A Voyage of Recovery: from Injury to Internet to the Classroom. Assessing the Role of Meditation during Brain Injury Rehabilitation: Autoethnography.

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Contents

Abstract

There is a brain injury epidemic because current diagnostic protocols and rehabilitation strategies are failing in mainstream health systems. As a result, people with brain injuries use social media to share experiences and look for alternative rehabilitation methods. Exploratory studies suggest mindfulness-based interventions, yoga and meditative practices induce neuroplasticity and may be beneficial for people with brain injury. The aim of this work is to provide a first-person account of traumatic brain injury and assess the role of meditation during rehabilitation. Using autoethnography as a method, the author's recovery from brain injury unfolds in layers to expose a crisis in identity, failings in the health system, phenomenological experiences, social media inspired methods of rehabilitation based on contemplative philosophies and a formal assessment of mindfulness-based practices. This study found practically applied concentration meditation correlated with improvements in neuropsychology tests. In contrast, formal mindfulness-based practices had mixed results. Some exercises provided psychological support, mindful movement induced positive and negative psychophysiological effects, the body scan was detrimental and the sitting practice had to be adapted for stability. Overall mindfulness-based practices lacked an appropriate context for complex brain injury symptoms and correlated with no change in neuropsychology tests. By combining suitable mindfulness-based components with concentration practices in a recontextualized format rehabilitative changes were affected in psychological, physiological and neurological domains that correlated with profound improvements in neuropsychology tests. This study suggests there is a supportive, inducive and direct role for meditation during brain injury rehabilitation.

A voyage of recovery: from injury to internet to the classroom. Assessing the role of meditation during brain injury rehabilitation: autoethnography.

This introduction outlines the global brain injury crisis and provides an overview of the diagnostic and rehabilitation options for traumatic brain injuries from two paradigms. The first is from a mainstream healthcare perspective and the second from the emerging functional brain injury paradigm that utilize neuroplasticity techniques. While meditative practices induce neuroplastic brain change for psychological conditions they may also be beneficial for brain injury rehabilitation. The author uses autoethnography to give a firsthand account of living with brain injury, developing alternative methods of rehabilitation which includes meditation and comparatively assesses the role of mindfulness-based interventions for brain injury rehabilitation.

Neurological disorders (NDs) affect over a billion people (Viruega & Gaviria, 2022) and are the leading cause of disability and second leading cause of death worldwide (Feigin et al., 2019). The World Health Organization (WHO) (2006) categorizes NDs in two groups, neuropsychiatric disorders and neurological insults. Neuropsychiatric disorders include dementia, multiple sclerosis and Parkinsons disease; neurological insults include cerebrovascular diseases, also called strokes, caused by occluded or hemorrhaging blood vessels in the brain (Lo et al., 2003) and traumatic brain injury (TBI) resulting from external forces to the brain (Patra, 2022). Feigin et al. (2017) estimated yearly stroke incidence at 10.3 million cases which accounts for 55% of all NDs, excluding TBI (WHO, 2006), while Dewan et al. (2018) estimated yearly TBI incidence at 69 million cases, suggesting a TBI to stroke ratio of almost seven to one. Surprisingly TBI incidence and mortality rates are not recorded in global comparative statistics (Feigin et al., 2020; WHO, 2006). Carrol et al. (2004) suggests TBI data is excluded because of methodological flaws in diagnostic and research standardization.

The current TBI diagnostic standard is described in a protocol for managing serious head injuries (Bullock et al., 1996) caused by blunt blows and acceleration/deceleration forces from road traffic

accidents (RTAs), falls and violent assaults. Head injury became interchangeable with TBI (Tenovuo et al., 2021) which is defined as "an alteration in brain function, or other evidence of brain pathology, caused by an external force" (Menon et al., 2010, p. 1638). The protocol has two diagnostic measures. The Glasgow Coma Scale (GCS), a 15-point index where one equals death and 15 full consciousness; the scale provides TBI classifications when coupled with loss of consciousness (LOC) and memory loss, post traumatic amnesia (PTA): severe TBI, GCS 3-8, PTA ≥ seven days, LOC ≥ 24 hours; moderate TBI, GCS 9-12, PTA ≤ seven days, LOC ≤ 24 hours; mild TBI (mTBI), GCS 13-15, PTA ≤ 24 hours, LOC ≤ 30 minutes (Jang, 2018). The second measure is a computerized tomography (CT) scan that uses continuous x-rays rotating along an axis around the head which are processed into three-dimensional images (Gharieb, 2022). Image abnormalities, contusions and hematomas (Shen, 2021), correlate with GCS severity: severe 90%, moderate 65%, mild 7% and mortality rates: severe 40%, moderate 10% and mild 4% (Andriessen et al., 2010). Standardizing these diagnostics for research, however, is complicated by compounding heterogeneity (Hildebrand et al., 2016) which includes demographics, cause of injury, diagnostics, multiagency interventions and secondary effects. The International Mission on Prognosis and Analysis of randomized Controlled Trials in TBI (IMPACT) (Maas et al., 2013) concluded heterogeneity inhibits first class research because a narrow inclusion criterion reduces participant numbers and wide criterion affects statistical power. Sandsmark (2016) points out the IMPACT study characterizes TBI by using the GCS and CT scans which only assess the physical head injury in respect to mortality. As disability from TBI is the highest in the world (Feigin et al., 2019) the neuropsychological outcomes, the functional brain injury, have not been considered. This is further exacerbated because IMPACT included research from severe and moderate cases which together only represent 5% of recorded TBI's (Maas et al., 2013). Most TBI cases are the 95% with mTBI.

mTBI, also called concussion (Mollayeva et al., 2017), is controversial with over 50 definitions (Gardner & Yaffe, 2015) and incidence rates vary from 100 to 749 per 100,000, per year (Skandsen et al.,

2019). The mTBI classification is derived from a GCS score of 13-15 within 30 minutes of an accident, however most people first attend emergency departments hours, days, or weeks post injury (Ruff et al., 2009). CT scans are mostly clear, but an injury progression develops; an acute phase in the first few weeks, a subacute phase up to six months and a chronic phase that can last a lifetime (Livernoche Leduc et al., 2022). Many injuries are thought to resolve within three months however, 15%, dubbed "the miserable minority" (Ll Wood, 2004, p. 1135), develop chronic mTBI, also called post-concussive syndrome (PCS).

PCS symptomology includes headaches, dizziness, imbalance, fatigue, altered sleep patterns and cognitive impairments (Katz et al., 2015). When combined with neuropsychology performance assessments for memory, attention, reasoning, problem solving, language skills and spatial awareness (Harvey, 2022), the accumulation forms heterogenous cyclic domains. Domains include psychosocial, cognitive, emotional and somatic (Al Sayegh et al., 2010), from which symptom causation becomes difficult to identify. The neuropsychological impact has a devastating effect on everyday activities, routines, family relationships, community interactions (Jaber et al., 2019) and job retention (Oldenburg et al., 2016) which can lead to isolation and homelessness. PCS/mTBI prevalence in homeless communities in the United States (US), European Union (EU) and the United Kingdom (UK) is estimated between 53% and 82% (Davidson III, 2020; Oddy et al., 2012; Stubbs et al., 2020). Up to 90% sustained injury prior to becoming homeless, many had either failed to get a diagnosis or were misdiagnosed.

Misdiagnosis is common (Iverson, 2006); in the US 17% of emergency departments have no diagnostic guidelines, in Germany the figure is 20% (Ryu et al., 2009) and across the EU, medical departments have inconsistent guidelines (Peeters et al., 2015). Diagnostic assessments are required in the UK legal system; brain injuries from accidents have a high litigation value and law courts appoint Medico Legal (ML), independent medical experts, to assess injuries (Ministry of Justice, 2021). Evans and Strutt (2020) reviewed the ML process for assessing PCS; the GCS is not considered because injuries are

rarely assessed within the time limits and CT scans are unreliable because of poor resolution. Without a neurological focal point, PCS/mTBI is legally argued to be a psychological or psychosomatic disorder (Ll Wood, 2004; Rohling et al., 2012; Ruff et al., 1996). This is reflected in the mainstream health system where standard treatment, pharmacology and therapy, are accordingly applied to treat PCS as a psychosocial disorder.

Antidepressants including selective reuptake inhibitors and tricyclic antidepressants are commonly prescribed for PCS, their effectiveness is comparable to placebos at best (Silverberg & Panenka, 2019) but the author recommends continuation. However, as mTBI increases the risk of stroke and dementia, likewise antidepressants are also thought to increase stroke and dementia (Albrecht et al., 2018; Nyam et al., 2019; Turner et al., 2021; Wang et al., 2018) meaning combining PCS with antidepressant treatment only compounds the risk. Slowinski et al. (2019) advises tentative caution after concluding these medications had no real benefit and lacked efficacy. Alternatively, psychological therapies were reviewed, Sullivan et al. (2020) suggests education, psychoeducation and reassurance have no effect; cognitive behavior therapy, an intervention that confronts the emotional and cognitive relationships affecting behavior patterns, had very limited support and counselling had limited support. van Heugten et al. (2012) reviewed neurofunctional rehabilitation for a range of brain injuries including TBI. The interventions concerned language, communication, visuospatial functioning and memory. Most were not described and those that were did not deliver them, 54% recorded statistical improvements that were unrepeatable because the methodology was poorly described. Traditional treatments engineer statistical significance to satisfying provider funding (Ylvisaker et al., 2002), realistic rehabilitation requires causal knowledge (Goldszmidt et al., 2012) and currently PCS is poorly understood in mainstream systems (Batchelor, 2019).

Chung and Khan (2014) point out the GCS and CT scan protocol (Bullock et al., 1996) has not changed in decades, the protocol is a mortality scale (Sandsmark, 2016) and consequently the

neurofunctional impact of PCS is misdiagnosed (Rickards et al., 2022; Smith & Stewart, 2020; Wazir et al., 2022). As heterogeneity prevents first class research (Maas et al., 2013) the global incidence of PCS is unknown, but from available estimates, PCS represents 15% (Ll Wood, 2004) of 95% (Maas et al., 2013) of 69 million annual incidents (Dewan et al., 2018) equating to 9.8 million new cases a year. This is comparable to strokes at 10.3 million (Feigin et al., 2017) which account for 55% of all global NDs excluding TBI (WHO, 2006). Mortality rates from strokes relative to all ND's, excluding TBI, is 67.4% (Feigin et al., 2020), in contrast mTBI mortality rates are low, 4%, based on GCS scores (Andriessen et al., 2010). A lower mortality rate with no viable rehabilitation strategy (Heslot et al., 2021) means PCS cases compound year by year creating a silent epidemic and increases the burden on society (Chen et al., 2022). The UK government has acknowledged over a million people with brain injury are being failed by public institutions including healthcare, the justice system and social care (A strategy for acquired brain injury. n.d.; Keegan, 2021) and a consultation period is underway to advise and implement change. TBI researchers are also prompting change (Allen, 2019; Okonkwo & Yue, 2020; Powell et al., 2021), a paradigm shift.

Ylvisaker et al. (2002) described two paradigms for brain injury rehabilitation: mainstream health system and functional restorative approaches. Current mainstream systems are failing (A strategy for acquired brain injury. n.d.) however functional approaches offer alternatives based on scientific evidence. The automotive industry pioneered crash test TBI simulations to improve safety (Bodnar et al., 2019) and the sports industry designed sensory arrays for helmets worn by impact sport players to assess the biomechanics of concussion (Rowson & Duma, 2020). Together these accumulated impact data, imaging, pathological evidence and biomechanical modelling for TBI characterization.

The brain has two functionally and structurally asymmetrical hemispheres composed of a 70% fluid, multicellular, gelatinous substance that is independently suspended within the skull (Prichard et al., 2022). 50% of cells are neurons; branched dendrites with elongated cell bodies called axons that

extend to synapses. Dendrites form functional zones, grey matter, in regions of the brain that are connected by their axons, white matter, that transfer electrochemical information through synapses between the functional regions (Rogers, 2021; Sampaio-Baptista & Johansen-Berg, 2017). The other 50% of brain cells: oligodendrocytes form myelin, an insulating sheath around axons; astrocytes provide synaptic support and neurotransmitter buffering; microglia are macrophages that engulf extracellular debris (Mira et al., 2021). As brain characteristics are maintained across mammalian species (Jerison, 2012), animals were used to replicate human systems to conduct the initial research.

Systematically applied physical forces, acceleration, deceleration, impact and rotational forces (Jones, 2021) were conducted on rodents to non-human primates. Simulated mTBI forces caused brain deformations (Romeu-Mejia et al., 2019) but CT scans revealed no abnormalities (Zhan et al., 2022). Alternatively, diffusion tensor imaging (DTI), which records in-vivo microscopic fluid diffusion through cell structures in a magnetic field (Wilde et al., 2012), identified fluid diffusion from axons post injury. Damaged and sheared axons were confirmed in animal brain tissue by postmortem histopathological analysis. Further postmortem analysis of brain tissue from humans with mTBI, who had died from other causes, found axonal damage (Johnson et al., 2013). People living with mTBI were scanned using DTI, the imaging results revealed traumatic axonal injury (TAI) (Jang & Byun, 2022).

TAI inhibits electrochemical signaling and molecular transport mechanisms causing cellular contraction and synapse retraction. Damaged cells form bulbs which rupture, spilling contents into the surrounding tissue causing excitotoxic stress and cell death (Bhowmick et al., 2019). Glial cells are damaged, myelin is disrupted and neurochemical buffering is inhibited. Together these result in a wider microglial inflammatory and repair response (Takase et al., 2018).

Hayes et al. (2016) suggests the progressive nature of cellular damage, immune response and repair mechanisms are comparable to the acute, subacute and chronic phases of mTBI (Livernoche Leduc et al., 2022). This is expressed in the general symptomology (Katz et al., 2015) observed post

injury in the acute and subacute phases. Chronic phase, neuropsychological symptomology (Al Sayegh et al., 2010), is caused by reduced white matter connectivity because dead and damaged axons do not regenerate (Fawcett, 2020). Axonal dysfunctions are random (Mitra et al., 2016), inter and intra hemispheric and affect multiple domains; awareness, attention, memory, cognition, auditory processes, language (van Heugten et al., 2012), the autonomic nervous system and neuroendocrine function (Weil et al., 2022), motor, vestibular functions (Valovich McLeod & Hale, 2015) and vision (Armstrong, 2018). Each brain injury is unique and functional rehabilitation is individualized in a bottom-up, sensory to cognitive approach (Dams-O'Connor & Gordon, 2013; Vas et al., 2021).

Functional rehabilitation from private independent providers is heavily criticized in mainstream science for a lack of evidence and quality of research (Barrett, 2009; Demortier & Leboeuf-Yde, 2020). Interestingly, mainstream rehabilitation programs in the US failed to treat military personnel with mTBI, the signature injury from “The Global War on Terror” (Singer et al., 2022, p. 1). Public/private partnerships have been accelerated for Federal Drug Administration approval for alternative diagnostics and functional rehabilitation strategies. Consequently, there is great interest in independent functional rehabilitation approaches (Jennings & Islam, 2022; Xiang et al., 2022) including visual, vestibular and cognitive methods.

The visual system comprises the eye and optic nerve transfer of information to the thalamus, a sensory relay region of the brain, to the visual cortex, occipital lobes for processing (Usrey & Alitto, 2015). The visual system is inextricably linked to the vestibular system, fluid filled canals in the inner ear with octonia, ear crystals, that trigger motion sensors inducing reactions to vertical and horizonal movement (Valovich McLeod & Hale, 2015). The vestibulo-occulo reflex, eye/ear and vestibulo-spinal reflex, ear/spine maintain and synchronize stable vision and body posture. Head Injuries cause neurological and physical damage to these systems (Shen, 2021) and independent functional strategies have been developed for rehabilitation.

Simpson-Jones and Hunt (2019) reviewed current visual treatments and identified effective optometric interventions which include oculomotor training exercises for motor problems and corrective colored, yoked and occluded lenses for motor, ocular and occipital processing conditions. Vestibular injuries are treated by neuro functional chiropractors who manipulate the body and central nervous system via the spine. Targeted manipulations prove highly effective for paroxysmal positional vertigo, a condition that causes vertigo and rotational spin effects following mTBI (Józefowicz-Korczyńska et al., 2018). Waterstone et al. (2020) correlates chiropractic manipulations for brain injury symptoms with functional brain changes.

Neuroplastic brain change is the primary goal in cognitive functional rehabilitation. Galetto and Sacco (2017) reviewed rehabilitative studies for attention, memory and communication where qualitative improvements after visual, reading and auditory memory tasks correlated with brain domain changes. Research using electroencephalogram (EEG) analysis, a method of recording brain wave frequencies (He & Liu, 2008), showed multiple brain regions elicited high energy indicating hyperactivity from damaged networks (Yang et al., 2021) during task adaptation. Over time, with task repetition, energy reduced and became streamlined, more efficient. In other words, existing brain tissue was reorganizing in response to repetitive stimulation, functioning was integrated into existing networks and were becoming automatic processes. In another study, preliminary imaging suggests reorganization in axon rich tissue including the corpus callosum, superior longitudinal fasciculus, superior fronto-occipital fasciculus and corona radiata following rehabilitation using the Arrowsmith Program (Weber et al., 2019). The program is an integrative strategy for retraining emotional, language and cognitive functional domains (Maja, 2020). Donnelly et al. (2021) provides qualitative evidence for improvements in emotional reactivity, self-awareness, motivation and cognition in the LoveYourBrain Yoga (LYBY) program; a six-week group-based mindful yoga intervention for people with mTBI (Pearce, 2019). The

program did not correlate the results with brain imaging, but the mindfulness element of LYBY may indicate mindfulness-based interventions (MBI's) have rehabilitative potential.

MBI's include hatha yoga and mindfulness derived from Hindu Vedanta and Buddhism, respectively, the Eight Limbs of Yoga and the Nobel Eightfold Path (Aich, 2013; Schmid et al., 2021). Both have operational procedures for practice and MBI's are based on the Buddhist *Satipatthanas*: sensations, feelings, thoughts and consciousness (Gunaratana, 2012), the four foundations of mindfulness. The process initiates and guides the mindful practitioner with a set of instructions, *dhammas*, dimensional physiological and psychological frameworks to help identify the reality of existence and provide psychological solutions to work with hindrances, physical and mental pain. Elements of this technique were adapted and manualized for clinical psychological interventions; the mindfulness-based stress reduction (MBSR) program (Kabat-Zinn, 2011) for chronic pain and mindfulness-based cognitive therapy (MBCT) (Crane, 2017) for depression. During the short evolution of MBI's *dhammas* were replaced by Western theoretical concepts (Harrison et al., 2017) and neurocognitive research accumulated evidence indicating brain change.

In theory engaging in mindfulness switches brain attention networks from the rest state, default mode network (DMN) to the executive network (EN) which is maintained and monitored by the salience network (Malinowski, 2013). EEG analysis indicates the rest state, DMN, is signified by alpha waves and by inducing mindfulness theta waves combine with alpha waves to provide an energized rest state across EN regions (Tang et al., 2015; Yordanova et al., 2020). Functional magnetic resonance imaging (fMRI), a technique that shows blood flow changes in brain tissue (Ward, 2015), correlates the EN to lateralized brain regions: the left hemisphere prefrontal cortex and anterior cingulate cortex with the right hemisphere insular region (Kurth et al., 2015). Magnetic resonance imaging (MRI), a method of recording structural changes in brain tissue (Ward, 2015), indicates density and volumetric tissue changes in EN regions after repetitive mindfulness practice (Tang et al., 2015). Activation of these

regions also increases white matter volume and synaptic efficiency in the corpus callosum, tissue that connects brain hemispheres and the super corona radiata, a major axon rich cortical region (Tang et al., 2012). There is little doubt MBI's induce brain change (Afonso et al., 2020) however there are different neural mechanisms for overcoming self-related pain and for preventing depression. MBSR is thought to mediate its effect on stress through the right hemisphere insular (Kang et al.,2022), while the mechanisms of MBCT involve the coupling and decoupling of wider functional processes in the left hemisphere (van der Velden et al., 2022). These alternative mechanisms may be reflected in the different reorientation and exposure/extinction processes (Teasdale & Chaskalson, 2011) resulting in attention and cognitive improvements. Link et al. (2016) suggests that if these improvements are reciprocated with brain change then theoretically MBI's should rehabilitate the corresponding functions affected by mTBI.

There is a paucity of MBI studies for mTBI rehabilitation however in a systematic review and meta-analysis of meditation, yoga and mindfulness, Acabchuk et al. (2021) concludes significant improvements were reported in mental health, physical health, cognitive performance, quality of life and self-referencing. In a scoping review, Lovette et al. (2022) discussed the measures used in mindfulness studies for assessing mTBI and concluded that current qualitative measures are unsuitable and do not adequately assess mTBI domains. However, a range of objective cognitive tests did find statistically significant improvements, but none were transposed to real life experience, social or occupational performance (Acabchuk et al., 2021; Lovette et al., 2022). The theoretical proposal that brain change promoted by MBI's would rehabilitate brain functions in people with mTBI (Link et al., 2016) is unfounded. Still, the therapeutic mechanisms of MBI's in reducing stress and depression have brain-changing qualities (Afonso et al., 2020) but key factors for using mindfulness in TBI rehabilitation may have been overlooked.

Interestingly the reviews of MBI's for mTBI (Acabchuk et al., 2021; Lovette et al., 2022) and the studies within characterize mTBI by using variations of mainstream rationale which suggests the origin of symptoms are psychological or psychosomatic (Ll Wood, 2004; Rohling et al., 2012; Ruff et al., 1996). There are however no definitive markers for psychological or psychosomatic conditions (Browning et al., 2011; Nobis et al., 2020) and if the UK (A strategy for acquired brain injury. n.d.; Keegan, 2021) and US (Singer et al., 2022) are implementing major changes in mainstream healthcare, there may be fundamental problems with mTBI diagnostics, the symptoms may not be psychological because the corresponding rehabilitation is ineffective (Slowinski et al., 2019; Sullivan et al., 2020). Additionally, people with TBI are rejecting mainstream healthcare (Hoepner & Keegan, 2022) in favor of social media-based peer-to-peer platforms including YouTube, Facebook and TiK Tok, to find functional rehabilitation processes to solve their own conditions (Bond et al., 2016; Carter et al., 2021; Madathil et al., 2015). Currently there is no research on social media-based rehabilitative techniques, advertised services or outcomes; alternatively, Poulin et al. (2019) reviewed free online websites, many provided quality up to date advice and information with readability designed for people with brain injuries and some encourage peer-to-peer discussions. Interaction provides a basis for people to become informed about the reality of their shared experience (Brunner et al., 2022) and while some mainstream general practitioners (GP) and clinicians suspect people with TBI have psychologically disengaged from reality (Paterson & Scott-Findlay, 2002), first-hand accounts of mTBI experiences illustrate an acute awareness of body, sensory, perceptual and cognitive dysfunctions (Elliott, 2016; Gombay & Andrews, 2021). Likewise, mindfulness allows mind/body domains to be evaluated (Reive, 2019) and if MBI's couple mindfulness, a fixed component (Crane et al., 2017), with variable targeted mechanisms for stress reduction and cognitive therapy, mindfulness in turn may be beneficial as an adjunct (Donnelly et al., 2021) to other rehabilitative processes. As calls grow to replace the mainstream psychological basis of mTBI with the functional paradigm (Pavlovic et al., 2019; Shenton et al., 2018) the role of mindfulness

and other traditional meditative practices, correlated with wider brain changes (Yordanova et al., 2021), may also enhance functional brain injury rehabilitative methods.

I sustained a head injury in the summer of 2017 and was diagnosed with PCS in 2018 with a prognosis in 2019 that I would never recover. Advice to accept the situation was ignored, social media (SM) platforms, as Brunner et al. (2022) suggests, offered peer-to-peer interactions that reduced isolation and allowed access to alternative information, shared experiences and up to date scientific research. These provided a basis for understanding my own condition in terms of the functional brain injury paradigm. Additionally, YouTube videos stimulated an interest in meditative practices from secular and cultural perspectives that indicated functional brain change potential. By intuitively combining functional rehabilitation techniques with elements of meditative practices profound improvements were experienced in sensory and cognitive functioning. These were noted by my neuropsychologist who supported an application to study for a Masters degree in mindfulness-based approaches to provide further rehabilitation while investigating the role of meditation for rehabilitation in real-time.

As a student/researcher I assessed myself, the participant, experientially during the first-year core curriculum mindfulness foundation module. Formal practices included the body-scan, mindful movement and sitting meditation supplemented with short sensory, mind evaluative exercises, discussion and academic research. Subjective results were recorded and described through the prism of TBI, a condition that cannot be qualified by RCT's (Maas et al., 2013) using mindfulness, which, as a science, is still being invented (Grossman, 2019) based on cultural meditative practices that are philosophically esoteric (Phan et al., 2020). As reductionist science is conservative (Mah et al., 2018) these study areas and the researcher/participant relationship are marginalized. Autoethnography is a qualitative research method that gives a voice to the marginalized by allowing the positioning of self, as researcher and participant in relation to society framed by a process (Wall, 2006). The process spans a

gradient from non-analytic, self-absorbed, emotionally evocative introspection to a more objective explicitly defined analytical goal (Vryan, 2006). A balanced inquiry relies on the full spectrum, self in society provides the story, self as researcher defines the data, the reader however decides the context from their own unique perspective (Stahlke Wall, 2016).

The overall aim of this study is to take the reader into the harsh reality of brain injury, through the failing mainstream system countered by alternative functional choices and meditative practices bringing self-realization and hope, catalysts for change (Snyder, 1995) and rehabilitation. Captured and exposed by autoethnography "stories are a gift of living testimony" (Ellis & Bochner, 2006, p. 430); my human story will enter dimensions of brain injury and the processes of reestablishing identity and self within society. The focused aim is to assess the role of meditation during brain injury rehabilitation.

Method

Participants

I am the sole participant in this study. Demographically I am in the 50-60 age range, white, educated to BSc. Honors level and living alone in a rural area. I sustained a TBI in 2017 and have progressively rehabilitated sensory processing and cognitive functions over five years. Before the injury I was fit, healthy, socially engaged and in full-time self-employment with a positive life outlook.

Measures

Autoethnography is a research method that has no direct measures (Snuggs & De Meulenaere, 2021) but relies on a range of data that can be categorized and further contextualized (Chang, 2016). I am mindful of the variety and quantity of data in this study which spans from July 2017 to February 2023, from suffering brain injury, through rehabilitation to the present data analysis. The nature of the injury prompted legal action, all medical and subjective brain injury experiences are recorded as evidence in official documents; independent internet use and research is stored in SM posts and search histories; formal academic and experiential research in mindfulness-based approaches and teacher training is logged in journals. To enhance the reader's understanding (Perrin, 2021) the data sets are presented in Table 1.

Table 1.

Data sets and categorizations.

Data sets.	Categories.			
	Dates.	Source.	Media.	Type of data.
Medical.	July 2017 to February 2023.	MHC, ML, PHC.	Medical records, legal documents.	Textual.
Internet.	August 2017 to February 2023.	Search history, posts.	Websites, SM platforms.	Textual, audio, visual.
Mindfulness.	October 2020 to September 2022	Experiential, research, teacher training.	Journals, assignments.	Textual, memory.
Personal.	July 2017 to February 2023	Lived experience.	Notes, worksheets, progress records, journals, images, diagrams.	Textual, visual, memory.

Note. Abbreviations: Mainstream Healthcare (MHC); Medico-Legal (ML); Private Healthcare (PHC); social media (SM).

Research design

The research method is autoethnography which places the self as both researcher and participant in a societal context within the research (Farrell et al., 2015). Researcher status is described as accidental when participating in a societal group by default with no research intention or deliberate when joining a group with a stated research agenda (Anderson, 2006, p. 379-380). This study analyzes the data from both positions, firstly as a brain injury sufferer engaged in a rehabilitation journey and secondly as a student/researcher with the stated aim of practically investigating the rehabilitation journey. The accidental status timespan ranges from July 2017 to October 2020 and the deliberate status from October 2020 to February 2023.

There are multiple subject positions and perspectives in the data; layered accounts enable

multivocal impressions to be integrated and interpreted by the author and reader (Poulos, 2021, p. 68). Layered accounts are variations of evocative and analytical autoethnographic styles, the analytical style provides a societal framework, a wider story narrative, while evocative accounts explicitly express the self, reflexively, in response to the societal context (Vryan, 2006). The analytical aspect, the social structures in this work, are complex and includes data that is concurrent, along the rehabilitative timeline and consecutive, between the accidental and deliberate researcher statuses.

Procedures

Data analysis is the autoethnographic process (Chang, 2016) and by being mindful of the research aims, revealing the societal structures influencing rehabilitation and investigating the role of meditation, the research can be narrowed. As time is the most reliable variable in longitudinal research (Street & Ward, 2012), concurrent medical data will primarily include the date with categories of source, expertise, diagnosis/opinions and comments; internet search history data will be selectively included in the narrative.

In addition to the concurrent data, medical records and internet search history, consecutive data from MBI training and experiential records primarily outlines individual practice with categories including timespan and observations providing a third layer. The fourth layer, an interpretive reflexive narrative of personal data collected along concurrent timelines, aims to bring a rich detailed account of influences prompting decision making, directional change and rehabilitation strategy formation. The concurrent comparison with MBI research provides the platform to unfold the role of meditation in the rehabilitation process. The work will be supported by peer reviewed literature from searches using Google Scholar and University Library resources with additional general internet searches, websites, SM, books, magazines, personal journals, images and memories.

Ethical considerations

The ethics application 2022-17252 for this study was approved by the School of Psychology Ethics and Research Committee, Bangor University in November 2022. The research adheres to the British Psychological Society (BPS) "Code of Human Research Ethics" (Code of Human Research Ethics, 2021a) and respects the dignity and privacy of individuals, groups and community structures (p. 7). The author is the sole participant and under BPS considerations (Code of Human Research Ethics, 2021a), the study has minimal risk.

Autoethnography employs analytical and evocative methods (Vryan, 2006) to unfold societal structures (Anderson, 2006) and self-identities (Denzin, 2006) respectively. Self-exploration exposes society for constructive criticism (Keleş, 2022); societal structures in this work includes data from the MHC, PHC and ML bodies, MBI research and teacher training institutions, members of the public and digital media sources: internet search histories and SM interactions. Data from internet search histories and SM platforms are in the public domain (Code of Human Research Ethics, 2021b, p. 9) and with reasoned judgment (Code of Human Research Ethics, 2021a, p. 9) the webpage content has cultural value to inform the research aims. However, peer-to-peer SM communications between users and user groups will be protected by creating generic composites (Andrew, 2020) or by anonymizing individual posts and comments to provide context. Confidentiality will be maintained across all societal data under the BPS ethical code 2.1 (Code of Human Research Ethics, 2021a, p. 7) by anonymizing the names of groups, agencies, communities and individuals for the researcher/participant to emerge.

As the researcher is also a participant in this autoethnographic study the risks were evaluated in the BPS code (Code of Human Research Ethics, 2021a). Potential risks include the analysis of past traumatic events and revealing confidential information, both may induce emotional and psychological harm (Poulos, 2021). The trauma has been resolved along the rehabilitation journey and the risks are considered minimal, however, to mitigate any eventualities, personal mindful practices, friends,

clinicians and the thesis supervisor are available for support. A balance between the benefits to society and personal embarrassment (Flippo, 2018) when revealing confidential information will be considered and discussed with my academic supervisor throughout the thesis writing process.

Data Analysis

Autoethnography is a balancing act between analysis and interpretation of data (Chang, 2016) and is often criticized for lacking rigor (Wall, 2006) because most accounts derive data from unreliable sources (Keleş, 2022). The primary data in this research was collected prior to study commencement and is documented in four layers; medical records, internet search histories, MBI training results and personal accounts. However, while retrieving the data my emotions and thought processes dramatically shifted. I stopped, sat and freely wrote the experience in a stream of consciousness style (Schultheiss & Brunstein, 1999), converting the implicit to the explicit in textual vignettes. But rather than gaining insight, my research bearings changed by becoming overcomplicated and confused. It reminded me of Duarte & Hodge (2007) on a field trip where the methodical plan for their work was lost to the power of experience when collecting and analyzing data. I had thought that by objectifying my data a personal truth would be delivered. But the truth I expected did not appear and instead I am describing difficulty with the autoethnographic process which is encouraged (Adams et al., 2022, p. 11). Autoethnography is difficult to grasp when reading it as a theoretical research method but now the writing has started some other energy has taken over and is trying to find a voice. To rescue this autoethnography (AE) (Atkinson, 2006) I need to add another layer to explain my position in this work because after a brain injury self-identity is lost (Villa et al., 2021).

Results

The results section begins by describing self-identity from my brain injury perspective, The Neurological Self. From this position the layers unfold a societal relationship with the mainstream health and legal systems is presented in The Injury. A concurrent glimpse into identity and the phenomenological experience of living with a brain injury unfolds through The Internet Part 1, Cosmic Interlude and the Internet Part 2 where a rehabilitation strategy including meditative techniques emerges. The role of meditation in brain injury rehabilitation consecutively unfolds in The Classroom, this Masters course in Mindfulness-Based Approaches. As this work includes longitudinal medical data, dates that include month/year in numerical, 00/0000 format refer to Appendix A. Other dates will be designated month or season in words with the year in numbers, word/0000.

The Neurological Self

Unboxing the research data had created a crisis and I realized that in my position as the deliberate status researcher (DSR) (Anderson, 2006), the student researcher with a methodical plan, I was going to unfold the data to fit the research method. But the accidental status researcher (ASR) (Anderson, 2006), my experiences of living with a brain injury without a research agenda, had reflexively emerged and was alternatively manipulating the method to fit phenomenological experience. As theory and experience conflicted, I became confused about my sense of self. But there is no agreed definition of the self (Swann & Bosson, 2010) and as interpretation depends on perspective, mine is about recovering from brain injury.

From a neurological perspective the brain is self-assembling, meaning self-identity is directly integrated into its structure (McGilchrist, 2019; Schiffer, 1998; Sperry, 1961) and function (Dresp-Langley, 2020; Frewen et al., 2020). However, after TBI, self-identity is lost (Villa et al., 2021) because neural damage disrupts the structure and function of the brain. After my TBI I experienced an altered

sense of reality that other people with TBI have described as a place of "(un)belonging" (Smith, 2005, p. 187) or an esoteric (Penner, 2014), vibrational (Gombay & Andrews, 2021) and unconscious reality (Shankar, 2018). However, brain injuries are unique to the individual (Maas et al., 2013) and Figure 1 provides an original diagrammatic representation of my pre-accident, post-accident and three years post injury experience. The diagram characterizes my interpretation of brain injury and can be used to outline the neurological identity profiles of the ASR and DSR. Figure 2 provides a clearer updated derivation of Figure 1.

Figure 1.

Spheres of awareness, mind/brain functions and content. Original diagram, Spring 2020.

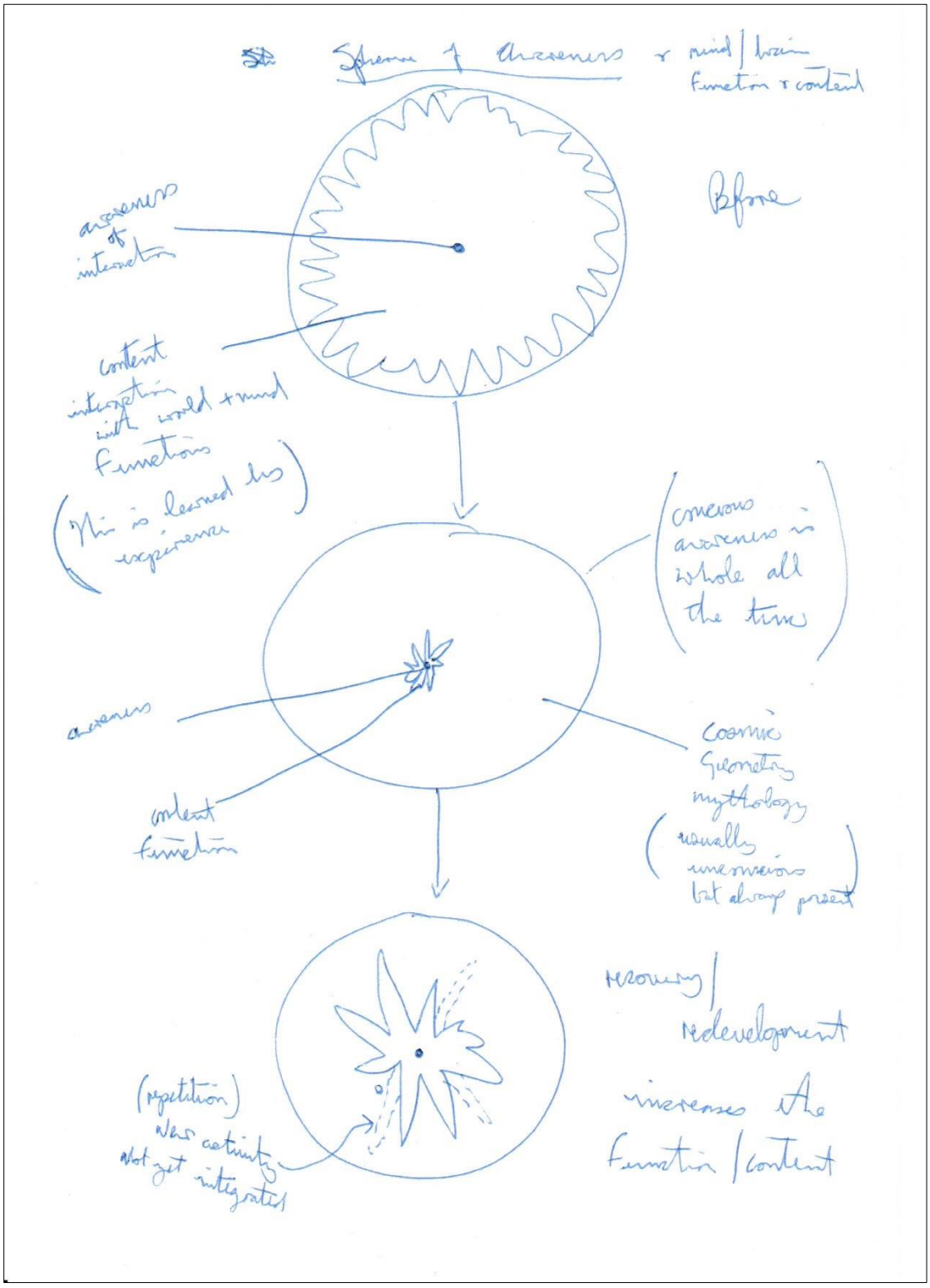
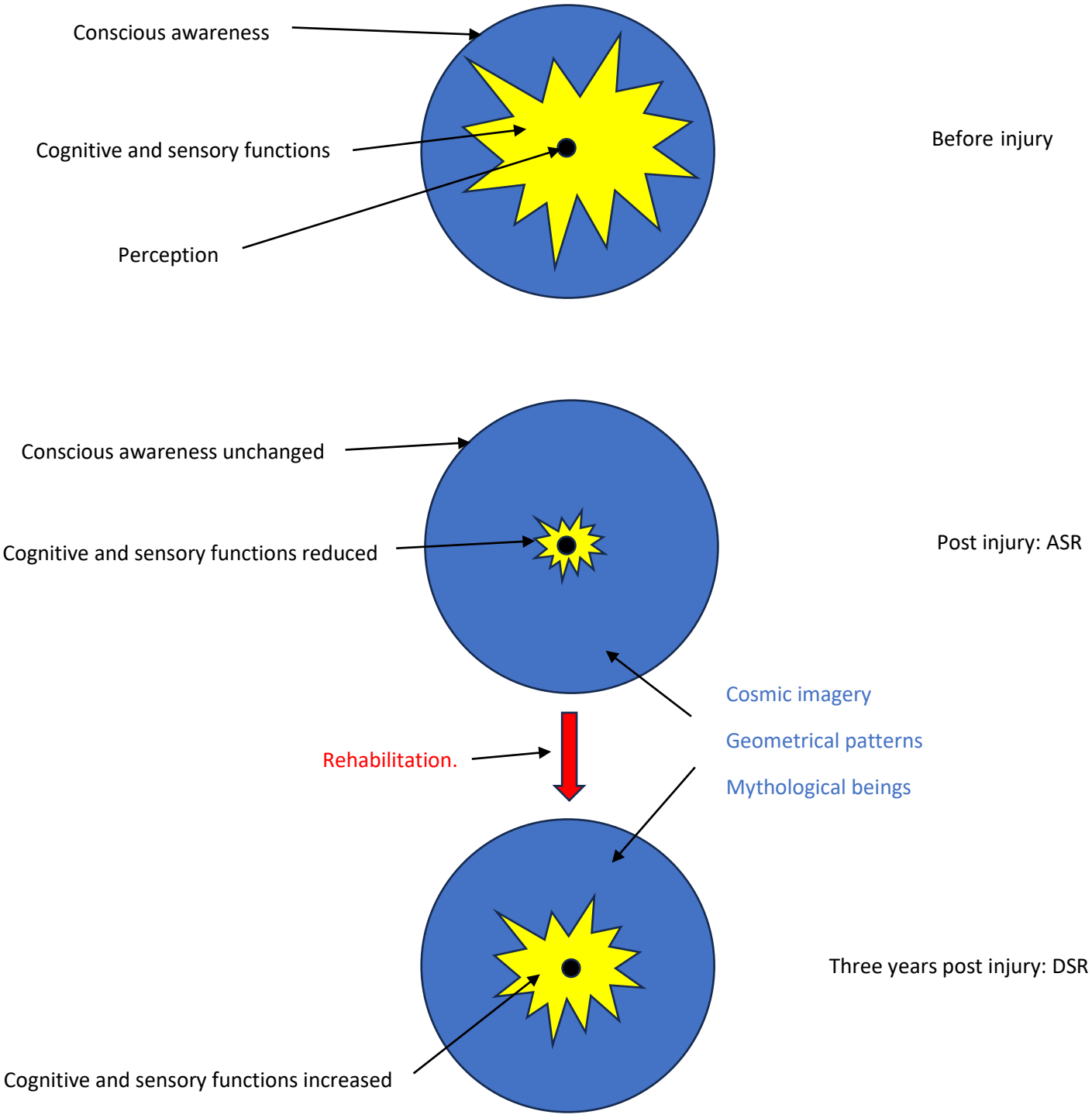


Figure 2.

Spheres of awareness, mind/brain functions and content. Updated version.



To provide clarity for the reader, the diagram has three descending circles that represent spheres of conscious awareness and the neurofunctional content within. The top sphere is an interpretation of pre-injury experience with sensory and cognitive functions represented by the yellow jagged shape. The dot at the center is perceptual awareness. The middle sphere represents the post injury ASR with reduced sensory and cognitive functioning that correlates with the loss of self-identity (Villa et al., 2021). The loss of functions and identity in my experience corresponds with an expansion of conscious awareness, also called “going wide” (Mardula & Vaughan 2020, p. 211). This is a phenomenological void with altered realities, cosmic travel, geometrical patterns and interactions with beings in places beyond the realms of normal imagination. The bottom sphere depicts an increase in sensory and cognitive function three years post injury, the recovering self, the DSR, within the sphere of conscious awareness. The additional dotted lines in the bottom sphere of Figure 1 are induced sensory and cognitive functions, the product of rehabilitation.

To further characterize the ASR Figure 3 outlines the original interpretation of symptoms in my own words seven months post injury. Table 2 provides a translation in a Word Document for clarity. The main headings from top left to right include: goldfish bowl head, the simultaneous view of internal and external experience perceived in the here and now; the black hole, describes blacking out with a note that I am still conscious inside; memory 1, means nothing can remembered from one moment to the next; memory 2, describes how performing future activities cannot be remembered; surreal imagery, reflects cosmic travel, emanating colors and altered realities; jumble process, means all actions and thoughts get jumbled up; eyes not focusing, are visual dysfunctions; flashing lights, are multifaceted from sparkles to auras to large luminous flashes; arm, means the sensation and function in my left arm was lost; side of head, describes hypertension over the head, drooping skin on the face, pain in the ears and jaw joints.

Figure 3.

Symptom descriptions, March 2018.

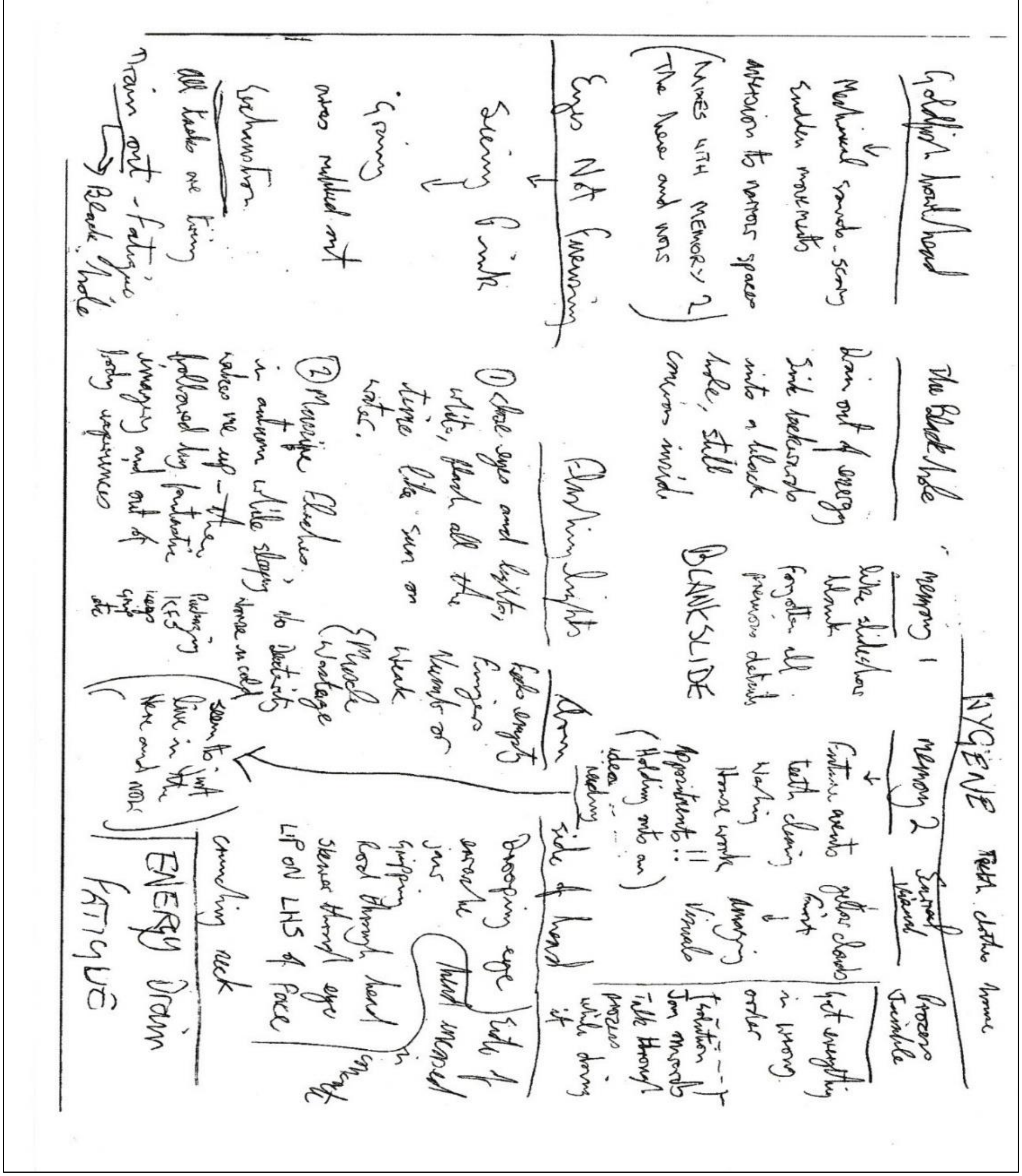


Table 2.

Word doc. Translation of Symptom descriptions.

Symptom heading.	Symptom descriptions.
Goldfish bowl head.	Mechanical sounds - scary. Sudden movements. Aversion to narrow spaces (Mixes with memory 2). (The here and now).
The black hole.	Drain out of energy. Sink backwards into a black hole, still conscious inside.
Hygiene.	Teeth, clothes, home.
Memory 1.	Like a slideshow blank. Forgotten all previous details. BLANKSLIDE.
Memory 2.	Future events, teeth cleaning, washing, housework. Appointments!! (Holding onto an idea).
Surreal visuals.	Yellow clouds first. Amazing visuals.
Process jumble.	Get everything in wrong order. (Solution [unreadable word] onwards). Talk through process while doing it.
Eyes not focusing.	Seeing pink. Grainy. Areas rubbed out.
Flashing lights.	1) Close eyes and lights, white, flash all the time like sun on water 2) Massive flashes in Autumn while sleeping wakes me up – then followed by fantastic imagery and out of body experiences.
Arm.	Feels empty. Fingers numb or weak. No dexterity. Worse in cold. Packaging, KFS [knife, fork, spoon], [unreadable word], grip etc.
Side of head.	Drooping eye, earache, jaw, gripping. Rod through head. Skewer through eye. Lip on LHS [left hand side] of face. Crunching neck. Side of head encased in concrete.
Exhaustion.	All tasks are tiring. Drain out – fatigue. Black hole.
Reading.	Seem to just live in the here and now.
Energy drain.	Fatigue.

The conflict in self-identity arises because on one hand the ASR represents my lived experience of altered realities and cognitive dysfunction that blurs between transcendental and hermeneutic phenomenology (Neubauer et al., 2019), respectively the nature of consciousness and components of

being. On the other hand, after partial rehabilitation, the DSR has emerged with increased neurological functioning and is trying to rationalize the brain injury experience and rehabilitation process in this work. In other words, this crisis in identity is caused by analyzing data from two perspectives, subjective experience by the ASR and objective rationalization by the DSR. But this is complicated by the neurological perspective because it reflects the conflict between experience and reasoning as functions of the brain. However, this voyage of recovery is about resolving this conflict through rehabilitation and assesses the role of meditation in the process. It offers a personal glimpse into the reality of the brain injury experience, but we start by exploring my injury through the medically authoritative eyes of others.

The Injury

While driving in July 2017 I had to break hard to avoid a stationary vehicle in the road. I remember being forced over the steering wheel and shifting leftwards to look in the rear-view mirror. I saw a flash of white as a van ploughed into the back of my car and my head whipped back hitting the driver's seat. As I drifted between consciousness and unconsciousness, I heard voices telling me an ambulance was coming. The sound of sirens and a commotion outside caused energy to surge through my body and I crawled over the passenger seat to get help.

At the thought of describing the medical response the words stupidity, incompetence and liars came to mind as gut-wrenching anger unraveled with images of obese nurses, laughing nurses, shouting nurses, bright lights, doctors, consultants, CT scanners, MRI scanners, vision tests, surgeons, assessments, manhandling and physical assaults. I hear verbal abuse insinuating I am a problem patient with psychological and psychiatric problems suffering from migraines and that I am making it all up, malingering. As these signs of trauma manifest (Bourne et al., 2013) they provide a testimony of reactive experience (Tamas, 2009), but this may bias the research (Poerwandari, 2021) and it is more appropriate to present my medical records for analysis and interpretation.

Over five years of medical and medico-legal (ML) records were systematically described in a table and presented in Appendix A for research validation (Lee, 2019) and reader reference. The data is categorized by date, month and year; institutional data is from mainstream public healthcare, private healthcare and medico-legal assessments. The data is further subcategorized into areas of medical expertise, diagnosis/opinion and written comments.

A sense of order was generated while sifting the data and the images from past experiences ceased. But as I filled in the table, inferences leaped off the page answering longstanding assumptions and the imagery returned. Rather than reacting I wrote these events in a stream of consciousness style which evolved into the reflexive process that proved therapeutic (Hernandez et al., 2022). As my thoughts and emotions untangled in text, I realized I was not being objective but was looking for someone to blame instead because the medical response had created more trauma than the accident had on that day in July/2017.

Back at the crash scene I remember crawling out of the car and the attending paramedic refused to treat me because I had exited under my own steam and there was no blood or broken bones. That was the protocol apparently, but in the accident and emergency (A&E) unit the next day, I was berated for not standing up to the paramedic because all head injury cases are supposed to be taken to hospital (NICE, 2014). Reading the NICE guidelines, however, I realized A&E did not follow the recommendations either because they missed my levels of consciousness, did not check my senses and while they conducted a CT scan of my head, they forgot to scan the cervical spine. I was diagnosed with concussion and sent home.

Over the next week my condition deteriorated and I went to my GP 08/2017 who described my symptoms as cranial hypertension, left-sided weakness, slurred speech, memory problems, visual distortions, physical fatigue, cognitive fatigue and nausea. The records show the GP could not access the medical regulations and I was sent back to A&E for reassessment. A CT scan of the head revealed no

abnormalities and I was sent home again. The picture emerging from the medical records indicates the national guidelines for assessing head injuries (NICE, 2014) were not being followed. Consequently, I am unsurprised to find my health authority had been placed in “special measures” (Fulop et al., 2020, p. 143) for over a decade, meaning they lacked adequate diagnostics, treatment and care which puts patient welfare at risk. My GP however did refer me to makeshift public/private schemes for left sided neuropathy and visual distortions.

I was assessed independently for neuropathy by a private osteopath and physiotherapist; both suggested the problem was caused by cervical and thoracic spine damage. These suggestions, however, were ignored by the public health service who mutilated my left arm in a surgical procedure to realign the ulnar nerve at the elbow. It made no difference and in a later consultation, cervical and thoracic spine damage was found in CT and MRI scans; but the damage affected my right side, the left sided neuropathy was dystonia, spastic like spasms (Prudente, 2014) caused by brain damage.

Meanwhile the visual distortions were assessed by a private vision specialist who suggested they were neurological in nature and I was referred back to the health service for MRI scans of the optic nerves and occipital lobes. At the hospital, however, an ophthalmologist carried out a simple eyesight test and suggested the visual distortions were psychological. I protested because I was there for MRI scans, but staff at the clinic manhandled me to the door and pushed me into the corridor. I remember holding onto a wall for balance with a feeling of disbelief and my trust in the health system evaporated.

I registered at a new GP practice a year post injury to get a second opinion and the GP, following the protocol, referred me to the local brain injury unit for a neuropsychology test and for a separate neurology assessment at a center of excellence in another health authority. At the center of excellence, 18 months post injury 12/2018 I was diagnosed with a brain injury and my assessment at the local brain injury unit 03/2019 revealed: reduced cognitive capacity, executive dysfunction, an inability to store and retrieve information, aphasia, cognitive fatigue and sensory overload. I was told I would never recover,

that there was no point in rehabilitation and that I should learn to accept my condition; I was disabled.

After the accident I could not work and my legal insurance was pursuing a personal injury claim (Ministry of Justice, 2021), consequently my injuries were also being assessed by the legal system. An initial ML assessment in 09/2017 reported that I had suffered a contrecoup head injury (King, 2000) with cervical spine damage, cognitive dysfunction and hypersomnia indicating a severe TBI. I was referred to a neurologist on 04/2018 who could find no evidence in my medical records and suggested my symptoms were caused by an unknown post-traumatic event. A different neurologist on 09/2018 confirmed there was no evidence in my medical records but continued the assessment with verbal abuse, character assassination and accusations of fraud and malingering. I protested but was manhandled to the door and pushed out of the building.

I had to pause while writing this because anger was rising and flashing images returned with memories of wanting to violently assault this person. But I steadied myself and being mindful of the therapeutic writing style (Hernandez et al., 2022), transferred the anger to words in a stream of consciousness followed by reflexion. Subsequently, I realized the behavior of this neurologist in my memory is the main trigger for reliving trauma. However, in his report the expert opinion was that my condition was psychological and he referred me for a psychological assessment. The psychology assessment on 12/2019 considered my updated medical records and suggested my symptoms were neurological. This contradicted the neurologist who then reassessed the evidence, 05/2020, and suggested that if the symptoms were not psychological, they were psychiatric instead. The argument went to a pretrial hearing where a judge recommended a psychiatric assessment, 12/2021, which concluded my symptoms were either neurological or had been a sophisticated invention. The case was settled out of court two weeks before the main court trial in May/2022, five years post injury.

I did not feel like a winner though because the only thing that emerged from this long-drawn-out process was trauma caused by the inadequate medical response and the psychological torture of

legal process. As AE challenges societal flaws (Keleş, 2022) I feel vindicated for exposing my trauma because both institutions, in respect to brain injury, were found unfit for purpose in the UK parliament (A strategy for acquired brain injury. n.d.; Keegan, 2021). Consequently, after my experiences, I am skeptical of medical experts and institutions and agree with Lowry et al. (2022) who suggests the medical system lacks funding for expertise and services. While Keegan (2021) confirms my truth, we can deduct from the legal evaluation, on the balance of probabilities (Redmayne, 1999), that my symptomology: the loss of sensory and cognitive functioning, represented by the jagged yellow symbol in Figure 1 and their manifestations reflected in Figure 3: visual processing, reduced cognitive and executive capacity, retrieval and storage of memory, aphasia and dystonia are the neurological components of the identity profile of the ASR. Vestibular dysfunction and damage to the cervical and thoracic spine are physiological additions while the psychological reactions exposed in this layer are secondary responses to the health and legal systems. As the health system offered no rehabilitation, I found alternatives on the internet instead.

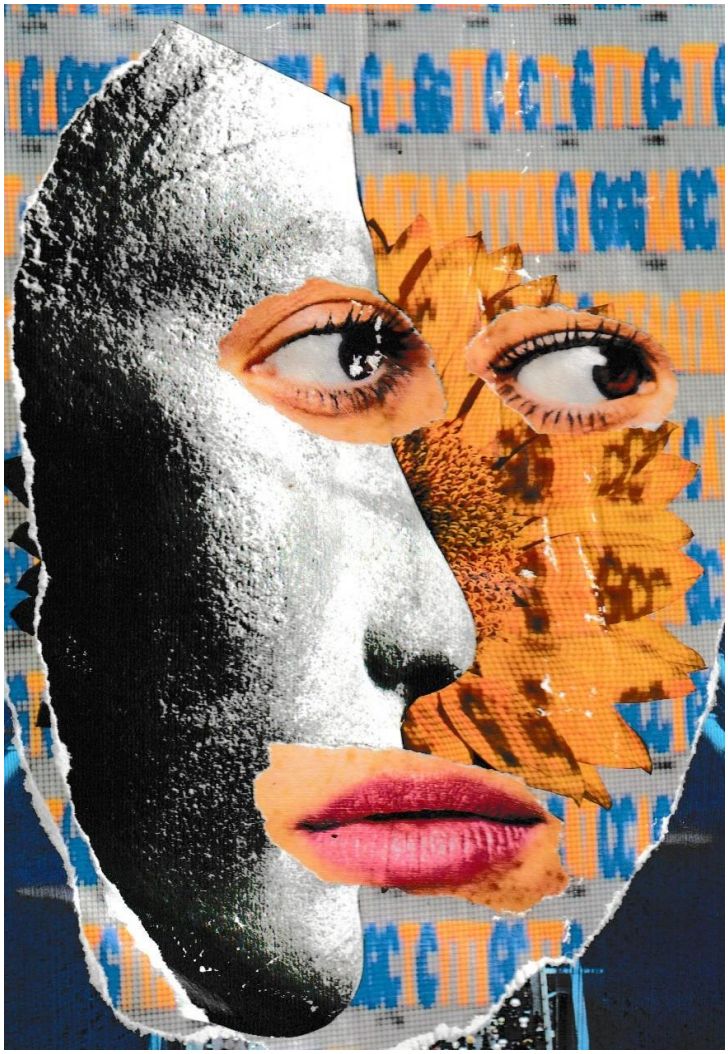
The Internet

The timeline of this layer runs concurrent with The Injury layer to provide an alternative view. Following a brain injury identity is lost (Villa et al., 2021) and in this short layer I intend to unfold this change and explore my neurological identity from images of my pre and post injury life on the social media (SM) platform Instagram. Theoretically by scrolling through my Instagram account I can glimpse myself from snapshots in time and see any change. Before my injury the images show socially conservative scenes with friends, horses, mountains, lakes and work content. However, post injury, August 2017, there is a radical change because images of surrealist collage art appear. An example is shown in Figure 3; as our digitized presence reflects identity (Atay, 2020) and surrealist art depicts the embodied self (Stokes, 1983), this image represents a shift from my preinjury self to the ASR. The face is assembled from gene codes, a sunflower, a carving of a face with eyes and lips linking the paper layers

together. These are the material components of life (Remick & Helmann, 2023) and as my mind fragmented so too was the nature of my perceived reality.

Figure 4.

Surrealist paper collage August 2017.



After the injury I remember ripping up pictures and gluing them together in some automatic process that Breton et al. (1934) suggests is a process of trying to make sense of experience. I don't remember any thoughts or emotions it was just something I did. 17 subsequent images become more

surreal with jumbled life forms, chemical elements and scenes from the cosmos but in September 2017 the imagery stopped. The last picture depicted energy and matter floating in the cosmos. This reflected my experience because my reality had deconstructed, I did not know who or what I was anymore; I had become elements in the universe. I remember collapsing with bright flashing lights and star bursts in my head; I had no balance or spatial orientation and my whole body vibrated with resonance. I was alone, scared and thought I might die, but there was nothing I could do, so I offered gratitude for life and just let go.

Cosmic Interlude

The cosmos opened in brilliant blackness and green globular forms, like the effects of an oil lamp, flowed through my mind and took me with them in a transportive rush. I was ejected into a black expanse and kept going to infinity where nothing existed except the awareness of consciousness in a timeless nothing. Then a blue orb and a gridwork of yellow and red dots appeared, the orb started spinning and the dots constructed geometrical patterns. But my awareness was pulled backwards, past animals, mythological beings and dead family members who were grouped together observing me. I became consumed by spiraling auroras of color, galaxies, stars and electrified granular comets until I sensed euphoria with a rhythmic resonance as the room reemerged around me. There was a sense of innocence and I bathed in its presence with the eternal comfort of knowing something else existed until I fell asleep.

This event has elements of the near-death experience relating to consciousness (Camelo, 2022), dream states, memory (Lin & Xiao, 2022, April) and spirituality (Chiles et al., 2021). But in the context of brain injury these altered states have been generalized as mental health conditions (Howlett et al., 2022) or delusional hallucinations (Rossell et al., 2010). However, in my experience I woke up to a strange new world and was confused by the sight of my hand on the bed because I did not know what it was. Then my body got up and transported my awareness through doorways to a tap and began

drinking water. There was a face in the mirror, it was familiar, but I could not work out what it was either. The body took my awareness back to bed, the globules returned, the cosmos reopened, but this time a translucent body appeared and systematically assembled body parts before awareness descended through auroras to energy fields, euphoric resonance and reawakening followed by sleep. For two months this became a pattern, my body would get up when I woke, would drink, eat, go to the toilet and venture about the rooms in my house. Everything experienced would visually reconfigure in the cosmos later. I began to remember these activities and events but other than what I had directly experienced nothing else existed except for being at one with the universe. If I was in one room, I could not imagine what was in another; I knew something was there but could not remember or visualize it. In the cosmos I began seeing images of my body in rooms floating in space and I began to question whether I was seeing anything at all. I became convinced that my experiences were constructed in my head and when I walked about, I thought I was walking through rooms in my mind. Then one day in December 2017 I opened the front door of the house and went outside by myself.

It was a dark overcast day as I walked along a wooded track next to the lake where I lived and it was hard to comprehend whether I was walking outside or through a vision in my mind. But as the wind blew, I became the wind; I sensed cold and I became the cold, I became the lapping water and the branches on trees; my consciousness became everything and everything became my consciousness. At home, these experiences were visually configured in the cosmos and after more walks I started to become familiar with my environment. I went to the village where buildings warped, paint on the roads radiated colors and round manhole covers spun like vortexes. When I met people, their faces moved like melting wax and when they spoke, I seemed to understand what they said from their movements. But I felt dumb because other than a few brief automatic responses I could not think or find words for conversation. I realized it was not just words I could not remember but most of my past and any ideas for the future were gone. I only existed in the here and now, the present moment.

Overall, this early period seemed like my brain networks had been disconnected. Based on current head injury research it may have been the acute phase (Livernoche Leduc et al., 2022) of traumatic axonal injury (Jang & Byun, 2022) that disrupts neural signaling and it may have caused a secondary brain injury (Lazaridis et al.,2019) characterized by the cosmic death phase. But after my rebirth my body acted with primal instinct to survive and with repeated exposure to my environment my brain was reconstructing itself, my reality and identity by neuroplastic change (Gulyaeva, 2017). While the health service did nothing, someone from my local community, seven months post injury, helped me contact a brain injury charity. They understood my experience, sent booklets that explained the symptoms, advised me to keep a diary of events and to search the internet for rehabilitation techniques.

The Internet Part 2

Social media platforms provide community for people with brain injuries through shared experience (Brunner et al., 2023) and are a good source of rehabilitation tips (Bond et al., 2016). I searched YouTube and found *The Ghost in my Brain.* [video] (Elliott, [Ethical Humanist Society of Chicago]. 2016, October 23) where an artificial intelligence professor told his truth about TBI and recovery. He explained that mainstream medical science psychologized his symptoms and told him nothing could be done. But he found alternatives, neuroplasticity techniques that enabled him to retrain his brain and one technique involved neuro-optometry for treating visual processing dysfunctions.

The health service had psychologized my visual dysfunctions on 09/2017 and while I was skeptical, I had nothing to lose and found an optometrist on the internet. I got tested on 10/2018 and was diagnosed with occipital lobe damage, prescribed glasses with tinted lenses and my visual distortions reduced instantly. What Elliott, [Ethical Humanist Society of Chicago] (2016, October 23) had said was true, so I searched for more techniques and tried brain training apps, puzzles and games but I just got good at doing them, nothing else changed in real life. I tried drawing the four basic shapes:

circle, rectangle, triangle and cylinder in two dimensions, three dimensions and sensed an underlying change. I tried walking bare foot in nature, the effects were tangible on body posture, releasing tension and general wellbeing. I began learning to touch type to stimulate my left-hand finger functions and redevelop computer skills. This was the surprise package because it trained far more than physical action; as letters became words, the repetition improved spelling and sentence structure but unlike speech, where I struggled to find words, they flowed through my fingers with ease. Typing became my voice and my voyage of recovery was recorded in an online journal.

The journal describes daily routines, time frames for living, the sensations of barefoot walking, drawing the basic shapes, visions of the cosmos, altered realities, beings from other dimensions, variations in symptomology, neural dysfunctions and about typing itself. By describing daily events, observations and thoughts I was creating memories for tasks and actions. These transferred to life because I began remembering to wash, do the laundry, go shopping and go to appointments. As my mind was processing more information the cosmic mind space was shrinking reciprocally. I typed about a listening technique that I called The Foyer Between the Worlds, an internal mind space between cosmic and real-world functions that allowed me to concentrate on the words from YouTube videos. Consequently, my capacity to understand speech improved. I listened to neuroscience lectures, learned about the hemispheres of the brain, functional organization, dendrites, axons and neural networks; I learned that self-identity is an accumulation of automatic functions constructed by interconnected networks and that most TBI's cause axons to sever, destroying automatic functions. However, if these functions were lost, they could be rebuilt through repetitive retraining. In further research I found *The science of meditation|Catalyst.* [Video] (Phillips, [ABC Science]. 2016, June 8) which explained that the structure and function of the brain could be changed by practicing meditation. I thought that if this was true then meditation should help rehabilitate neurological dysfunctions. I became intrigued and watched traditional overviews of meditation from Vivekananda, a modern Vedantic, Hindu-based

tradition (Vivekananda Samiti, IIT Kanpur, nd) with links to a university module (NRCVEE IIT Delhi, nd) for practically applying meditation to real life tasks. The module provided scientific explanations about meditation techniques for students to improve cognitive abilities and increase concentration capacity for their work. Descriptions of conscious awareness and the layers of mind body phenomena in *Who am I*. [Video] (Divyandaprana, [NRCVEE IIT Deli]. 2019, October 30) were like my layers of phenomena, sensory and neurological functioning from my recovery journey. Another video confirmed meditative practices induced and augmented neural restructuring in *Vedantic Perspectives to Modern Neuroscience*. [Video] (Divyandaprana, [NRCVEE IIT Deli]. 2019, November 18). I began to understand my brain injury through combinations of neuroscience, traditional Vedanta and modern scientific descriptions of meditative practices. I started experimenting by mixing rehabilitation techniques with concentration meditation and with practice my recovery accelerated. To learn more, I attended an eight-week MBCT course in Autumn 2019 to see if it would improve my cognition. But the course was a disaster, the venue caused sensory overload, no one understood my perspective and it seemed to be more about emotion than cognitive skills. But I found the sensory exercises and walking practices helpful and applied to Bangor University in spring 2020 to study mindfulness-based approaches at the Center of Mindfulness Research and Practice (CMRP) to find out why.

The Classroom

The course was part time over three years, taught online and was comprised of modules including Buddhist Background, Mindfulness and the Brain, Research and in the first year The Foundations of Mindfulness which included eight months of experiential practice. I approached the experiential component with a committed open-minded attitude. The home practices included: guided body scan (BS) for seven weeks; guided mindful movement (MM) for two weeks followed by alternating MM for two days and one day BS for five weeks; unguided sitting practice (SP) for two weeks followed by unguided alternating SP, MM and BS for five weeks. Sensory exercises (SE), noticing pleasant (P) and

unpleasant (UP) experiences and the three-minute breathing space (3MBS) were interspersed over the formal practice time periods. I kept a journal and the main observations for each practice are presented in Table 3. As I had annual neuropsychology tests, they could provide an informal measure for evaluating any change over the year. The assessment on 07/2020 that shows sensory and cognitive impairments is used as the baseline.

Table 3.

Experiential practices and observations.

Practice.	Observations.
BS.	A difficult practice to maintain with a distinct common pattern. I could follow the guidance at the beginning but when moving to the left leg the guidance drifted off and became incomprehensible. After this my awareness shifted to typical cosmic experiences. Occasionally I was aware of pain over my head, in the ears, jaw, neck, right shoulder, lower back and down my right leg. Within the cosmic mind space these often appeared outlined in color coded body parts in a translucent body. During the BS I would come back and reengage with the guidance towards the end, around the upper regions of the body, shoulders and head. I found the BS confusing because rather than experiencing my body I lost it for most of the practice and did not want to continue, it seemed a pointless exercise. I had to introduce a pre-practice routine of mindfully preparing my intent to continue. However, the same pattern of experience repeated most of the time and at other times I would hear the guidance intermittently, experience mind wandering, notice twitches down my left arm and be aware of my body lying on the floor. I developed a practice of sitting aside after the BS to bring these experiences to mind.
MM.	This practice was initially powerful and problematic at the same time. I could fully engage with the movements, sense gravity, tingling sensations in the body area that moved and felt awkwardness in many positions as if my body did not belong in the position. I noticed when standing that my feet, although correctly aligned, felt out of place and my right foot in my mind was four to six inches behind the left foot. If I allowed my mind to choose where to locate my foot it moved backwards, but if I looked, I had to force my foot forward to be visually realigned again. While laying down my body felt awkward and out of place in most positions. For the first ten days I thought I was triggering neurological symptoms because the tension in my neck and over the skull got worse; my face had no feeling, my ears and jaw joints were painful; sciatica in the right leg got worse and my lower back felt strange. Away from the practice my balance and spatial awareness became problematic. At night in bed, I would wake up in pain, the bed sheets would be tangled around me as if I'd been writhing and in awakened dream states two translucent neon blue bodies contorted in an invisible container that floated in space. After 10 days the dream figures did not appear anymore, I was no longer writhing at night; my issues with spatial awareness and balance lost prominence; the movements in all positions felt less awkward; the sciatica pain reduced; the areas of tension, ear and jaw pain reduced and sensation was returning to my face. However, my right foot still felt four to six inches out of place when visually it was in line. I also noticed that my arms when raised horizontally were at

vastly different levels when I looked at them, but in my mind, they were level. It was as if my body had been skewed and fixed in an unnatural position. However, after ten days there was a significant all-round change and I began noticing more sensations as if for the first time.

MM/BS. MM continued and I was becoming more aware of different sensations, heat, touch, pulsing, damp clammy hands, tingles, judders. The prominent thought about this practice was that I was re-sensing my body as if I had lost the ability to sense it after the accident. I became more aware of misalignment but also realized some of the exercises were readjusting my body. This was very noticeable when standing on one leg because it was very shaky at first and over time it was as if the exercise itself was making my body stronger and able to do the exercise more easily. The postural contortions were making the muscles stronger and I was able to hold positions. However, during the floor exercises a week into the alternating practices tension grew in the shoulders, head and neck areas which became painful. I lost my spatial awareness and could no longer estimate distance or the size of objects. A daunting negative feeling returned. Away from the practice my right ear and jaw joint got painful, there was a sharp sensation of pain in the back of my neck to the right of the cervical spine, the sensation in my face was lost and the skin over my right eye drooped again. I got concerned and stopped the MM practice.

Returning to the alternating BS was daunting but I was eager to see what would happen. I continued with the pre practice preparation. The break away from the practice had changed my attitude because as the guided BS began, I still could not follow the verbal instructions and just accepted that this was the way it happens. I just let go and a sense of euphoria filled my stomach. I was detached from my body and occasionally the guiding voice appeared from a long way off. After the sensations in my neck, head and face got worse following MM I continued with the BS for two days. However, I became worried about returning symptoms in my neck, head, face, jaws and ears, decided to stop practicing the BS and reverted to my own technique of walking mindfully in nature for personal wellbeing.
I returned to both practices two weeks later, after the symptoms lessened and decided to restrict wider movements during the floor components of MM; I may have been over stretching or getting into positions that aggravated something. The BS just continued in the same pattern and I just accepted it. I also thought that I should try to influence both MM and BS after the foundation year because there were obvious physiological problems with my neck and head and further potential neurological issues with body sensing.

SP. I found the SP a very stable platform to develop breath meditation. I focused on the breath at the tip of the nose and maintained this practice until mind wandering and distracting sounds were noted and let go. Then I began expanding my awareness of the breath through the nostrils and back of the throat. If mind wandering or distractions returned, I refocused on the tip of the nose and started again. I began expanding awareness of the breath down the back of the throat and into the lungs and noted changes in feeling tone, body sensations, changes in emotion and thoughts. Again, if I got caught up in distractions or self-referencing, I refocused on the tip of the nose and started again. Once I could maintain this practice, I used the breath imaginatively to bring awareness to my whole body. In my mind I was sat in a bubble, aware of my whole being floating in the universe. Internal or external distractions were noted and let go. However, in this position cosmic auroras began manifesting visually and I became detached from feelings, sensations, emotions, thoughts and distractions. These were the same cosmic experiences following my injury.
I introduced the seven attitudinal foundations to the practice and noticed that all of them were required to develop each stage of my breath meditation system. To counter mind wandering I developed the attitudes in sequence to be able to let it go. It was the same for sounds distractions, emotions and sensations. The attitudes were used at each stage of breath meditation practice and I realized there is a hierarchical and dimensional basis for its use. Once each layer, feeling, emotion, thoughts and sensation distraction had been overcome then the

attitudes were applied to the current state of awareness. So, as I sat on the verge of slipping into the cosmic auroras my attitude was one of trust but I did not want to go into the cosmic space, so I strived with concentration to maintain this position because if I stopped striving, accepted and let go I knew from experience I would disappear into the universal space.
There was another relationship that unfolded I began working with developing and maintaining positions on the attitudinal scale because I realized I could hold body sensations. This was a problem in the body scan practice where I kept losing body sensation. In SP I could sense the touch of cloth on my thighs and rather than noting it and letting it go I began, with patience and curiosity, to hold onto it. I realized I could do this with multiple senses such as temperature and touch. The more I practiced with this the more I became aware of these senses in all regions of my body. Then I extended the attitudes towards trust and non-striving while trying to hold sensation and realized they disappeared between these two attitudes. There was some kind of switch between trust and non-striving. With trust I could sit with sensation but if I moved to non-striving I disappeared into the cosmos.

SE. I summarized the exercises in MBI context as being aware of each sense: sight, sound, taste, smell, sensation and thought and noted for each there is a feeling, an emotion and thought. But I noticed other elements of this process. First, I must be conscious and aware of the senses and secondly, I noticed the attention and concentration required to maintain focus on the task. I had a dilemma here because I was not only aware of the sense and the response, but I was visually aware of my body in my mind, the area around it as if I sensed the situation from an expanding perspective, the wider world and solar system. I recognized this because this was a symptom of my brain injury where I thought I was connected to the universe.

P/UP Most pleasant experiences revolved around natural events, fields, sky, water, mountains, plants and wildlife. My connection to the lived experience within nature was always uplifting and I engaged in sensory experiences from a wide, world encompassing perspective within a universal context.
UP experiences involved pain, tension and worries about the return of symptoms that I experienced during the alternating MM/BS practices. This involved the feelings of dread and blaming the heath service for not sorting it out. But after reverting to one of my own practices, walking mindfully in nature, I was able to bring these events into an MBI context by watching my associated thoughts respond to the sensations of pain, let them go and commune with the sights, sounds and sensations of nature for wellbeing. Another UP experience involved reactions to a phone call from my solicitors. Whenever they rang there was always another problem and the reactive effect I experienced unwound chains of thoughts about my injury, poor treatment by the heath service and torture by the legal process. It all made me tense, annoyed and angry. But what I was learning on the mindfulness course made me approach it in a different way. I noted my reactive feelings, body sensations, emotions and thoughts and looked at them from an external perspective, as if I was looking at myself as someone else. Then the experience changed and I noticed my attitude change, while I watched the negative UP process unfolding my stomach eased, the tension lifted and I relaxed. The UP experience dissolved and became a P experience.

3MBS. At first, I adopted the practice in the face of reactive triggers that induced negative thoughts or feelings from everyday situations in conversations or from observing behavior patterns such as cars speeding or people having inappropriate opinions. I learned to come to the present, adjust posture, find an anchor and focus on it, then after a period expand with a new perspective to the wider senses and place in the world. However, one of my major brain injury triggers was aphasia, where the incoming and outgoing language processes just went blank. Sometimes I fretted and became embarrassed with shame. I learned to stop, concentrate on breathing and internalize before expanding back into the environment around me. I tried the 3MBS with a negative fatigue laden response to visual sensory dysfunction triggered by computer screen

lighting. I noticed that applying the 3MBS was not possible because the cognitive processes required for controlling attention were gone. It was better to find a dark space and sleep.

I was instructed to practice mindfulness in an MBI context that included sensations, emotions, thoughts and behavior (Feldman & Kuyken, 2019) with an intention supported by the seven attitudinal foundations: non-judging, patience, beginners mind, trust, non-striving, acceptance, letting-go (Kabat-Zinn, 2013, p. 21-29). My intention was to see if mindfulness would help improve my brain injury dysfunctions. I had previously found an MBCT course detrimental, but some practices were supportive and I was surprised to find that although changes are usually measured before and after an eight-week intervention, the effects of individual practices had never been adequately researched (Malinowski et al., 2017). As the use of MBI's for people with brain injury is exploratory, until recently no one has considered the neuropsychological implications (Lovette et al., 2022; Smart et al., 2022) meaning these results may provide insight into individual mindfulness-based practices from a brain injury perspective.

While I made observations from this perspective it is important to show that I understood the MBI context. During a UP exercise I was mindfully walking when a phone call from my solicitor triggered a reaction. I noticed my mood shifting and a tangle of emotions and thoughts unwound in my mind. It was a progression; words triggered a change in mood, causing tension and prompted an emotionally charged thought response that proliferated. By just noticing I was able to accept and disengage from the process by changing perspective to watch the tension, negative thoughts and mood shift by letting them go. However, when facing neurological triggers there were mixed results.

Realizing the onset of aphasia in a conversation, where incoming words are difficult to grasp and outgoing words hard to find, I noticed embarrassment. I gathered myself and applied the 3MBS by silently adjusting posture before focusing on my breath and waited before expanding to the wider experience. The embarrassment passed and I could view it for what it was within context, but the practice did not overcome aphasia. Interestingly with a different neurological trigger, sensory overload, I

was able to notice the onset of cognitive fatigue but my ability to perform the 3MBS was inhibited because the neurological resources required to engage in the practice were drained.

Other neurological issues emerged in pleasant experiences where I felt detached from experience in an MBI context. I became one with sights and sounds on a universal scale with a sense of euphoria. This way of perceiving the world had become normal since my accident but in the MBI context it was a problem because the detachment meant I was unaware of my body and internal sensations. Awareness of the body became a prominent theme in the foundation year which unfolded in MM when I noticed my body was out of alignment. My feet and arms felt out of position in my mind when visually they were in line. As MM progressed it felt as if my symptoms were getting worse and away from the practice I was writhing in my sleep and in awakened dream states I was visualizing contorting transparent bodies. But with more practice I started to experience body sensations as if for the first time. It was as if my body was being reshaped by MM, the transition was physically painful but somehow my senses were waking up, were becoming disinhibited by the movement. However, as my body became more supple, stronger and my sensory world was expanding, I think I overexerted myself because my symptoms returned and the sensory experience in my body was inhibited again.

Noticing the lack of physical sensory experience in my body was most prevalent in the BS. Below my neck and shoulders the sense of my body disappeared and my mind shifted to an expansive awareness. This shift was the typical experience I encountered after my injury, was the gateway to cosmic phenomena and included the visualization of translucent bodies detailing issues in body part schematics. These were not hallucinations, rather I think my mind was showing me the problem visually as an alternative to verbalizing it. The BS experience was confusing because I struggled to follow the guidance which may be aphasia related or issues with attention and concentration control, I had reduced sensory experience below the head and shoulder area which may be physiological and/or neurological and I encountered esoteric phenomena. At the time I would sit aside after the practices in a

quandary because the MBI framework does not encompass esoteric events (Aizik-Reebs et al., 2021) and a lack of body sensation is assumed to result from suppressed psychological trauma (Lepak & Carson, 2021). At first, I began to think I had suppressed psychological trauma, but it did not make any sense and I could not accept the explanations but trusted my instinct instead. I considered the root cause was physiological and/or neurological and I made a mental note to resolve this issue after the foundation year.

I made a significant breakthrough in understanding these experiences in the SP by developing a step-by-step system of breath meditation. First by concentrating on the sensation at the tip of the nose until I had noticed and let go of intermittent mind wandering, emotions, sensations or sounds before proceeding to expand the breath into the nostrils, back of the throat, the lungs and imaginatively by moving the body of the breath through my body. I worked with discipline and at any stage if I became tied up in a distraction I returned to the tip of the nose and started again. At each stage of the breath meditation my mind expanded until, in the imaginative phase, I sensed a euphoric resonance, elements of cosmic experiences appeared and I visualized my body in an invisible bubble floating in space. I repeated this practice and included the seven attitudinal foundations and witnessed their dependent step-by-step evolution through each breath phase and in the imaginative breath phase recognized a tipping point beyond the attitude of trust. The tipping point sat between the experience of this world and the esoteric visual world of the cosmos; it was the same experience as The Foyer Between the Worlds developed before the Masters course. If I stopped striving and accepted the experience, I disappeared into the cosmos but if I concentrated on an object, I remained aware of both worlds. I had previously improved my listening skills by concentrating on words from YouTube videos. I decided to substitute the breath for touch, a sensation that I usually lost. I chose an area of my thigh and proceeded with meditation using the attitudinal foundations as the vehicle to control expansive awareness. In two weeks, I could maintain the sensation of touch in my mind, meaning I had reengaged

with this sense in this world. However, just as I was getting to grips with this mindful/concentrative practice the foundation year ended. I felt I had improved over the year and was happy because I had got through it but in the post course measure, the annual neuropsychology test 07/2021, there was no change in the storage and recall of text, numbers and speech for conceptual processing.

I was disappointed like Mardula, an experienced mindfulness practitioner and teacher in *Mindfulness and stroke. A personal story of managing brain injury* (Mardula & Vaughan, 2020) who also found mindfulness did not help rehabilitate her conceptual processing after a stroke (p. 56-57). But unlike Mardula, I did not accept my situation with compassion and because I had noted the changes in my mind and body during MM I intended to experiment with change. Being mindful of my cervical spine, I modified MM and combined the practice with the techniques I learned before the Masters course in a recontextualized format. Using this new rehabilitation strategy between July/2021 and June/2022 I noticed profound improvements in psychophysiological behavior and dramatic improvements were found in neuropsychological tests 06/2022; apart from dystonia only minimal sensory and cognitive impairments remained. In respect to Figure 2, the yellow and blue functions, sensory/cognitive and metacognitive respectively became more balanced and during practice the four foundations of mindfulness prevailed.

Discussion

Summary

This work was almost lost to the power of experience during the data analysis phase because I had underestimated self-representation in the research design. While the loss of identity is normal after brain injury (Villa et al., 2021) I had to rescue the work by including an extra layer, the neurological self. Interestingly the assimilative nature of AE (Bochner & Ellis, 2006) meant the extra layer enriched the research because recovering the AE reflected my voyage of recovery. The layers in this work provide the

reader with a broad overview of the realities of living with and recovering from a traumatic brain injury from personal and societal perspectives. The crisis in identity reflects the loss of identity after injury (Villa et al., 2021) and my experience with the health and legal systems mirror governmental concerns that they are unfit for purpose (Keegan, 2021). Internet and phenomenological experiences however provided an alternative and progressive view of rehabilitation strategy development that combines the reality of experience with neuroplasticity and meditation techniques. In the Classroom the focused aim of this study shows that meditation in both context and practice played a significant role during brain injury rehabilitation. Inspired by YouTube videos I combined practical concentration meditation with repetitive rehabilitative methods which correlated with improvements in neuropsychology assessments. In contrast, eight months of experiential MBI training showed no change in neuropsychological assessments. However, MM induced physiological change and by merging MM with my previous rehabilitation practices I reformulated the rehabilitation strategy to cover the three domains of brain injury: psychological, physiological and neurological (Azulay et al., 2013); mind/body/brain. The new practice regime correlated with further improvements in neuropsychology assessments. The key factors for developing this strategy were gaining phenomenological insight during brain injury, contextualizing it with neuroscience and contemplative philosophies from social media, merging meditative practices with repetitive rehabilitative methods and widening my research to assess MBI content.

Main points

Brain Injury, Phenomenology and Neuroplasticity

My experience after the injury follows a pattern of fragmenting reality and primal survival over seven months followed by five years of recovery. These can be correlated with the acute, subacute and chronic phases of TBI (Livernoche Leduc et al., 2022) which Hayes et al., (2016) further correlates with the progressive effects of neural cellular damage, immune response and repair mechanisms

respectively. My fragmentation of reality corresponds to the acute phase during the progression of neural damage, primal survival may relate to the subacute phase during the immune response and my recovery period correlates with the chronic phase during neural cell repair.

As the acute phase of neural degeneration progressed, I thought I would die and with dispositional mindfulness in the face of death (Welz, 2022) accepted the experience and let go to gain phenomenological insight into the nature of my consciousness and being. I transcended into eternal nothingness where only conscious awareness existed, I saw visual representations and geometrical patterns before encountering dead family members, the symbolic sign of a near death experience (Camelo, 2022). The return journey to my body was like travelling through the cosmos before sensing resonating energy fields and the sense of euphoria like a spiritual awakening (Cooper et al., 2021). While these events may also be psychogenic dissociative seizures (Ertan et al., 2022) this was my experience and like the neuroscientist Taylor (2009) *My stroke of insight*, I found it fascinating because my consciousness became one with the universe (p. 41). But in the following days my body would get up to drink and eat in an automatic quest for survival while my awareness was carried around like a passenger. I did not know what my body was and like Mardula in Mardula and Vaughan (2020), found it hard to resolve my awareness with the face I saw in a mirror (p. 31).

In the subacute phase I began resolving my body/mind connection, was developing behavior patterns with familiar routines and as behavior is directly linked to neural change (Frewen et al., 2020) my brain may have been repairing itself through neuroplasticity in response to stimuli (Gulyaeva, 2017). In the chronic phase, like Elliott (2016, p. 125-156) *The ghost in my brain: how a concussion stole my life and how the new science of brain plasticity helped me get it back,* I was metacognitively aware of sensory and cognitive dysfunctions; I could see the gaps in information processing, with blank spaces and I had the sense of only living in the here and now, present moment awareness (Kabat-Zinn, 2013). However, to rebuild my life I set out to rehabilitate myself using neuroplasticity methods. After success

with neuro-optometry I tried brain training apps, games and puzzles; I got good at them but while these are considered effective rehabilitative tools in mainstream health care they are compensatory with no wider restorative value (Ylvisaker et al., 2002). I began making up rehabilitation techniques which involved repetitively drawing the four basic shapes, walking barefoot in nature and learning to touch type where I did notice a difference. Repetition is a key component of neurorehabilitation (Hawkins, 2021); I realized this by repetitively typing my experiences and listening to topical content on YouTube. I developed and maintained a stable mind position between cosmic and real-world experience in what I called The Foyer Between the Worlds. I listened to neuroscience lectures on brain injury rehabilitation and the neuroplastic properties of meditation; I realized in meditative terms the message from the videos was the object of concentration in my attention and from the content I recognized my phenomenological and neuroplastic experiences reflected in Hindu and Buddhist philosophy.

My experience of being at one with the universe, a metacognitive state shared with Taylor (2009), was like the merging of atman-Brahman (Preti, 2011), consciousness and universe, in Hindu Vedanta. From this state I had viewed my body as a separate entity while internally my mind conducted metaphysical body scans seen in translucent bodies. As I continued to interact with my environment, I saw visions of myself in those environments floating in the universe; It was like watching myself in the external universe from an internal universe at the same time. My mind was creating realities from visions of my body, mind and being that I could identify in Hindu and Buddhist *dhammas*. My experiences had the components, Figure 2, resembling the Buddhist five aggregates of clinging: body, feeling, perception, volition and consciousness (Analayo, 2006). I could also see it in the Vedantic *Perspectives to Modern Neuroscience*. [Video] (Divyandaprana, [NRCVEE IIT Deli]. 2019, November 18) which explained how perception creates mind activity that, if repeated, becomes behavior, memories and automatic function. I had noticed my behavior patterns develop after repeated exposure to stimuli and had seen these being created in visions in my mind; I had been watching the process of

neuroplasticity. Some of the steps were represented in the 12 links of dependent co-origination, the Buddhist *dhamma* equivalent of neurocognition (Kurak, 2003), but the dependent links, perception, memory, cognition, attention and concentration (Mindfulness Insight Meditation, 2020, September 16) in my processing were dysfunctional. I thought that by merging meditation techniques and rehabilitative exercises it would improve these brain functions; I tried it and it worked because my recovery accelerated. I had been given the prognosis that I would never recover on 03/2019 and by 07/2020 I had made a profound improvement. I wanted to know more, attended an MBCT course but it was detrimental and decided to study Mindfulness-Based Approaches at the CMRP to find out why.

Assessing Mindfulness from a Brain Injury Perspective

There is no doubt MBI's change the brain (Afonso et al., 2020) and Link et al. (2016) had theoretically speculated that the neural changes induced by MBSR would rehabilitate the corresponding brain regions in people with brain injury. In a systematic review Acabchuk et al. (2021) found MBI's improved mental health, physical health, cognitive performance and quality of life. However the interventions did not account for complex neuropsychological symptom clusters (Smart at al., 2022) and the measures lacked neuropsychological context (Lovette et al., 2022) because the changes measured did not transfer to real life experience. While my annual neuropsychological assessments showed change using Vedanta-based techniques, following the foundation year, the same assessment showed no change. The difference may be because MBI's are designed for psychological issues (Crane et al., 2017) whereas brain injuries manifest in psychological, neurological and physiological symptomology (Azulay et al 2013). Sullivan et al. (2020) found psychological therapies including MBI's had little or no effect on people with brain injury; I found an eight-week MBCT course detrimental but the sensory and walking exercises were supportive. As there is a paucity of research into MBI components (Malinowski et al., 2017) and this research assessed the individual practices and found variable effects.

During the foundation year I found the psychological framework of MBI's easy to grasp from the

teaching. However, practically the context was most prominent in the SE and UP exercises because I could identify the components in real life; following a phone call verbal information unwound a tangle of thoughts and emotions that were overcome by changing perspective, a therapeutic mechanism of mindfulness (Teasdale & Chaskalson, 2011). In the 3MBS changing perspective was effective for overcoming embarrassment from aphasia, a psychological response to a neurological problem. The elements of this process are characterized in the "phenomenological matrix of mindfulness" (Lutz et al., 2015) where embarrassment is an object in open awareness, narrowing attention focuses onto another object causing a change in perspective and when focus is widened to sensory experience the reactive process is observed. However mindfulness research creates "supernormal" (Rosenkranz et al., 2019, p.181) populations because people with neurological conditions are usually excluded, but their phenomenological matrices may be very different from people with uninjured brains. A case in point can be found in the introduction of Mardula and Vaughan (2020) where Trish Bartley, a mindfulness provider (Bartley, 2011), describes Mardula's stroke experience as "a brand-new world" (p.1) for anyone who has not experienced a brain injury.

When I experienced aphasia my mind went blank that is interestingly described in Mantle (1897, p. 325) as "word blindness, word deafness and mind blindness." Where my word processing functions should have been, only expanding empty space existed. Case and group studies into mindfulness and aphasia reveal the interventions need to be reformatted with reduced practices and recontextualized with aphasia themed content (Crielesi et al., 2019). Another neurological trigger, sensory overload, caused cognitive fatigue that drained the mental resources required to practice. Attempts to improve mindfulness interventions to counter cognitive fatigue include online delivery (Johansson et al., 2015) simplifying the content, reducing session times and extending courses (Azulay et al., 2013). These studies reported improvements but as there is no realistic evidence to suggest mindfulness interventions have any effect on people with brain injury (Sulivan et al., 2020), the studies may be

biased, a common theme in mindfulness research (Rosenkranz et al., 2019). Mindfulness as a science with a psychological context is still being invented (Grossman, 2019), however in a brain injury context the measures may be unreliable (Lovette et al., 2022), many studies underreport problems and dropout numbers while overreporting successes (Acabchuk et al., 2021; Niraj et al., 2020). Studies into MBI's and brain injury are experimental and researchers may be failing to grasp the reality of the brain injury experience, the components in Lutz's model may be compromised and appear like the "islands" following Mardula's "mind tsunami" (Mardula & Vaughan, 2020, p. 29) where functions of the mind were always shifting or being lost. Like my aphasia where there were words and memories one moment there was blank space the next, or like sensory overload where the functions were inhibited. Coupled to these were additional dysfunctions because in the SE I experienced the phenomenon of becoming one with sights and sounds as they merged with my consciousness on a universal scale. But in this reality there were no words or body sensations.

In the BS most of my body sensations were absent and replaced by visually esoteric phenomena including translucent body representations. These were not the speculative mental health conditions (Howlett et al., 2022) or delusional hallucinations (Rossell et al., 2010) usually diagnosed in brain injuries because the consultant psychologist 03/2021 and psychiatrist 12/2021 in my legal case did not find any. Like the experiences of Elliott (2016) and Taylor (2009) they were just another way of seeing, universal and metacognitive. Mardula describes this as the sense of "Being" … and it was the… "Doing," conceptual processing, that was difficult (Mardula & Vaughan, 2020, p. 56). In other words, people with brain injuries are disconnected from many functions depending on their injuries and experience unusual phenomena instead. However, the MBI context does not address esoteric phenomena (Aizik-Reebs et al., 2021) and the explanation for not sensing my body was the suppression of psychological trauma (Lepak & Carson, 2021). I started to think I had suppressed psychological trauma, trauma by suggestion (Dalenburg et al., 2012), but in MM it became clear that physiological injuries were having an impact.

In my medical records osteopath and physiotherapy assessments 08/2017 and 02/2018 respectively, show cervical and thoracic spine injuries, postural adaptations and loss of left arm muscle functions. These cause pain, tension, loss of balance, migraines, body misalignment (Le Huec et al., 2019) and inhibit nerve cell signal conduction (Liu et al., 2021). I also had dystonia 01/2023 which meant my central, motor and sensory nerve signaling was impaired (Prudente, 2014). In contrast to the BS, I could maintain my attention on the guidance and sense my body in MM. I found that while the movement began to realign my body posture, sensations were being stimulated and it felt like I was perceiving them for the first time. As spinal movement causes neurophysiological effects (Pickar, 2002) I experienced restlessness in my sleep with visions of translucent bodies contorting into shapes, reflections of experience. My cervical spine injuries may have been inhibiting the flow of sensory information and MM was disinhibiting them with mind phenomena as a side effect. MM is based on Hatha Yoga (Kabat-Zinn, 2013) and while I was experiencing positive changes, I learned that yoga can also aggravate spinal injuries (Lee et al., 2019, March) because one day the movements caused my physiological symptoms to return. I was mindful of these effects and appropriately stopped practicing for two weeks. When I began practicing again my body began to realign and disinhibit sensations in MM, but my experience in the alternating BS practice was unchanged. I could follow the guidance and sense my body in MM but could not below the head and shoulders, below the cervical spine, in the BS. This may mean the inhibited sensations of cervical spine injury and altered sensory signaling from dystonia required movement to prompt sensory flow, but the sensory flow was also required to provide an object to focus on because without it I lost the guidance and my mind drifted away into esoteric phenomena.

Azulay et al. (2013) suggests it is hard to distinguish between the effects of neurological, psychological and physiological symptom domains after TBI and the phenomenological matrix of mindfulness (Lutz et al., 2015) may be affected by these effects. I had found it difficult to tell whether going blank from aphasia, having attention and concentration impairments or spinal injuries and

dystonia made my mind expand to experience esoteric phenomena. However, as the contrast between BS and MM experiences were beginning to make sense, another interesting concept was unfolding in a traditional meditation context. Wallace (2006) *The attention revolution: Unlocking the power of the focused mind,* suggests multiple layers of the mind unfold by overcoming obstacles, mind wandering, emotions and sensory distractions. My aphasia reduced or inhibited mind wandering, sensory inhibition from spinal injury reduced body sensations, both caused my mind to expand to an esoteric state by default. In other words, the obstacles that needed overcoming when developing a mindful state were reduced or not present, meaning my mind, like Taylor (2009), Elliott (2016) and Mardula and Vaughan (2020), was in an altered state already; universal, metacognitive and non-conceptual respectively. Without the obstacles I was aware of other phenomena like my conscious awareness merging with visual and auditory stimuli or the symbolic visual content in my mind which are also called *nimittas* in *Esoteric Theravada: the story of the forgotten meditation tradition of Southeast Asia* esoteric (Crosby, 2020). While these may be part of my altered states of awareness, *nimittas* are encountered in states of *jhana*, beyond the superficial layers of mindfulness, with sensations of bliss Gunaratana (2009) *Beyond mindfulness in plain English: An introductory guide to deeper states of meditation*. It seems my sensory and neural dysfunctions, like Taylor (2009), Elliott (2016) and Mardula and Vaughan (2020) create phenomenological experiences that can be recognized in traditional Buddhist frameworks, but I could not recognize these experiences in MBI contexts. MBI's were designed to develop mindfulness, a non-conceptual metacognitive state of mind (Bodhi, 2011; Teasdale, 2023) by decoupling self-referential brain functions (van der Velden et al., 2022) to provide therapeutic effect. But people with brain injuries lose their sense of identity (Villa et al., 2021) meaning they may already be decoupled from self-referential processes and by practicing mindfulness they may induce even wider metacognitive effects.

I found practicing the BS and sensory exercises induced phenomena that may be the result of dysfunctional sensory, cognitive and self-referential processes. MM on the other hand had the opposite

effect because movement created sensory objects to focus on and this reconnected with self-referential functioning. The mind requires both conceptual and non-conceptual, doing and being, modes of mind Segal et al., 2018) respectively, to balance the mind. MBI's are designed to help people with maladapted, over productive conceptual mind states meaning these interventions may lack the context to help people with under productive or damaged conceptual mind states.

Interestingly I found that by developing mindfulness in the SP through a four-stage breath meditation practice I could balance non-conceptual esoteric with conceptual self-referential experience. It was the same experience as The Foyer Between the Worlds, a position between conceptual and non-conceptual views of the world, but in the SP, I used the seven attitudinal foundations as a gauge and could maintain the balance with the attitude of trust by concentrating on an object. The Foyer is like an invisible bubble where I visually see myself in the internal universe but paradoxically, I also sense myself in the external universe at the same time. If I stopped striving and accepted, I would go into the internal esoteric universe but if I concentrated on a sensory object, I could maintain my position balanced between the worlds. Concentration is an active mental power that can be focused on any object including a conceptual process (Htwe & Thein, 2018) but it is not an explicit practice in MBI's. Mindfulness observes the body, feelings, thoughts and emotions while practical concentration focuses on a specific object or process to improve learning (Grewal, 2014). I found concentration not only helped maintain a balance between the worlds but by focusing on dysfunctional sensory elements I reengaged with them and amazingly with repetition they recovered functionality. I found that mindfulness as a nonconceptual state of awareness (Bodhi, 2011; Teasdale, 2023) provided a non-judgmental observational platform but when coupled with concentration, an intentional power (Grewal, 2014; Htwe & Thein, 2018), my dysfunctions were rehabilitated. In other words, concentration may be the active ingredient for inducing and promoting neuroplastic brain changes to improve conceptual processing during brain injury rehabilitation.

Implications.

The research shows different meditative practices have different effects and concentration may have been overlooked as a powerful tool for brain injury rehabilitation. I began using concentration with rehabilitation exercises and the recovery of my conceptualizing functions accelerated. My research agrees with Mardula and Vaughan (2020, p. 56) because practicing mindfulness alone showed no change in her conceptual processing. While I could experience the MBI context in real life through the exercises, the formal practices had mixed results. The BS was psychologically disruptive in an MBI context and produced esoteric phenomena, MM on the other hand disinhibited sensory experience by readjusting my body and the SP had to be adapted to include concentration to maintain stability. I had come full circle because the adapted SP practice was the same as The Foyer Between the Worlds where I could be mindful of experience but also implement intentional change through concentration. After the foundation year it seemed appropriate to merge MM with The Foyer Between the Worlds and practical concentrative exercises to maximize rehabilitative potential. Together these formed a triple set of practices with physiological, psychological and neurological contexts that were effective in inducing change correlating with neuropsychology assessments 06/2022.

These however are not mindfulness-based practices (MBP's) defined by Crane et al. (2017) *What defines mindfulness-based programs?,* because the warp has a rigid criteria that maintains the core curriculum of practices based on contemplative traditions in a psychological context based on science. The weft on the other hand allows adaptations to the core curriculum based on participant population contexts, provider expertise and science. However my rehabilitation strategy is based on the reality of experience and the only suitable formal practice from the core curriculum was MM which as Donnelly et al. (2021) *A retrospective study on the acceptability, feasibility, and effectiveness of LoveYourBrain Yoga for people with traumatic brain injury and caregivers,* suggests, acts as an adjunct to other rehabilitative processes. While this approach provides a mindfulness component with physiological benefits in a

psychological context originating from Buddhist *dhammas* (Kabat-Zinn, 2011), brain injury has psychological, physiological and neurological domains (Azulay et al., 2013). In other words current MBI's lack the appropriate context for brain injury experiences. As MBI's were developed from recognizing the reality of experience in Buddhist *dhammas,* practices (Kabat-Zinn, 2011) and western psychology (Harrison et al., 2017), future research may benefit by comparing the phenomenological experience of brain injury with functional neuroplasticity recovery methods and frameworks from contemplative traditions to recontextualize and develop practices to utilizing neuroplastic potential for enhancing brain injury rehabilitation techniques. The author is developing these concepts and practices within the private sector and brief descriptions of alternative meditative processes and their roots have been revealed in this work. The specific details have been withheld from the reader following advice for intellectual property right purposes.

Strengths and limitations

This work indicates meditation has a role during brain injury rehabilitation and can be correlated with behavioral and neuropsychological change. Writing this AE highlights behavior change because the sensory, information processing and communication skills required for learning and research were left dysfunctional after my injury. AEs are personal stories in a societal context and are criticized for lacking credible data (Walford, 2004) however this work includes medical records to validate my experience. Improvements in neuropsychology assessments not only show changes in my condition but differentiate the effectiveness of MBI's and other traditional practices. It is important to remember that I am the sole participant in this work, but this does reflect brain injury research standards because the IMPACT study (Maas et al., 2013) found heterogeneity reduces reliability to the level of the individual. Therefore, it is unsurprising that health systems have failed people with brain injuries (Keegan, 2021) and clinicians have little understanding (Edge, 2010) because there is a paucity of realistic first-person accounts (Buckley, 2020). Consequently, the reader may have struggle to understand some of my perspectives

but I can only write from experience and the only realistic first-person accounts I could find for comparison were autobiographies (Elliott, 2016; Mardula & Vaughan, 2020; Taylor, 2009). While criticism may arise because these include stroke and TBI, they share many symptoms (Marklund et al., 2019). The broad aim of this work was to expose the reader to the reality of brain injury while the focused aim was to assess the role of meditation during brain injury rehabilitation. From my perspective I have realized these aims but this work is at the level of the individual. Ultimately it is the reader's responsibility to determine the value, reliability and quality of the work (Poerwandari, 2021) from a societal perspective.

Conclusions

The aim of this work was to expose the reader to the realities of brain injury and assess the role of meditation during brain injury rehabilitation. Layering the data provided the reader with a wide range of personal and societal perspectives into the brain injury experience. The role of meditation emerged from the brain injury experience itself because my phenomenological insights were reflected in contemplative philosophies. By appropriating the neuroplastic properties of concentration meditation my recovery of conceptual processing accelerated. Comparatively MBP's provided a psychological framework but they lacked brain injury context, caused confusion and had no overall rehabilitative value for conceptual processing. However, in what may be the first assessment of individual MBI practices from a brain injury perspective, mindful movement proved an effective practice for inducing neurophysiological change. By combining the effective elements of mindfulness with concentration practices profound changes were experienced across the psychological, physiological and neurological domains of brain injury. Therefore, this work suggests meditation practices with an appropriate contextual framework supports, induces and directly influences recovery during brain injury rehabilitation.

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Appendix A

Systematic analysis of mainstream healthcare, private healthcare and medico-legal assessments.

Date: Month/year.	Institution.	Expertise.	Diagnosis/opinion.	Comments.
07/2017.	MHC.	Paramedic.	High blood pressure.	Accident scene protocol, patient not taken to A&E
08/2017.	MHC.	GP.	Head injury.	Disorientated, difficult to comprehend and limp left arm. Patient states the world looks very different today. Sent to A&E.
08/2017.	MHC.	A&E.	CT scan clear, concussion.	Sent home to rest.
08/2017.	MHC.	GP.	Head injury with deteriorating symptoms: left side weakness, slurred speech, memory deficit, irregular eye movements, vision abnormalities, hypertension, brain fatigue, significant nausea.	GP was unable to access medical regulations. Sent to A&E for reassessment.
08/2017.	MHC.	A&E.	CT scan clear, concussion.	Home rest, expect unusual experiences.
08/2017.	MHC.	GP.	Head injury ongoing symptoms.	Referred to public/private scheme for vision tests.
08/2017.	PHC. *	Ophthalmologist.	Eyes normal, serious visual processing problems.	Referred to MHC, recommends MRI scan of optic nerve

				and occipital brain region.
08/2017	PHC. **	Osteopath	Patient is nauseous and disorientated with balance, visual and cognitive issues. Somatic dysfunction of cervical and thoracic spine. Restricted neck rotation. Pain in facial and anterior neck muscles. Facial torsion through thoracic facia. Occipito-atlantal restriction. Restricted C2-4, C 5-6, C7-T1, T4.	Accumulated notes from 23/08/2017 to 28/11/2017. Some improvement to balance, thoracic and cervical spine. Recommends GP referral to neuro-physiotherapist.
09/2017.	ML. ***	GP.	Significant head injury, cognitive deficit, hypersomnia and cervical spine issue.	Referral for neurology and physiotherapy assessment.
09/2017.	MHC.	Ophthalmologist.	Eyesight normal.	Problem patient, suspect psychological issues.
09/2017.	PHC. **	Ophthalmologist.	Confirms normal eyesight and reaffirms visual processing problems.	Advises specialist private neuro-optometry via BABO.
10/2017.	MHC.	GP.	Head injury ongoing. Limp left arm. Patient is erratic and anxious. Suspect visual problems are migraines.	Reassured patient. Referral to physiotherapy consultant for left arm. See no point in neurology referral because CT scan is clear.
11/2017.	MHC.	Consultant physiotherapist.	Left arm ulnar nerve neuropathy.	Recommends physiotherapy.
11/2017.	MHC.	GP.	Head injury ongoing. Left arm neuropathy.	Referral to public/private

				physiotherapy scheme.
12/2017.	MHC. **	Dentist.	Receding gums, bleeding gums, excessive gum and mouth ulcers and lesions.	Causation, lack of hygiene, extreme stress and nutrient deficiency. Lack of care following head injury. Urgent hygiene referral.
12/2017.	MHC.	Dental hygienist.	Gingivitis, bleeding gums and gum disease.	Accumulated notes from 07/12/2017 to 27/03/2018. Ultra-sonic scaling, fluoride treatment. Daily hygiene plan prompter. Significant improvement over four months.
02/2018.	PHC. *	Physiotherapist.	Debilitating right sided occipital and frontal head pain. Grossly restricted use of left arm and hand. Loss of fine finger movement. Moderate postural adaptation of a protracted head and flattened thoracic kyphosis. Loss of 30% cervical spine movement. Gross wastage of hypothenar muscles. Left hand grip strength 40% compared to right.	Treatment plan to improve spinal mobility, reduce head pain and graded exercises for left arm and hand strength. Accumulated notes from 02/2018 to 04/2018. Six allotted scheme sessions reduced head pain. Left arm and hand no response to treatment.
03/2018.	MHC.	GP.	Head injury ongoing. Blackouts. Left arm neuropathy. Diaphragmatic and gastric pains.	Referral for nerve conduction tests. Referral to gastric clinic.
04/2018.	ML. ***	Neurologist.	Post-traumatic stress disorder or psychological disorder. Episodic fainting.	GP has not made a referral to neurology. CT scan is clear. No evidence of head injury in paramedic

				report. No evidence of cervical spine injury. Injuries are not related to the accident.
06/2018.	MHC.	GP.	New patient.	Organize transfer of medical records. Appointment for two weeks.
07/2018.	MHC.	GP.	Head injury. Suspected brain injury.	Referral for neurology, neuropsychology and cardiologist. Pituitary hormone range tests.
08/2018.	MHC.	Orthopedic.	Nerve conduction studies show severe inhibition of ulnar nerve and moderate median nerve signs.	Severe atrophy and/or complete muscle wastage to left arm and hand. Recommends further electro studies and surgery.
09/2018.	ML. ***	Neurologist.	Mild concussion. Stress, introspection. Psychological problems.	No evidence of head injury. Fainting due to low blood pressure, awaiting cardiology. Left arm problems due to his work. Advise psychological screening.
09/2018.	MHC.	GP.	Head injury, abdominal pain, blackouts, left arm neuropathy.	Awaiting neurological assessment. Patient does not meet the criterion for neuropsychological assessment. Patient has arranged private assessment for visual distortions.
10/2018.	PHC. **	Behavioral optometrist.	Eyesight normal. Visual hallucinations. Irlen's Pumkin Test shows Significant visual distortion. Pattern Glare Test 1 and 2 reveal	Significant visual stress and pattern glare. Conclusion, hyperexcitability in occipital lobes caused by brain damage. Significant reduction

			distortion of lines in the visual field, emanating colors, blending, blurring, flickering, fading and shadowy shapes.	of stress and distortion is seen with blue tinted lenses. Follow up tests required to adjust prescription as the brain adapts.
11/2018.	MHC.	Gastric endoscopist.	Non circumferential esophagitis. Five centimeter sliding hiatus hernia. Erosive duodenitis.	Advice for stress reduction. Dietary advice. 60 mg omeprazole for three months. Reevaluate.
11/2018.	MHC.	GP.	Head injury ongoing. Abdominal pain. Light sensitivity, pattern glare.	Awaiting neurological assessment. Patient reports reduced visual stress, abdominal pains, cessation of blackouts and cognitive improvement. Patient requests permission to resume driving.
12/2018.	MHC.	Neurologist.	Non-acute brain injury. PCS. Left sided weakness. Spatial awareness affected. Cognitive, language, visual and memory dysfunctions.	No surgery required. Strongly suggest neuropsychological assessment and rehabilitation. Strongly recommend ENT assessment.
01/2019.	MHC.	GP.	PCS, light sensitivity, left arm neuropathy.	Referral for neuropsychology assessment. Referral for ENT assessment.
02/2019.	MHC.	Cardiologist.	Syncope not cardiac related. Heart normal, blood pressure normal.	Brain injury related.
03/2019.	MHC.	Neuropsychologist.	Reduced cognitive speed and capacity. Reduced ability to store and retrieve memory. Aphasia. Reduced executive functions. Cognitive fatigue. Sensory	Accumulated report findings from six assessment sessions from 03/2019 to 06/2019. Patient is unlikely to recover. No rehabilitation resources. Handouts

			overload. Depression and anxiety are normal.	provided for advice; mindful exercises may help.
04/2019.	PHC. **	Irlen's registered vision tester.	Severe visual distortion. Non Irlen's syndrome.	Turquoise tinted lens replacements.
04/2019.	PHC. **	OT Driving assessor.	Passed driving assessment.	Observed visual impairment and verbal memory recall delayed. Agreement to drive only with tinted glasses, without radio/audio in daylight only.
05/2019.	PHC. *	Orthopedic consultant.	Lack of sensation in left hand, gross muscle wastage. Ulnar, median and radial nerves affected. MRI scans show ulnar compression at elbow. MRI shows root nerve damage at C5, C6 and C7. Surgery required.	Accumulated reports from 05/2019 to 09/2019. Ulnar nerve damage at elbow. Surgery successful. Leave root damage and reassess if required. No rehab offered.
09/2019.	MHC.	Neuropsychology assistant.	Memory problems, cognitive fatigue and sensory overload.	Given activity templates and advised to train concentration and attention skills.
12/2019.	ML. ***	Senior consultant psychologist.	Adjustment anxiety disorder ICD-10 from RTA.	PCS symptoms are neurological in nature.
03/2020.	PHC.	Optometrist.	Improved pattern glare. Sensitivity to direct sunlight and LED lighting.	Prescribed green tinted lenses with digital neutral grey transition coating.
05/2020.	ML. ***	Neurologist.	Psychiatric problems.	Addendum report reassessing updated MHC, PHC and ML records. Wording technicality in MHC neurology diagnosis

				12/2018. Will not accept, further assess or comment on medical records. Referral to psychiatrist.
07/2020.	MHC.	Neuropsychologist.	Improvement of cognitive functioning but continues to experience problems with aphasia, information retention, slow processing and sensory overload.	Profound improvement is seen following optometric and alternative neuroplastic exercises and mindfulness. Will support university application.
08/2020.	MHC.	GP.	Significant improvement in PCS symptoms.	Confirm support for university application to study mindfulness-based approaches.
03/2021.	ML. ***	Consultant psychologist.	Adjustment anxiety disorder ICD-10 from RTA. PCS symptoms are neurological.	Addendum report reassessing all updated medical records. Reaffirmation of previous findings. No additional information for pre-court hearing. Recommend neuropsychology referral.
07/2021.	MHC.	Neuropsychologist.	Continues to experience problems with aphasia, information retention, processing and sensory overload.	No change, updated information for university disability support.
12/2021.	ML. ***	Consultant psychiatrist.	No evidence of psychiatric symptoms.	Face to face interview indicates the client has aphasia, left sided nerve damage and visual distortions. No evidence of somatoform disorder. Agree with adjustment anxiety

				disorder ICD-10 from RTA. Conclusion for the court: neurological disorder or sophisticated and invented symptomology.
12/21.	MHC.	ENT consultant.	No conditions found.	Patient reports self-correcting vestibular and balance issues.
06/2022.	MHC.	Consultant clinical neuropsychologist	Minor sensory disturbance and cognition deficits.	Reassessment shows minor continued symptomology. Patient has adapted well for day-to-day functioning.
01/2023.	PHC. *	Consultant orthopedic specialist.	Seizing left arm, hand and fingers. Oedema, blood and lymphatic system. MRI and CT scans of cervical spine show damage to C2, C3, C4, C5, C6, C7, T1, T2, T3 and T4 with root nerve damage and dehydrated discs. Oddly pinching is right sided.	Cervical and thoracic spine damage unrelated to oedema and clamping. Suggest this is caused by dystonia due to brain damage. Nothing can be done, patient content with explanation.

Notes: The systematic analysis uses the month and year as a reliable longitudinal variable. The categories denote health system type, practitioner expertise, diagnosis/opinion and comments made.

Abbreviations: Mainstream healthcare (MHC), private healthcare (PHC), medico-legal (ML), general practitioner (GP), accident and emergency (A&E), cervical spine (C), thoracic spine (T), British Association of Behavioral Optometrists (BABO), ear/nose/throat (ENT), post-concussion syndrome (PCS), occupational therapist (OT), International Statistical Classification of Diseases and Related Health Problems - tenth revision (ICD-10), road traffic accident (RTA), light emitting diode (LED).

* Public/private health scheme.

** Self-referral.

*** Legal/courts referral.