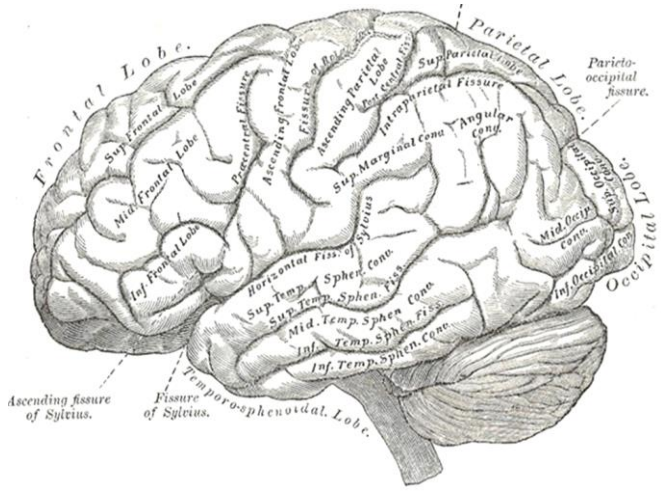
Grey matter:
Brain injury and Functional Neurological Disorder



Dr Laura McWhirter MRCP MRCPsych

Clinical Research Fellow, University of Edinburgh

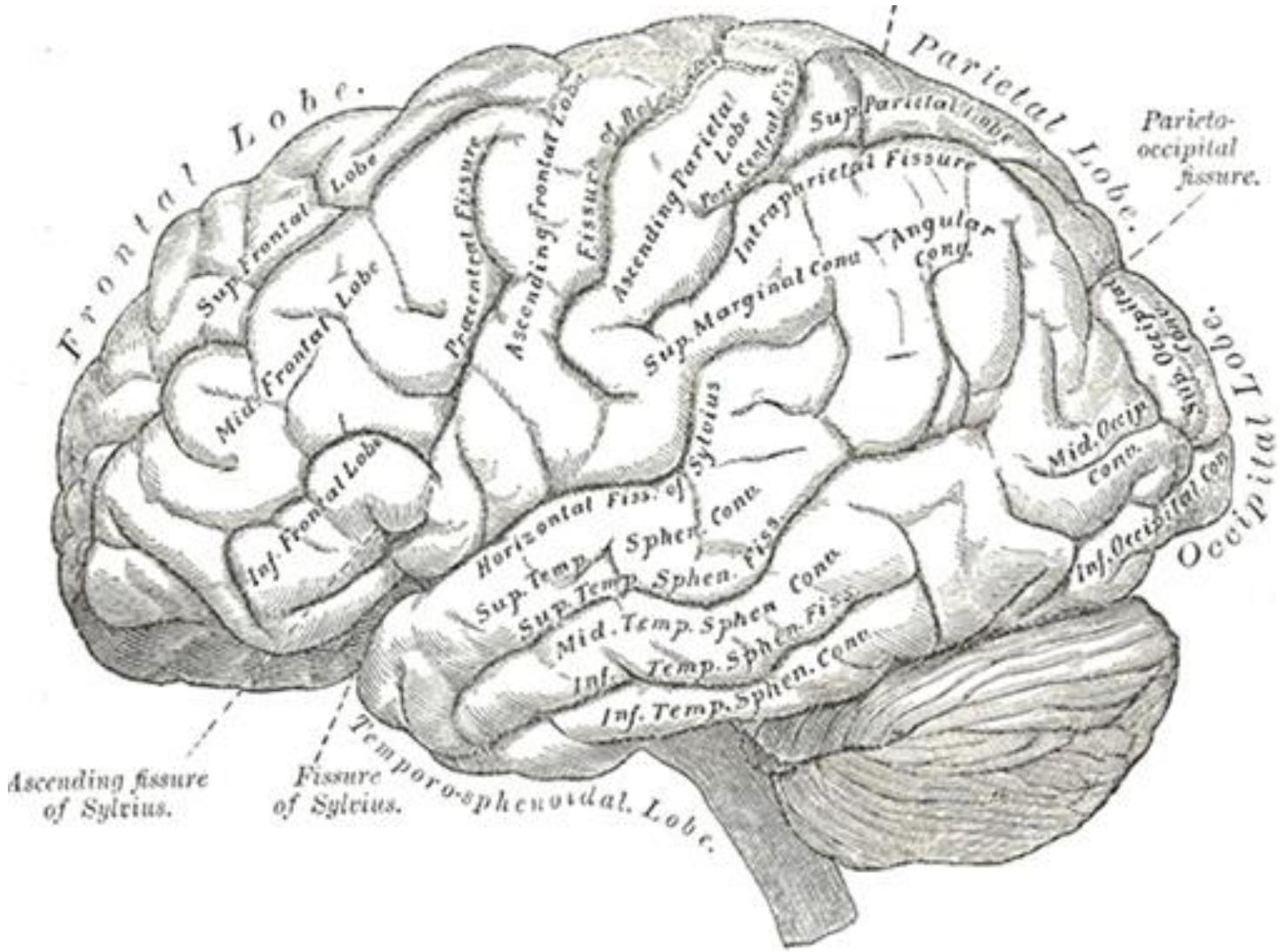
Honorary Consultant Neuropsychiatrist, NHS Lothian

THE UNIVERSITY of EDINBURGH
Edinburgh Neuroscience

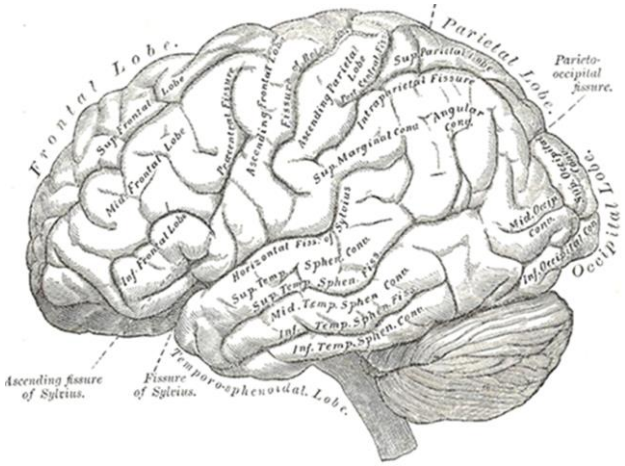
CCBS
Centre for Clinical Brain Sciences

Who gets brain injuries?

- Head injury = common reason for Emergency Department attendance
- Most < 35 year olds but second ‘peak’ in > 65s
- Men > women


Frontal Lobe.
Parietal Lobe.
Occipital Lobe.
Temporo-sphenoidal Lobe.
Parieto-occipital fissure.
Ascending fissure of Sylvius.
Fissure of Sylvius.
Sup. Frontal Lobe
Mid. Frontal Lobe
Inf. Frontal Lobe
Ascending frontal Lobe
Ascending Parietal Lobe
Sup. Parietal Lobe
Intraparietal Fissure
Sup. Marginal Conv.
Angular Conv.
Sup. Occipital Conv.
Mid. Occip. Conv.
Inf. Occipital Conv.
Horizontal Fiss. of Sylvius
Sup. Temp. Sphen. Conv.
Sup. Temp. Sphen. Fiss.
Mid. Temp. Sphen. Conv.
Inf. Temp. Sphen. Fiss.
Inf. Temp. Sphen. Conv.

What happens after a brain injury?



severe

moderate

mild

How severe was the brain injury?

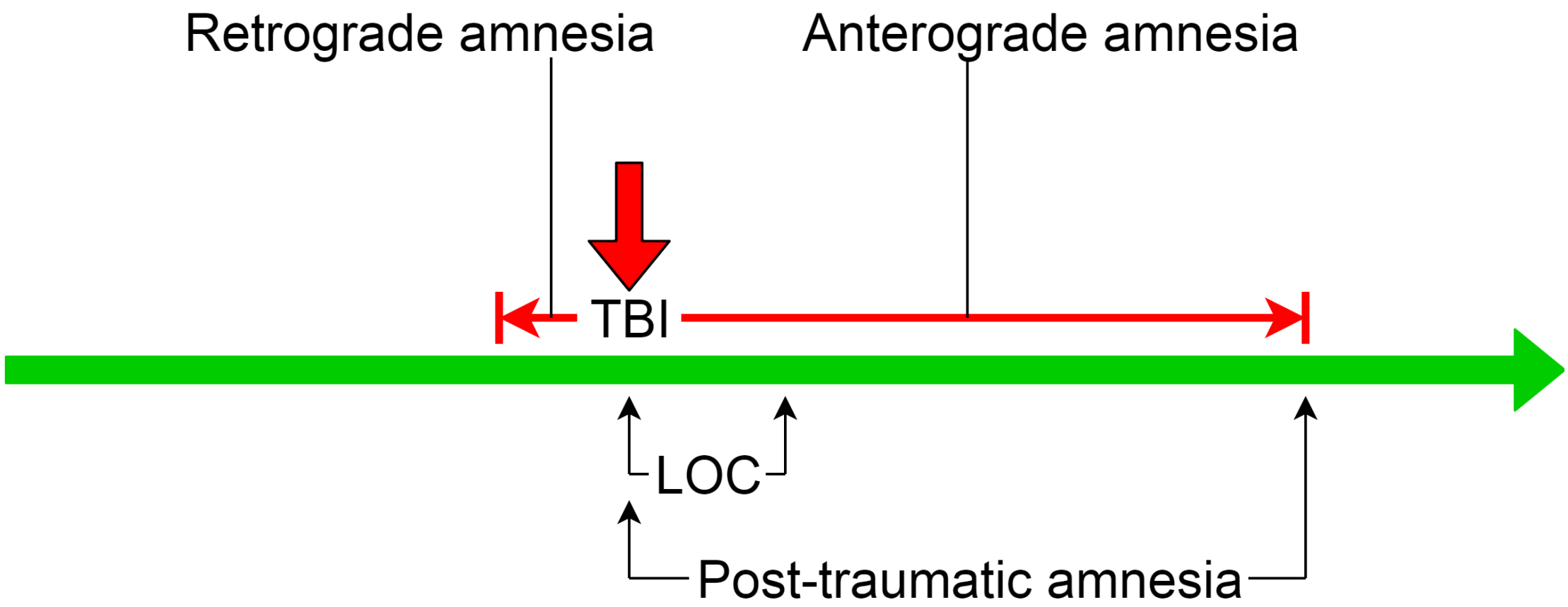
Glasgow Coma Scale (Teasdale and Jennett 1974)

	1	2	3	4	5	6
Eyes	Does not open eyes	Opens eyes to pain	Opens eyes to voice	Opens eyes spontaneously		
Verbal	Makes no sounds	Sounds	Incoherent words	Confused	Orientated, converses normally	
Motor	No movements	Extension to pain	Abnormal flexion to pain	Flexion / withdrawal to pain	Localizes to pain	Obeys commands

How severe was the brain injury?

	Severe	Moderate	Mild
Glasgow Coma Scale (GCS)	< 8	9 - 12	13 - 15
Loss of consciousness	> 24 hours	30 minutes – 24 hours	< 30 minutes
Post Traumatic Amnesia (PTA)	> 24 hours (often > 7 days)	1 – 7 days	< 24 hours

How severe was the injury?

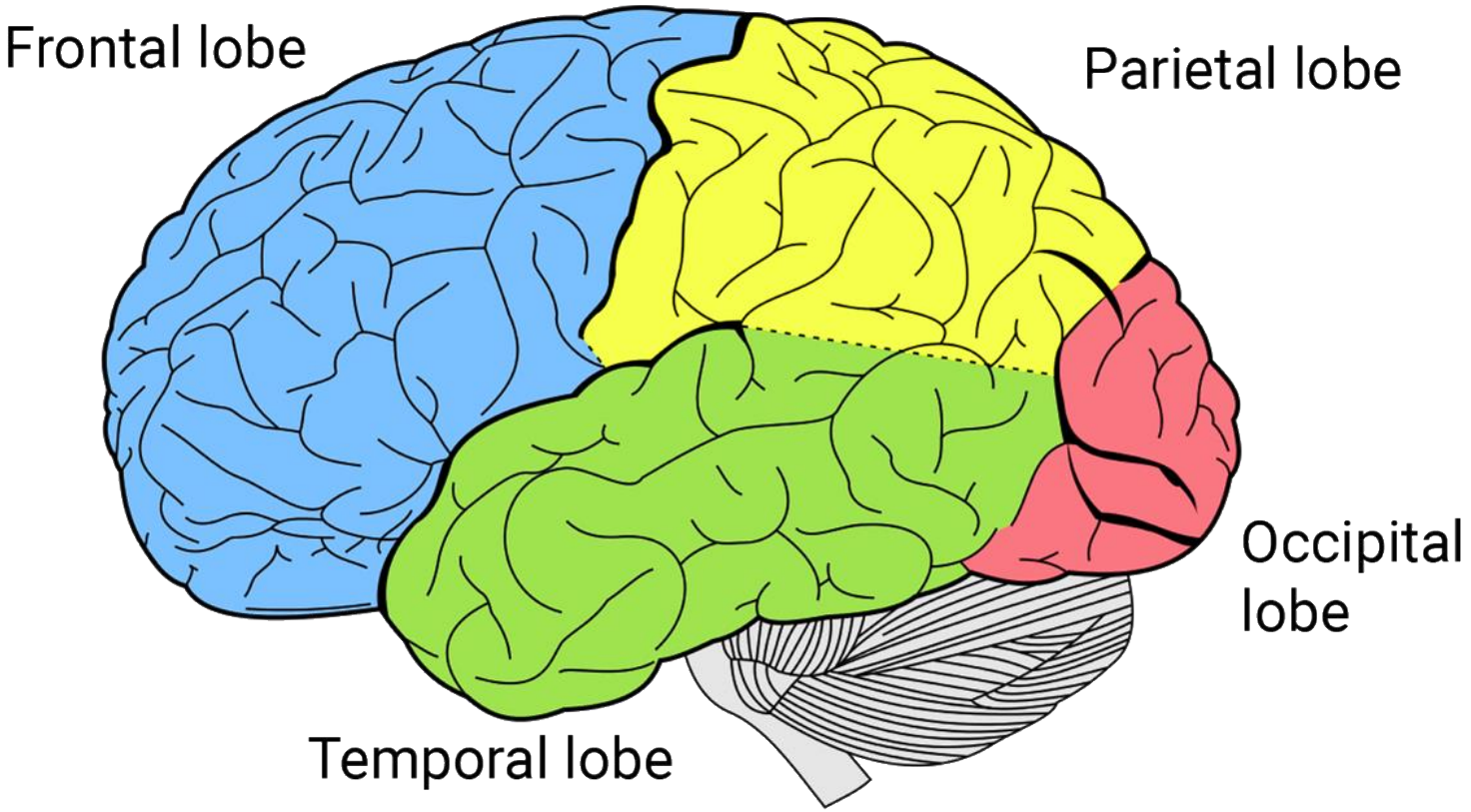


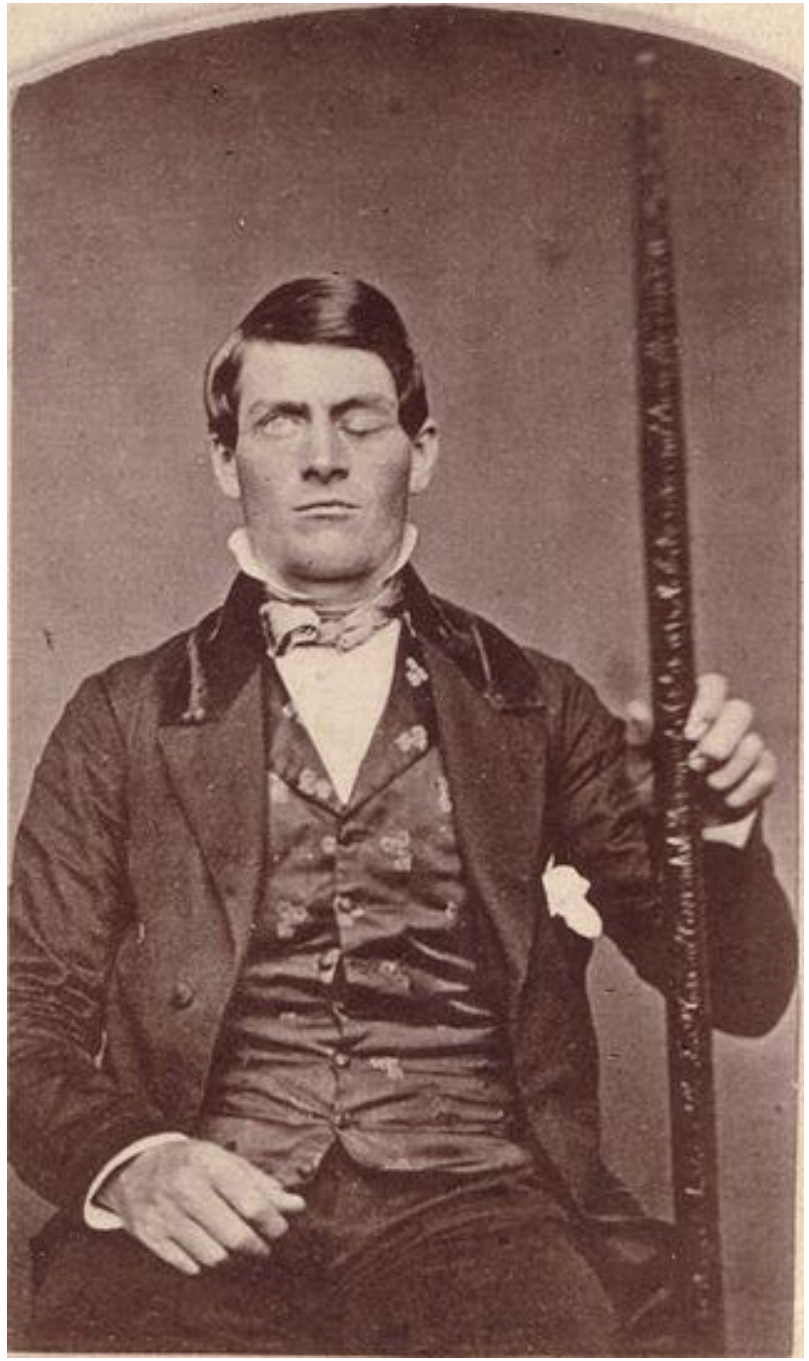
How severe was the brain injury?

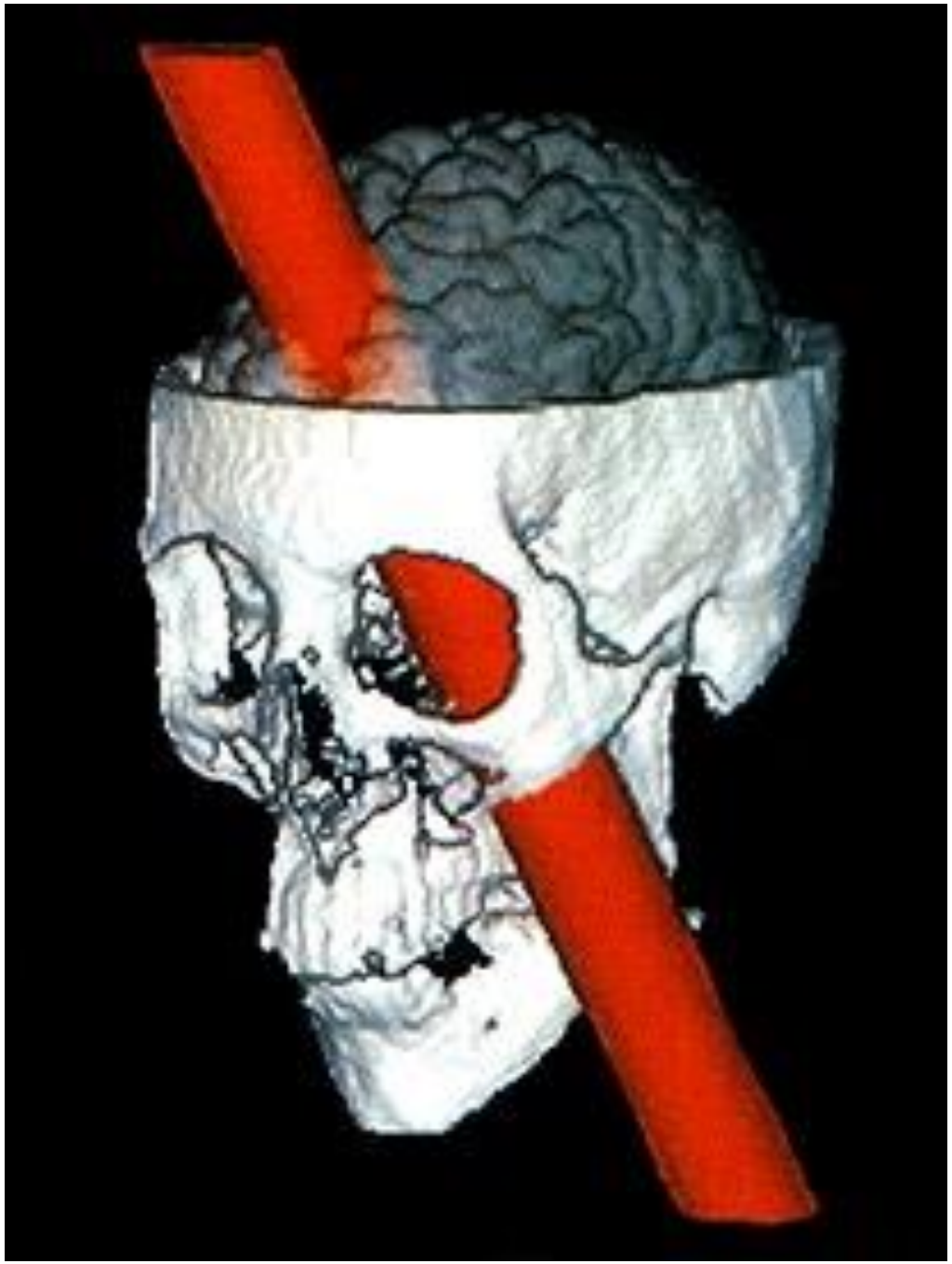
Mayo Classification System

	Moderate-Severe TBI	Probable Mild TBI	Possible Mild TBI
Signs / symptoms	Death due to this TBI		Blurred vision, confusion, feeling dazed, dizziness, headache or nausea
Worst GCS	< 13		
Loss of consciousness	> 30 minutes	< 30 minutes	
Post-traumatic amnesia	> 24 hours	< 24 hours	
Evidence of injury	Haematoma, contusion, haemorrhage (= definite moderate-severe)	Skull fracture (dura intact)	

Outcome after severe TBI







Executive function	Executive dysfunction
Motivation	Apathy and lack of drive
Planning and organisation	Problems with initiating and carrying out a sequence of actions
Monitoring performance	Inability to monitor or reflect on performance
Flexible thinking	Rigid inflexible thoughts and behaviour
Multi-tasking	Unable to shift attention between tasks
Focus	Problems with sustained attention; difficulty engaging in conversation or group activities
Interpreting social cues and codes	Poor social judgement
Emotion regulation	Mood disturbance, irritability, aggression

Outcome after mild brain injury

J Rehabil Med 2004; Suppl. 43: 84–105

Taylor & Francis
healthsciences

PROGNOSIS FOR MILD TRAUMATIC BRAIN INJURY: RESULTS OF THE WHO COLLABORATING CENTRE TASK FORCE ON MILD TRAUMATIC BRAIN INJURY

Linda J Carroll,[1] J. David Cassidy,[1,2,3] Paul M. Peloso,[4] Jörgen Borg,[5] Hans von Holst,[6] Lena Holm,[3] Chris Paniak[7] and Michel Pépin[8]

From the [1]Alberta Centre for Injury Control and Research, Department of Public Health Sciences, University of Alberta, Edmonton, Alberta, Canada, [2]Department of Medicine, University of Alberta, Edmonton, Alberta, Canada, [3]Section for Personal Injury Prevention, Department of Clinical Neurosciences, Karolinska Institutet, Stockholm, Sweden, [4]Department of Internal Medicine, University of Iowa, Iowa City, Iowa, USA, [5]Department of Rehabilitation Medicine, Uppsala University, Uppsala, Sweden, [6]Department of Neurosurgery, Karolinska Institutet, Division of Neuronic Engineering, Royal Institute of Technology, Stockholm, Sweden, [7]Glenrose Hospital and the Departments of Psychology and Educational Psychology, University of Alberta, Edmonton, Alberta, Canada, [8]Department of Psychology, Laval University, Quebec, Canada

Outcome after mild brain injury

"early cognitive deficits in mTBI are largely resolved within a few months post-injury, with most studies suggesting resolution within 3 months."

J Rehabil Med 2004; Suppl. 43: 84–105

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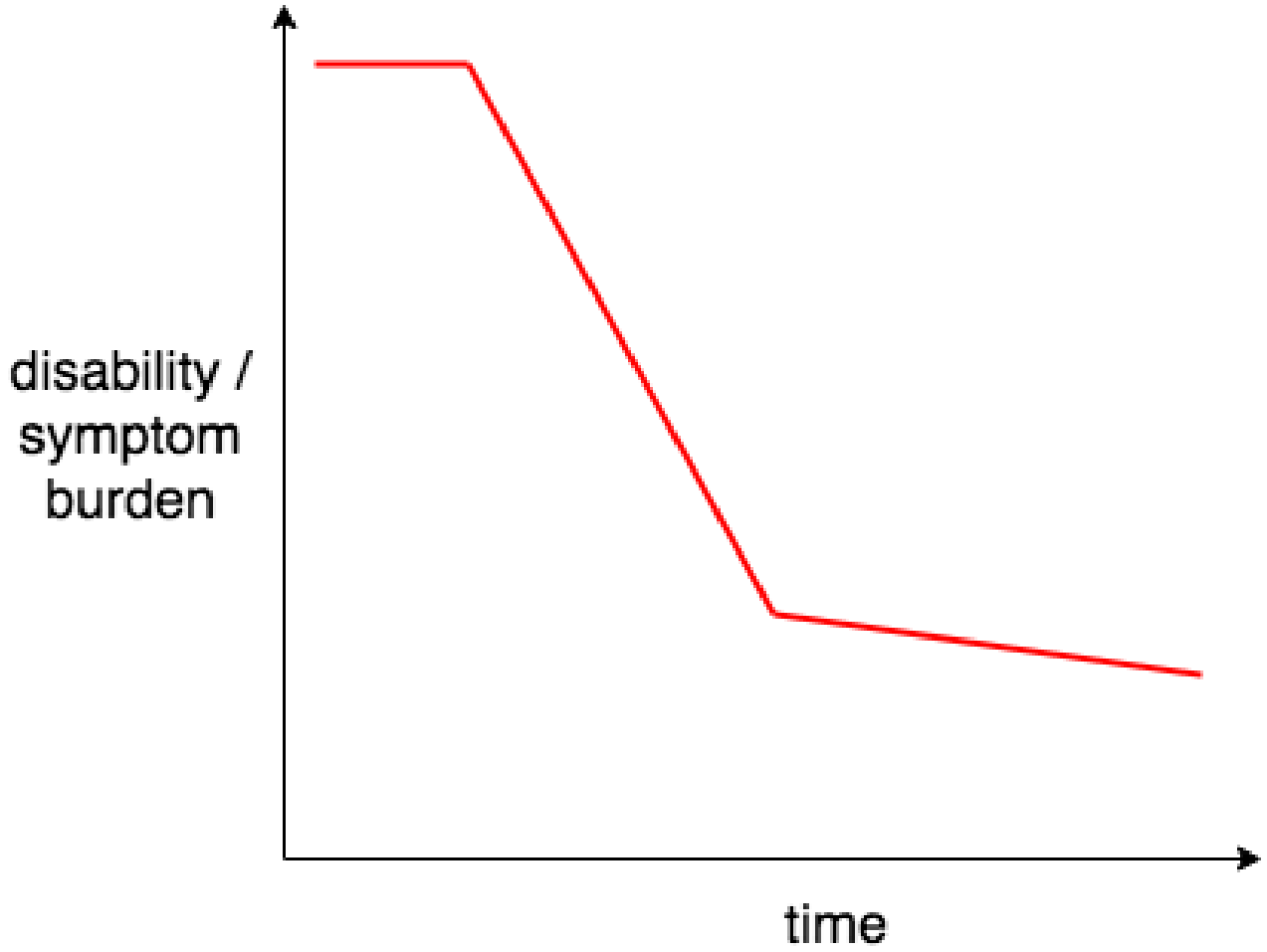
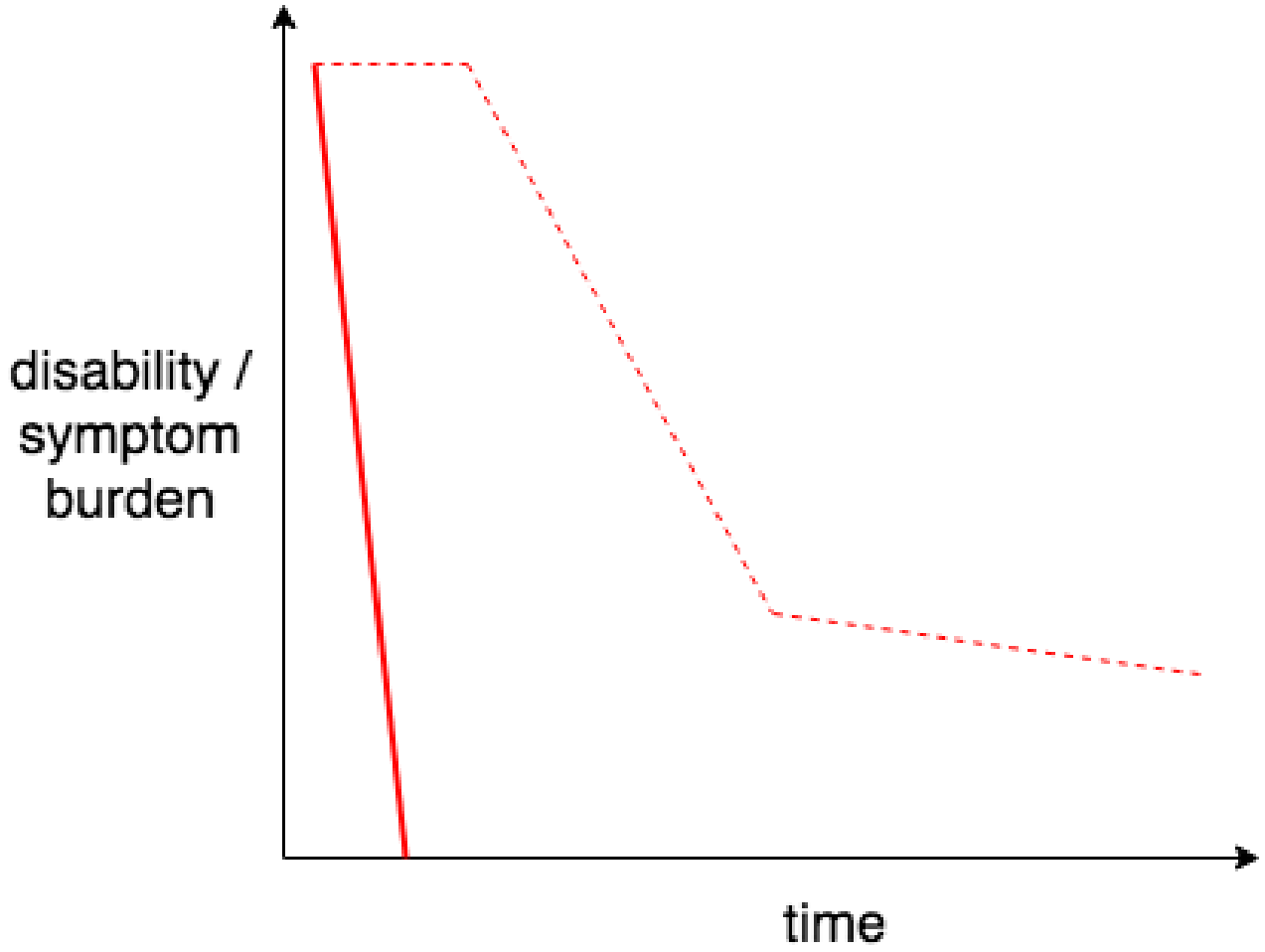
Common symptoms after mild TBI

- Headache
- Dizziness
- Fatigue
- Hypersensitivity to light and noise
- Dissociation (depersonalisation and derealisation)
- Memory and concentration problems
- Sleep problems
- Irritability

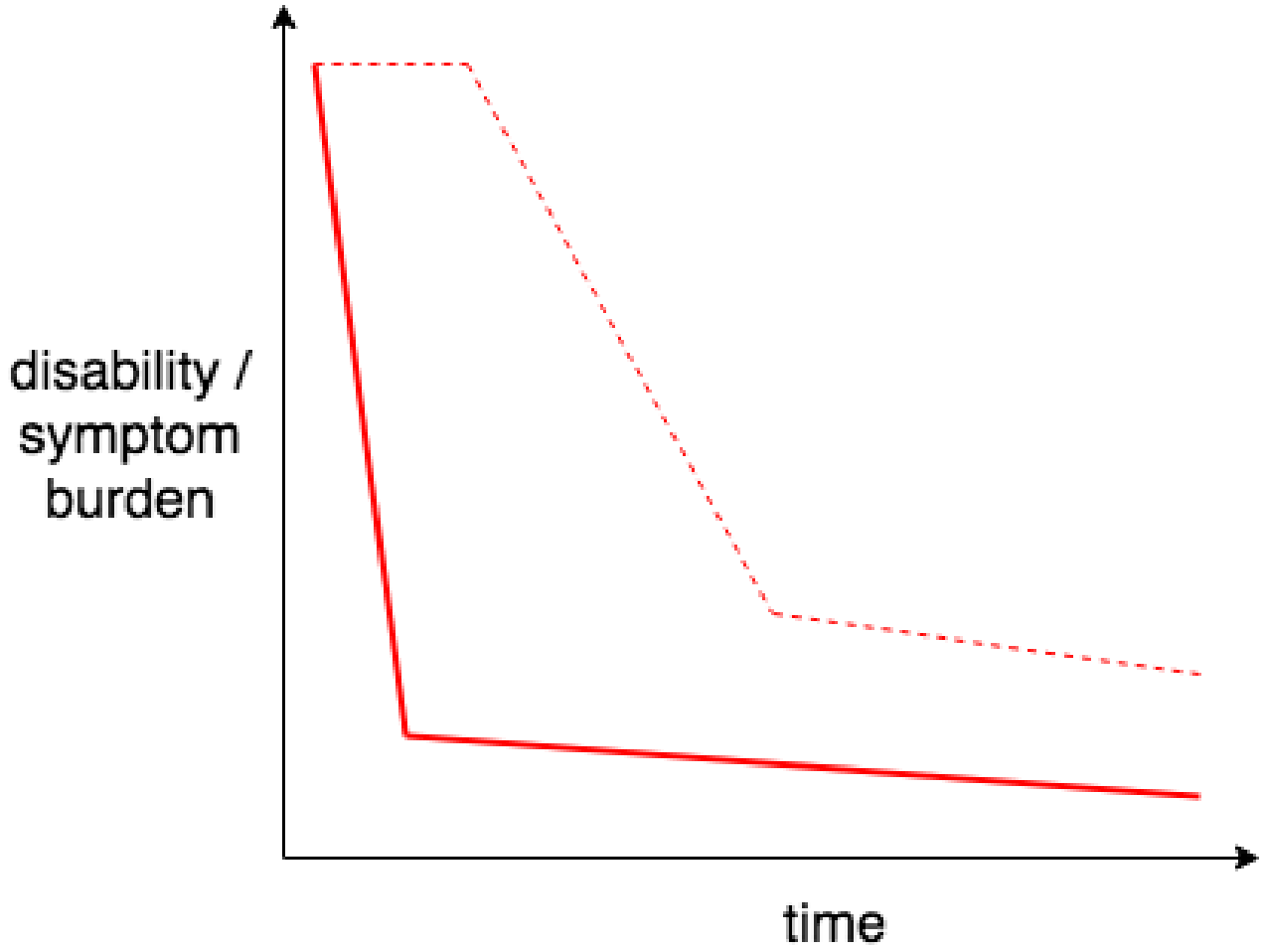
severe TBI



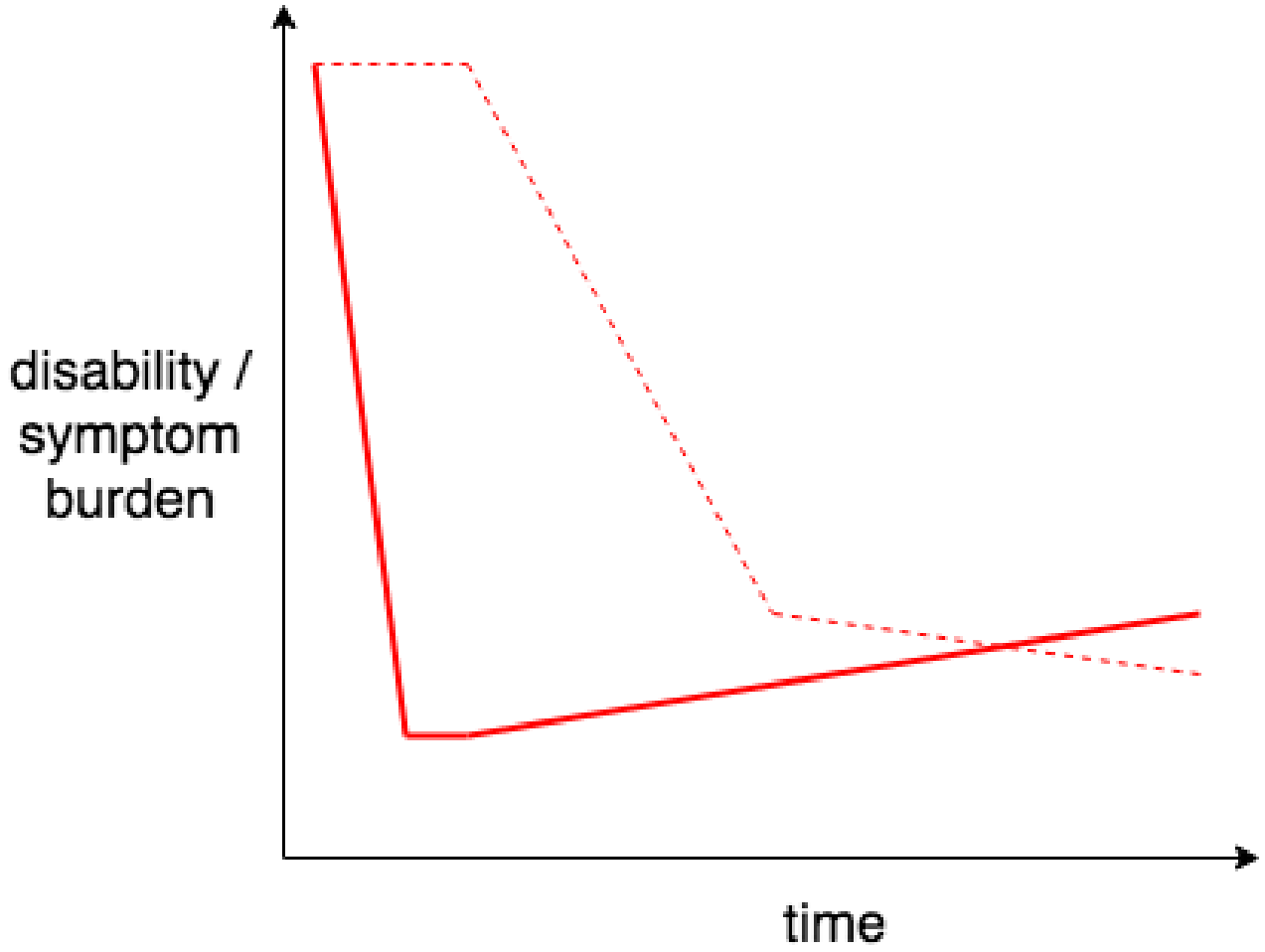
mild TBI

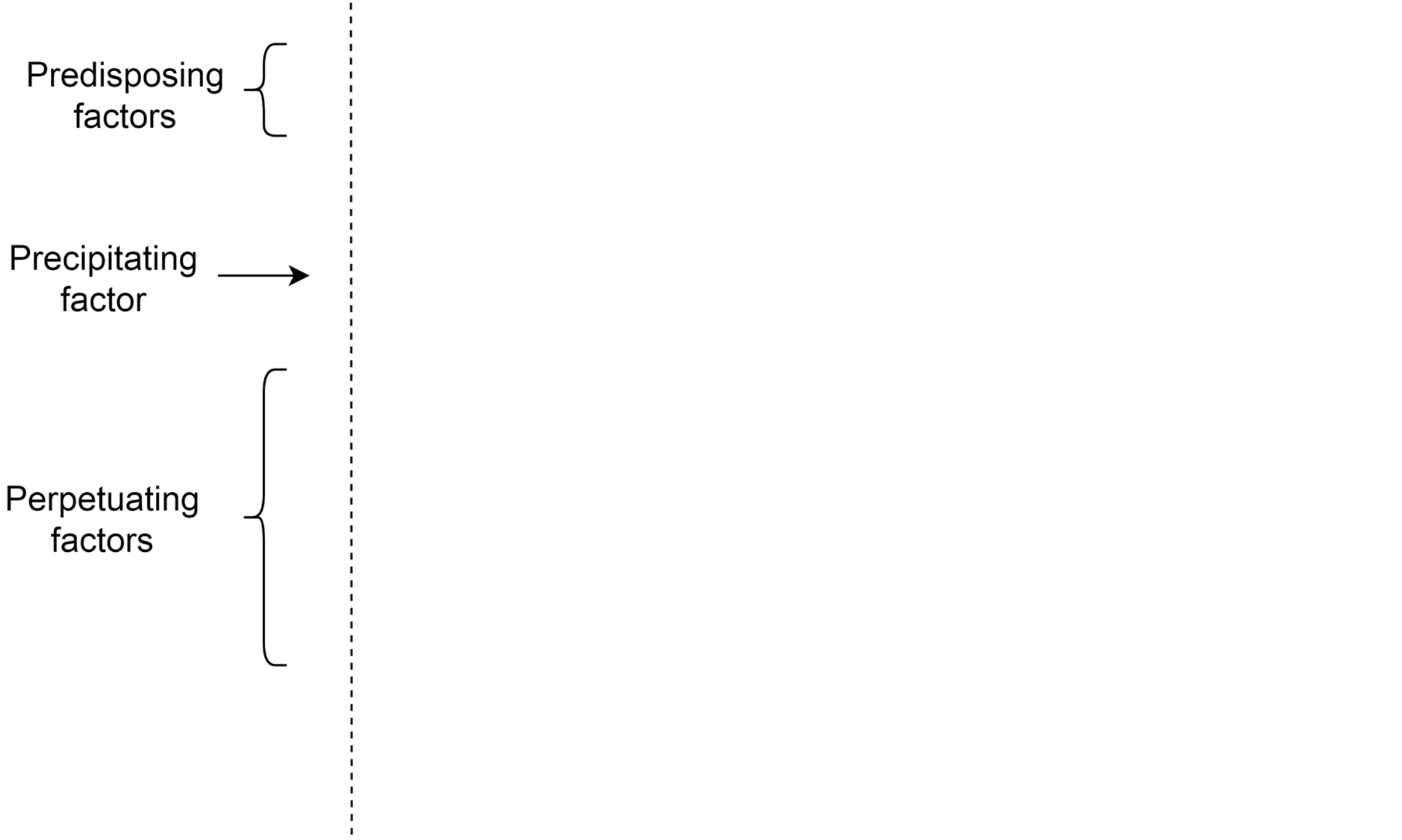


mild TBI → **persisting symptoms**



mild TBI → **symptoms worsening over time**




Predisposing factors
Precipitating factor
Perpetuating factors

Predisposing factors

Precipitating factor

Perpetuating factors

ongoing symptoms

Predisposing factors

Precipitating factor

Perpetuating factors

alcohol

drugs

health anxiety

traumatic life events

stress

functional symptoms

ongoing symptoms

Predisposing factors

alcohol

drugs

health anxiety

traumatic life events

stress

functional symptoms

Precipitating factor

Perpetuating factors

Cognitions ↔ Emotion ↔ Behaviour

psychosocial factors

other neurological and psychiatric disorders

ongoing symptoms

Predisposing factors	• Pre-injury level of function? • Previous psychological difficulties, functional symptoms, or abnormal illness behaviour?
Precipitating factor →	• How severe was the injury?
Perpetuating factors	• How has the person changed their behaviour/activity? • Attitude and beliefs about the injury? • Are there neurological or psychiatric comorbidities? • Are they involved in litigation / seeking disability benefits?

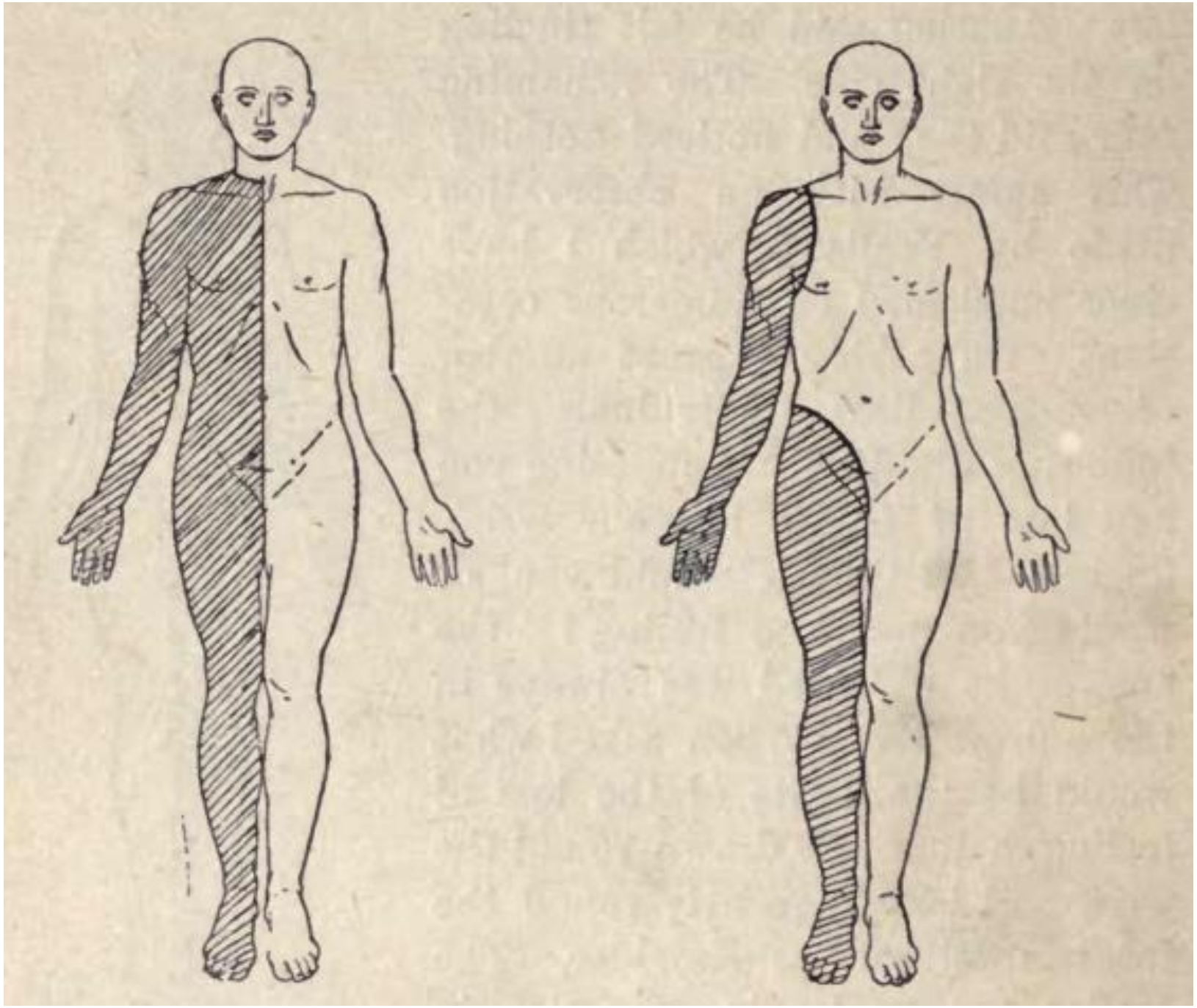
Functional neurological disorder (DSM 5 criteria)

A. One or more symptoms of altered voluntary motor or sensory function.

B. Clinical findings provide evidence of incompatibility between the symptom and recognized neurological or medical conditions.

C. The symptom or deficit is not better explained by another medical or mental disorder.

D. The symptom or deficit causes clinically significant distress or impairment in social, occupational, or other important areas of functioning or warrants medical evaluation.



Functional cognitive disorders: a systematic review

Laura McWhirter, Craig Ritchie, Jon Stone, Alan Carson

Cognitive symptoms are common, and yet many who seek help for cognitive symptoms neither have, nor go on to develop, dementia. A proportion of these people are likely to have functional cognitive disorders, a subtype of functional neurological disorders, in which cognitive symptoms are present, associated with distress or disability, but caused by functional alterations rather than degenerative brain disease or another structural lesion. In this Review, we have systematically examined the prevalence and clinical associations of functional cognitive disorders, and related phenotypes, within the wider cognitive disorder literature. Around a quarter of patients presenting to memory clinics received diagnoses that might indicate the presence of functional cognitive disorders, which were associated with affective symptoms, negative self-evaluation, negative illness perceptions, non-progressive symptom trajectories, and linguistic and behavioural differences during clinical interactions. Those with functional cognitive disorder phenotypes are at risk of iatrogenic harm because of misdiagnosis or inaccurate prediction of future decline. Further research is imperative to improve diagnosis and identify effective treatments for functional cognitive disorders, and better understanding these phenotypes will also improve the specificity of diagnoses of prodromal degenerative brain disease.

Lancet Psychiatry 2019

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Introduction

disorders were more likely to attend alone, to be worried

Functional cognitive disorders	Cognitive symptoms due to ABI or dementia
Attends alone	Attends with someone
Patient more aware of the problem than others	Others more aware of the problem than patient
Answers independently	Turns to accompanying adult for support
Detailed description of complaints	Account of symptoms lacking in detail
Frequently offers elaboration and detail	Unlikely to give spontaneous elaboration or detail
Can answer questions with multiple components	Can only answer single-component questions
Loss of recent and remote autobiographical memories	Relative preservation of remote memories
Complaint of memory 'gaps'	Complaint of specific memory 'gaps' unusual
Memory symptoms within most people's normal experience	Symptoms outwith normal experience
Unstable or worsening course	Cognitive impairment improves then plateaus
Marked variability	Less variability

The **why** and **how** of functional neurological disorder

doi:10.1093/brain/aws129 Brain 2012: 135; 3495–3512 | 3495

BRAIN
A JOURNAL OF NEUROLOGY

OCCASIONAL PAPER

A Bayesian account of 'hysteria'

Mark J. Edwards,[1,*] Rick A. Adams,[2,*] Harriet Brown,[2] Isabel Pareés[1] and Karl J. Friston[2]

The **why** and **how** of functional neurological disorder

Abnormal **prior expectations** and **excessive attention** towards affected body part / system combine to produce prediction errors → symptoms

doi:10.1093/brain/aws129 Brain 2012: 135; 3495–3512 | 3495

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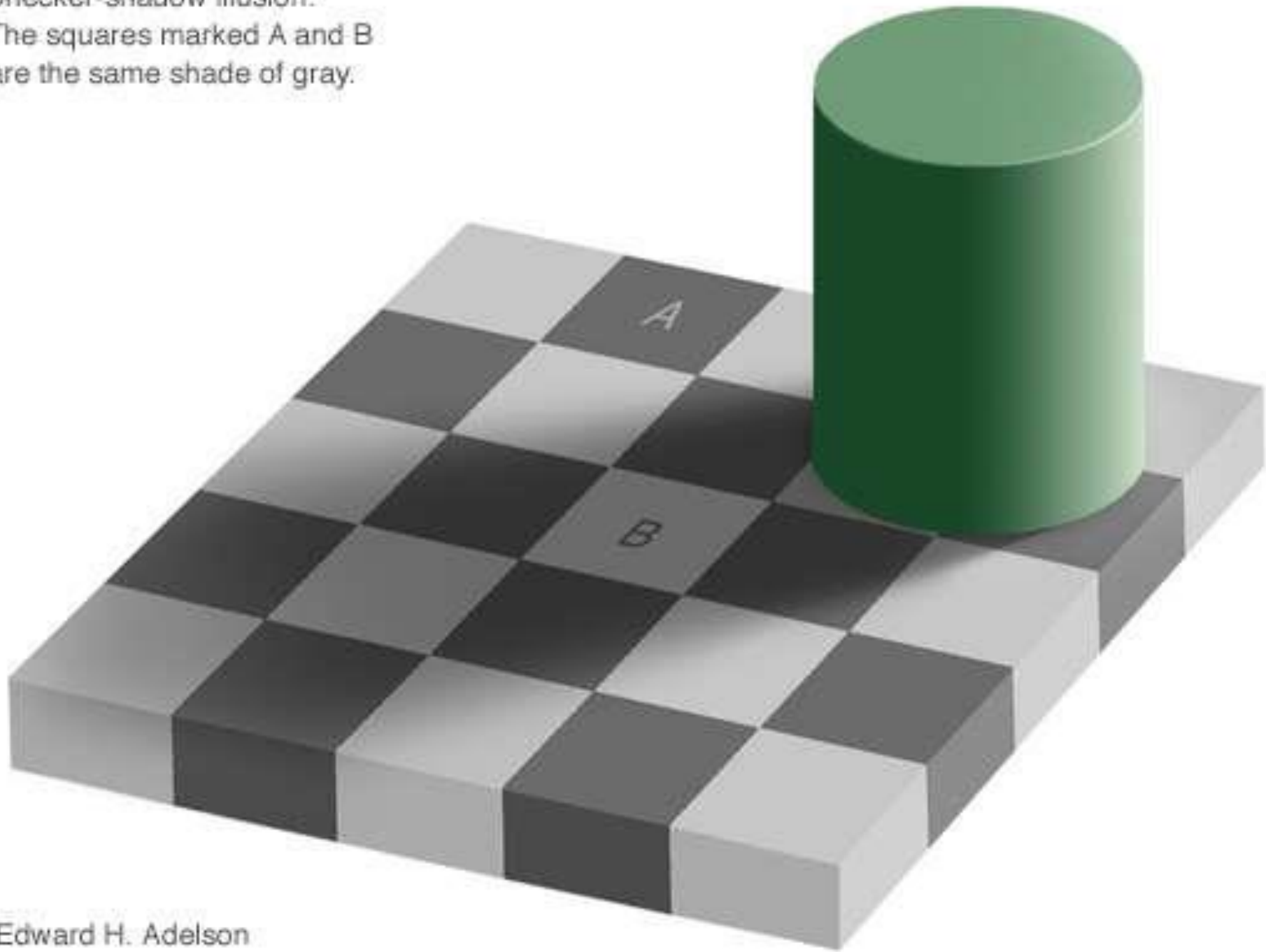
Checker-shadow illusion:
The squares marked A and B
are the same shade of gray.



Edward H. Adelson

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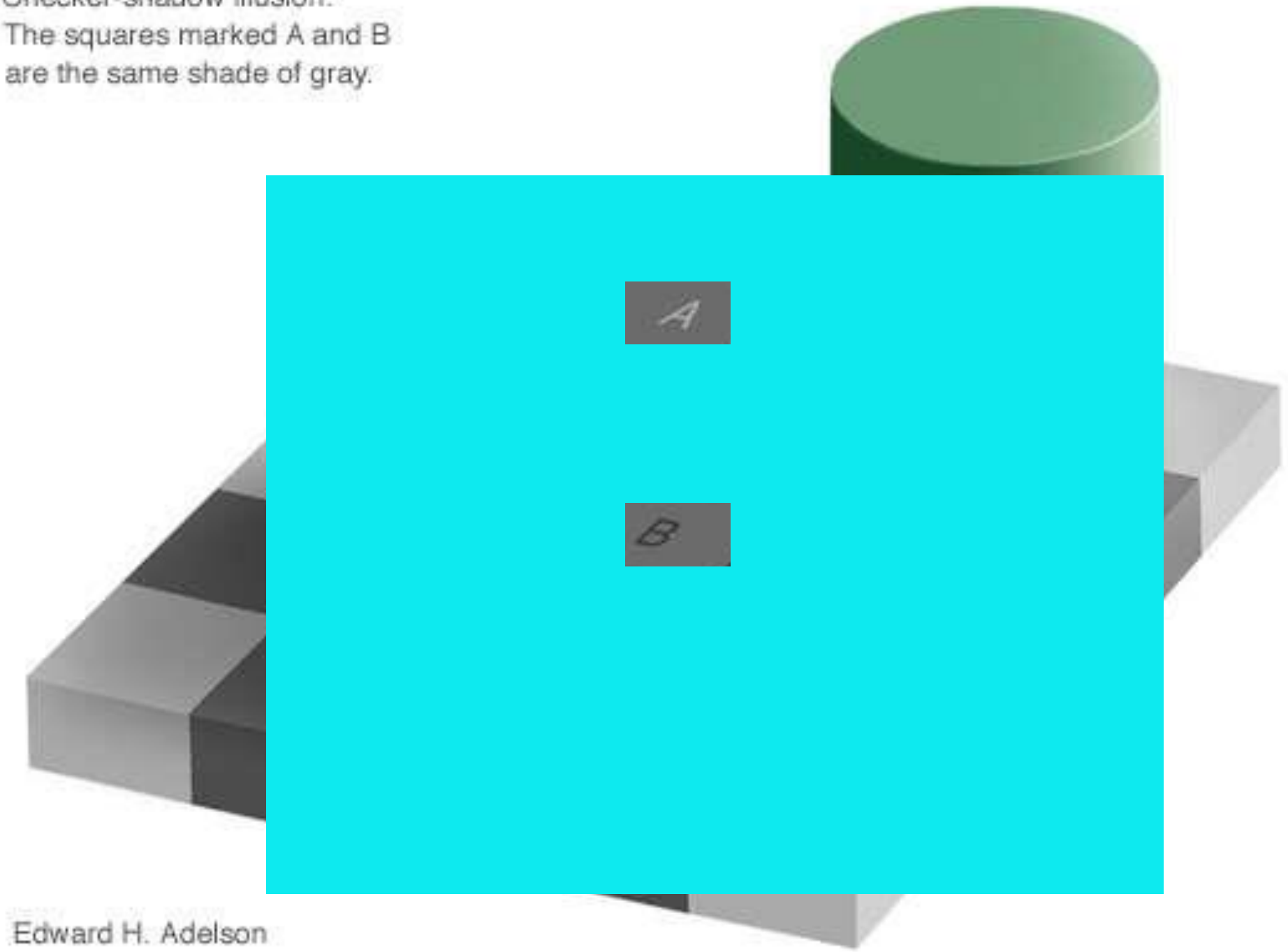
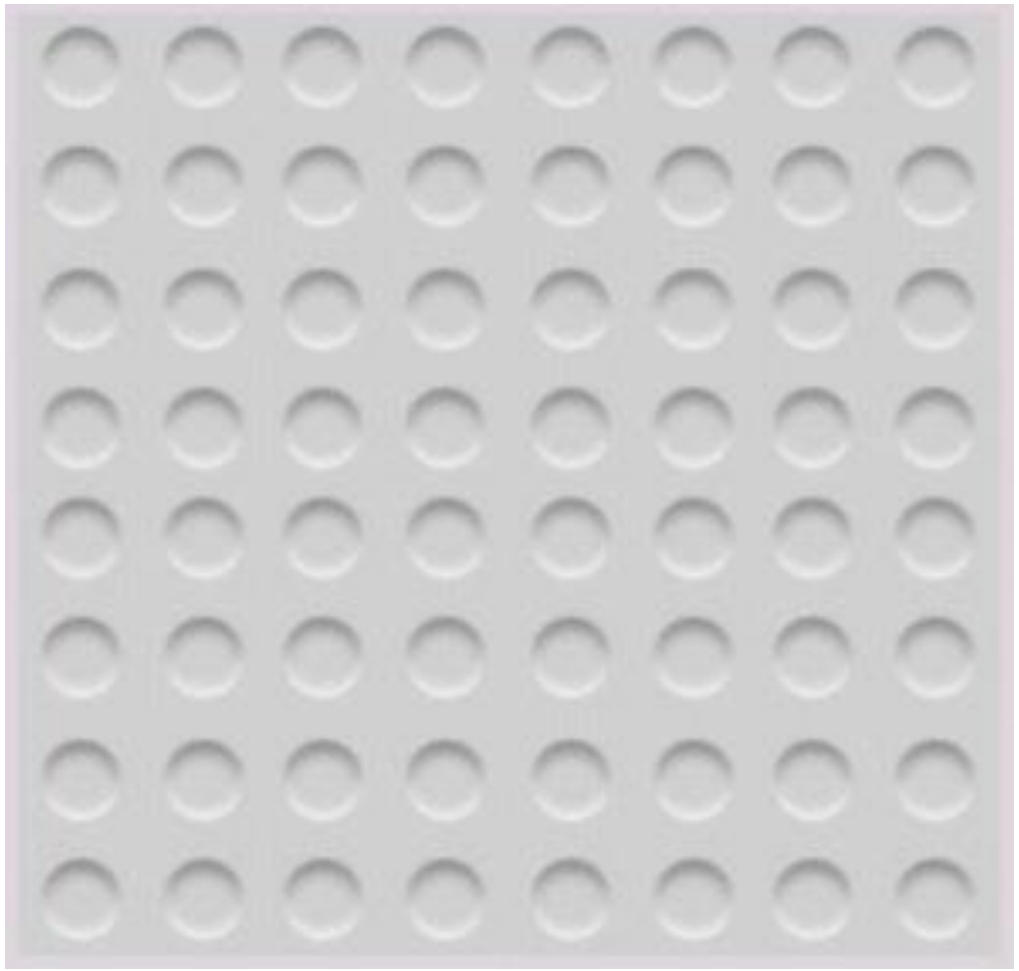
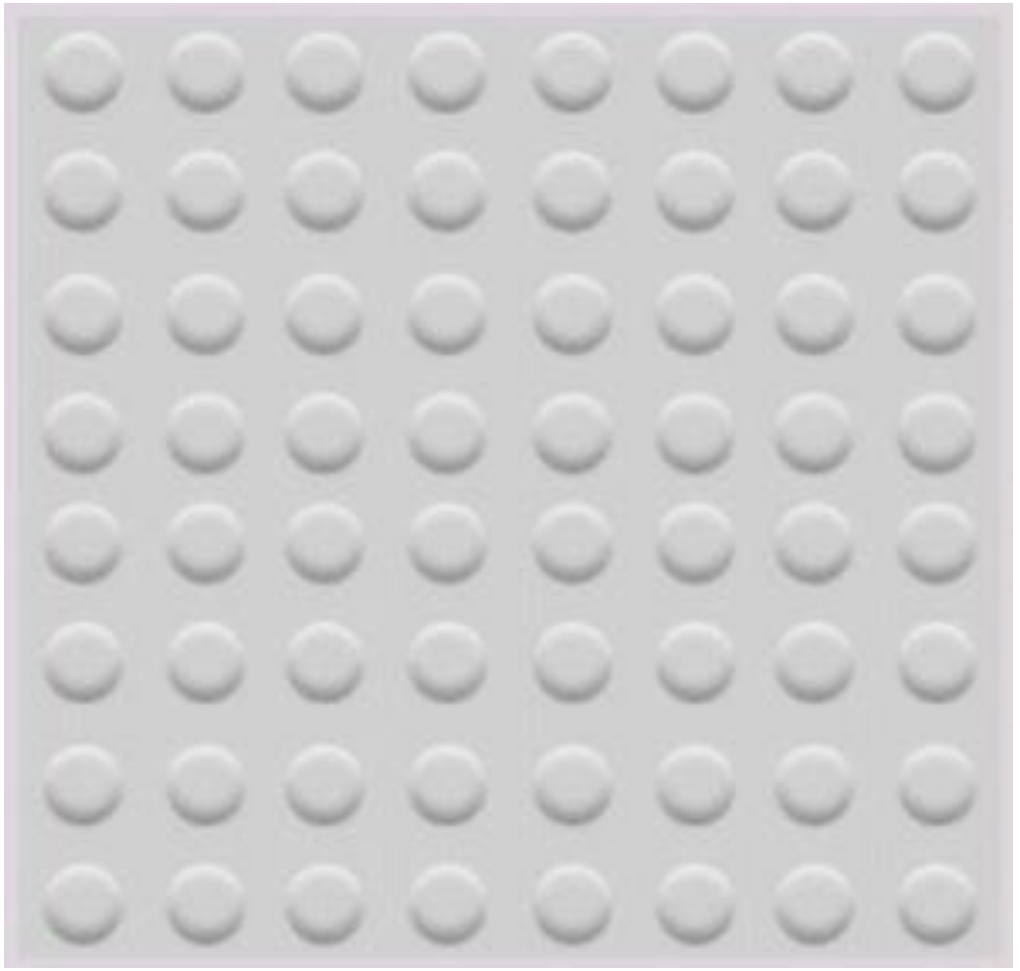


Edward H. Adelson

Bumps or pits?





Common comorbidites

- Depression
- Anxiety disorders
  - Phobic anxiety
  - Post-traumatic stress disorder
- Somatic Symptom Disorder
- Health anxiety disorder (previously hypochondriasis)
- Chronic pain
- Chronic fatigue

Treatment

- Target to specific symptoms
- Clear explanation and written information about diagnosis
- Stop unhelpful treatments
- Psychological therapy (eg cognitive behavioural therapy)
- ‘Hands on’ therapy (physiotherapy, occupational therapy, speech and language therapy)

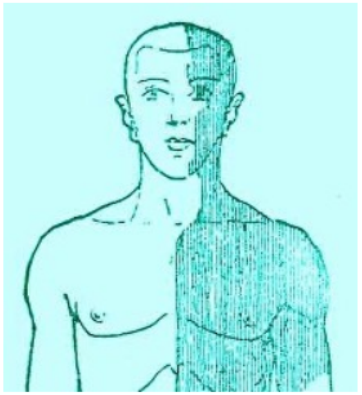
www.neurosymptoms.org

Functional Neurological Disorder (FND) : a patient's guide

neurosymptoms.org

including Functional/Dissociative (non-epileptic) Seizures, Functional Movement Disorder and other functional symptoms

Welcome | Symptoms | Causes | Not imagined | Treatment | Video | Stories | About+News | Links Downloads | Feedback



This website is about **Functional Neurological Disorder (FND).** This is when someone has:

- NEUROLOGICAL SYMPTOMS (such as limb weakness, numbness, shaking or blackouts) which are
- REAL (and not imagined)
- and due to a PROBLEM with the FUNCTIONING of the nervous system
- not due to damage or structural disease of the nervous system
- causing difficulties for the person who experiences them

Some people have troublesome symptoms that they wish to understand without necessarily having a 'disorder' - these are called functional neurological symptoms, and this site is for you too.

FND and functional symptoms surprisingly common but can be difficult for patients and health professionals to understand.

This website, written by a neurologist with a special interest in these problems, aims to give you a better understanding of these symptoms. It has no advertising and is free. I hope you find it useful

Professor Jon Stone, Consultant Neurologist, Edinburgh

Translation?

How to use this website ...

Most people with functional or dissociative neurological symptoms have a combination of symptoms like "weakness, numbness and fatigue" or "blackouts and sleep problems"

Click on a symptom on the right or use the menu above to explore the symptoms that are relevant to you.

Click on 'Causes' to discover what is known about....

- what is going wrong in the body when they do happen.(Mechanisms) and
- why people become vulnerable to these symptoms (Causes)
- what is known about the accuracy of the diagnosis (Misdiagnosis)

Click on 'Not imagined' for some answers to this issue

Click on 'Treatment' for discussion of what treatments may help

Click on 'Videos' or 'Stories' for some real patient stories

Symptoms ...

Functional Limb Weakness	Functional Tremor
Blackouts / Attacks	Functional Dystonia/Spasm
Sensory Symptoms	Functional Walking Problems
Pain	Word Finding Difficulty
Tiredness / Fatigue	Slurred Speech
Sleep Problems	Bladder Symptoms
Poor Memory / Concentration	Bowel Symptoms
Dissociation	Drop Attacks
Worry / Panic	Swallowing Problems
Dizziness	Complex Regional Pain

www.headinjurysymptoms.org

Head Injury Symptoms

a Guide to Recovering from Mild Head Injury, Concussion and Mild Traumatic Brain Injury

Welcome | Symptoms | Diagnosis | Road to Recovery | Outcome | Feedback | Stories | Links & Downloads

Definitions

Am I Brain Damaged?

Welcome

Welcome to headinjurysymptoms.org!

This website was designed to provide information on mild head injury, concussion and mild traumatic brain injury (MTBI). It also contains many practical tips and tools to promote recovery.

> What is Mild Head Injury, Concussion and MTBI?

Mild head injury is very common, but rarely results in any (permanent) brain damage.
Approximately 1 million people per year attend UK Emergency Departments with a head injury. Fortunately, the vast majority of them have what is called a mild head injury.

> Find out more about the Assessment of Head Injuries

After suffering from a mild head injury it is normal to experience:

- Headaches

Key points

- ‘Mild’ TBI covers a wide range of injury severity
- Outcome is influenced by pre-injury risk factors and post-injury cognitions, behaviours, and comorbidities
- Functional neurological disorder and/or psychiatric illness is a common cause of illness after mild TBI (including trivial injuries)
- Functional neurological disorders are diagnosed on the basis of **positive** clinical features of internal inconsistency, not by exclusion

Questions

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