-house software based on the FSL package (FMRIB Software Library - http://www.fmrib.ox.ac.uk/fsl/). For each data set, two reference images are first constructed by separately calculating the mean intensity in each voxel from all the non-diffusion-weighted and all the diffusion weighted images. Non-diffusion weighted images and diffusion weighted images are then registered to the corresponding template, using 12 degrees of freedom, to allow for eddy current induced stretches, shear and translations, along with motion induced rotations and translations. The two sets of internally coregistered images are then registered to each other using 6 degrees of freedom, which inhibits the incorrect stretching of the images which can otherwise occur as the registration process tries to match the edge of the brain parenchyma on the diffusion weighted images (which have dark CSF) to the bright CSF in the un-weighted images.

62. The data are then masked to remove extraneous brain tissue, using a combination of the 'Brain Extraction Tool' (BET) from the FSL and locally written programs. An initial brain extraction is performed using the BET software, which employs a mesh that is moulded to the surface of the brain using a series of adaptive rules and constraints, so that the MR data set can be segmented into ‘brain’ (within the mesh) and ‘non-brain’ (outside of the mesh). Following this preliminary extraction, a simple connectivity algorithm based on intensity thresholding is applied, as the FA volume data set masked by the output of BET alone often shows a few bright (high anisotropy) voxels around the external surface of the brain most likely as a result of partial volume effects. Finally, the extracted T2-weighted volume is used as a binary mask on whole data set. After registration and masking of the data, the diffusion tensor is calculated for each voxel using multi-variate linear regression after logarithmic transformation of the signal intensities (Basser et al. 1994), using in house software. The tensor matrix at each voxel is subsequently diagonalized to compute the eigen-values, and images of the tensor trace and fractional anisotropy (FA) are created. The fractional anisotropy is one of a range of possible anisotropy indices (ibid) and is chosen because it is rotationally invariant, does not tend to
smooth the data (cf. Pierpaoli & Basser et al. 1996); FA has been shown by Papadakis et al. (1999) to have the best signal to noise ratio and greatest detail of the indices tested.

Group mapping of DTI data.

83. Group mapping techniques (derived from the Voxel Based Morphometry (VBM) analysis methods described above), will be used to compare parametric maps of FA between subjects, and to investigate the relationship of regional changes in FA to injury, cognitive and psychosocial variables. Normalisation will again be performed using Statistical Parametric Mapping software, but in this case version 2 (SPM2, Wellcome Department of Imaging Neurosciences, University College London, UK) will be used, as the combined registration and segmentation process used for the IR-SPGR images is not appropriate for the DTI data. A two stage registration process will performed, in a manner analogous to the "optimised VBM" (Good et al. 2001a). The mean T2-weighted (b=0) image for each subject will first be registered to the epi template provided in SPM. The derived warping parameters will then be applied to corresponding FA images in order to map the latter into standard space. The normalised FA images of all subjects will then be averaged and smoothed to create a new, study specific, template to which each subject's FA images can be re-registered. The registered FA images will also be very roughly segmented to give maps of the probability of a tissue being either white or grey matter, and these segmented images thresholded at a low (10%) probability to provide a binary mask of WM. Next, as with the IR-SPGR data, the FA images will be mildly smoothed to reduce noise, and also minimize the effects of small residual mis-registrations (see Jones et al. 2005). We will use a conservative degree of smoothing, with a kernel size (5x5x5mm) of the same order of magnitude as the width of many WM tracts. Finally, the smoothed images are multiplied by the brain mask, to restrict subsequent analyses to WM only.

84. In order to take advantage of cluster level statistics, we will again use a non-parametric approach. This also overcomes the difficulty that parametric methods assume that the residuals of the model tested will follow a Gaussian distribution (not true for DTI data) and reduces the need for smoothing to coerce the data into meeting this condition. Between-group differences in white matter FA, and within group correlations of FA with variables of interest, are estimated by fitting an analysis of covariance (ANCOVA) model at each intracerebral voxel in standard space. Finally, we again search for spatial clusters among the voxels highlighted, and test the "mass" of each cluster (the sum of suprathreshold voxel statistics it comprises) for significance. We know that the variance of FA values in the brain depends upon the FA values themselves (Basser et al. 2007). While we restrict our analyses to core WM regions where this is relatively uniform, the effects of noise may still vary slightly from region to region. We therefore also inspected the voxel level maps (which treat each voxel independently and therefore inherently allow for such local differences in statistics), to ensure that these highlight the same areas as the cluster level results. In this way we retain the additional power of the cluster statistics while controlling for the potential disadvantage of its non-local nature.

ROI Analysis of DTI data.
The normalised (ie standard space) FA maps produced during the group mapping analysis (above) will also be used for the ROI based analysis. Following Kraus et al. we will manually define regions in key brain structures and WM tracts. The masks so created will then be applied to the FA, MD, $\lambda_1$ and $\lambda_2$ maps, and regional values of each parameter calculated on a per subject basis. Following Kraus et al. we will calculate from these a per subject index of ‘white matter load’ (defined as the number of regions in which FA is more than 1SD below the control mean for that region).

Histogram Analysis of DTI data.

Histogram analysis will be based on the methods described previously (Rashid et al. 2004). Brain masks based on the segmentation of the data set (produced as part of the group mapping processing described above) will be applied to the parametric FA and MD maps in order to avoid partial volume effects. Two separate analyses will be performed, one including data from the whole parenchyma, the other restricted to WM. Voxel values will be extracted from the brain/white matter masks and noise, uniformly distributed with a mean of 0 and a range of ±0.5, will be added in order to minimize the effect of digitisation quantization (Tozer & Tofts, 2003). Fully normalised (Tofts et al. 2003; 2008) histograms will be created, and mean, peak position and height, skew and kurtosis calculated for each subject.

Overview of Statistical Analysis

The design is a matched retrospective cohort study with prospective follow-up. Our main outcome measures will be: psychopathology, including PCS and psychiatric diagnoses; cognitive impairments and MRI abnormalities. We will derive summary measures in all 3 domains. Regarding neuropsychological (and self-report) assessments, while we will explore the scores of individual tests in relation to mTBI we will use exploratory factor analysis to derive factors and summary factor scores for the main areas of cognitive functioning (ie combining individual tests which measure common functions, eg “attention”; executive functions’ “IQ”) to reduce the problem of multiple comparisons. Given our stated aims: (1) we will calculate proportions and their 95% confidence intervals (CI) of abnormalities in the domains of, psychopathology, cognition and neuroimaging. We will then compare groups using paired t-tests for continuous variables and use McNemar’s test for proportions. We will also apply conditional logistic regression adjusting for potential confounders for categorical data and equivalent regression techniques to take account of the matched nature of data for continuous outcomes (see Cummings et al. 2003). For aims (2) and (3) we will use odd ratios (OR) to measure the strength of association between categorical MRI parameters and outcomes, and between types of injury and outcomes, and we will use correlations for continuous variables.

At the one year follow-up, we will consider 3 main outcomes: PCS (as measured with the Rivermead Postconcussion Symptoms Questionnaire (RPQ) (King et al. 1995)), GHQ scores and global functioning. We will use multiple logistic regression to examine predictors grouped under the following headings: demographic (eg. age, rank); injury related (eg., GCS; blast); premorbid (eg., past psychiatric history, personality); psychopathological (eg., anxiety, depression, PCS,
PTSD symptoms, and general functioning at initial assessment); cognitive (e.g., neuropsychological factor scores); and neurological (MRI scan findings).

Power Calculations

69. From Kraus et al. each control had on average reduced FA in 3.6/13 ROIs (standard error of the mean (SEM))=0.55; the mTBI had 5.9 (SEM 0.72). This translates roughly as an effect size (ES) of 0.72. This would be detected a priori with 90% power with n=42 in each of 2 groups, and 95% power with n=52 in each group, with α set at 0.05. However, when one examines region specific ESs (Table 3 Kraus et al.) they range from 0 to around 1.0 (for 13 regions plus whole brain - no adjustment was made for multiple comparisons). The most significant contrast was with the superior longitudinal fasciculus which showed an ES of approx 0.94 while the corticospinal tract yielded a contrast p value of 0.032, the ES was approx. 0.55 due to larger variance. This effect would need n=70 in each group to be detected with 90% power a priori.

70. It may appear that our study is slightly over powered for DTI however, the larger group numbers will allow us to make important within-group contrasts, such as blast vs. non-blast injuries; and cases with and without symptoms of PCS. An ES of 0.72 could be detected at 80% power in a 20 vs 80 within mTBI group contrast. Similarly, power to detect clinically significant PCS between mTBI and controls requires larger numbers assuming a relatively low prevalence at 6 months. Based on Jacobson (1995), significant symptoms were present in 21-24% following mTBI. A sample size of n=88 in each group (which allows for 12% attrition in 6 months) will enable us to detect a difference of proportions of 20% vs 5% (cases vs controls) with 80% power and a 5% risk of false positives.

Implications

71. The results of this work will be applicable not only to the UK military but to the US and other nations and also civilian populations where mTBI is of course, very common. The research has the potential to have a lasting scientific impact as well as practical relevance. In view of this we will develop a broad dissemination strategy including scientific, clinical, military (including survivors of TBI and other consumer and advocacy groups) as well as national and international governmental constituencies.

72. The project will provide information on whether the current internationally agreed operational definition of mTBI is associated with demonstrable brain pathology, using state-of-the-art neuroimaging techniques and whether the presence or absence of such pathology has effects on social outcomes, cognitive function and post-concussional symptoms. In particular, the work will determine whether certain neuroimaging techniques should become more widely applied in military settings and whether definitions of mTBI can be refined and validated. The role of blast injury as a potential cause of mTBI will form an important component of this and following the research we may be able to advise specific amendments to operational definitions.

73. The results of this work will provide information on how such injuries affect brain structure and functioning and what the time course of any effects may be. This
will then enable rational algorithms to be developed by armed forces medical services for the immediate and longer-term management of such injuries in the field and after deployment. This may include the administration of therapeutic agents with neural protective properties (given current interest in biomarkers of brain injury and opportunities for translational research) as well as more basic nursing procedures, eg., whether specific advice should be given regarding return to active duties. This in turn will provide commanding officers, policy makers and clinicians with evidence on which to base the allocation of appropriate levels of resources needed to minimise the effects of such injuries and to treat those individuals with long-term difficulties.
REFERENCES


TBI DIAGNOSTIC TOOL - EXAMPLE ONLY

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**INSTRUCTIONS**

This form is automated for electronic completion.

Complete this page on ALL patients presenting with a history of head injury, including major trauma.

Complete a form on all patients who have been exposed to blast (even when the presenting complaint is not head injury).

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**mTBI diagnostic criteria**

To make a diagnosis of mTBI there must be:

- One of the following:
  - Presumed or credible history of a head injury/bump to the head.
  - Involvement in a blast.
B. Directly associated with one or more of the following:

- Dazed or confused.
- Loss of consciousness (ie. "knocked out") less than or equal to 30 minutes.
- Post-traumatic amnesia less than 24 hours.
- Transient other neurological symptoms or signs, including seizures.
- Intracranial lesion on neuroimaging likely to have been caused by index injury (if CT performed.)

C. But with none of the following:

- GCS less than or equal to 12.
- Loss of consciousness greater than 30 minutes.
- Post-traumatic amnesia greater than or equal to 24 hours.
- Neurological symptoms or signs apparently unrelated to the mild TBI.
- Intracranial lesion requiring surgery.

*If the patient has a diagnosis of mTBI issue them with an "mTBI Card" & Action Sheets 3a parts 1&2 irrespective of whether they are admitted or returned to unit.*
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