Functional Neurological Disorder and Personal Injury

Laura McWhirter

Ingrid Hoeritzauer

Alan Carson

Jon Stone*

Diagnosis; Neurological disorders; Personal injury

Introduction

The situation in which a person develops symptoms and impairments are greater than, or inconsistent with, the extent of their injuries or severity of pathophysiological identifiable disease is not unique to personal injury litigation, but commonly encountered in all fields of clinical medicine.

In Functional Neurological Disorder ("FND"), neurological symptoms occur which are involuntary and experienced as real—usually distressing and disabling—but which are not a direct result of structural damage or pathophysiological disease. Common symptoms of functional neurological disorder include paralysis (weakness) and other abnormalities of movement, sensory abnormalities, seizure-like episodes, and cognitive (memory and concentration) difficulties. Importantly, FND does not only occur as a stand-alone diagnosis, but is commonly comorbid with symptoms which do relate directly to structural damage or disease; that is, a person with symptoms due to neurological injury might *also* have functional symptoms—sometimes described as "functional overlay" (although best described as functional disorder comorbidity in our view). FND is therefore one reason why a person may develop symptoms and disability which seem excessive, or incongruent with the extent and nature of an injury sustained.

As clinicians and researchers closely involved in the treatment of patients with FND, and who also have experience of providing expert opinion in litigation regarding FND and cases where there is functional disorder comorbidity, we are familiar with the challenges which FND and allied disorders can pose to both legal and non-neuropsychiatric medical experts. In this review, we explain what functional neurological disorders are, how they overlap with other conditions, how they are diagnosed and defined, and with regard to causation what factors may predispose, precipitate and perpetuate symptoms. Finally, we will summarise current scientific understanding regarding the neurobiological mechanisms of FND.

Case A: Functional Neurological Disorder

A 56-year-old roofer falls from 10m in the course of his work. He sustains a serious fracture of the left leg which is repaired operatively with excellent objective outcome. He is predicted by the orthopaedic surgeon to be able to return to work within six months. However, he is slow and fearful of mobilising after surgery, has difficulty walking, and one year after the injury still walks cautiously, and effortfully with elbow crutches. On examination, there is intermittent "give way" weakness of both legs. Hoover's sign is positive in the left leg: he is unable to push his left leg down onto the chair, but when prompted to

* Centre for Clinical Brain Sciences, University of Edinburgh.

move his attention to the task of lifting the opposite leg, full strength returns. He receives a diagnosis of functional neurological disorder, which he appears to accept. He is angry and persistently ruminates about the effect the accident has had on his life. He goes through multidisciplinary rehabilitation but does not improve. He continues to take significant doses of opiate and sedative medications; his activities remain severely limited, and he is unable to mobilise without a wheelchair when out of his house. Covert surveillance demonstrates no discrepancy between reported and observed function. There are arguments about a pre-accident history of pain and depression for which he had treatment but didn't take time off work, and about whether the legal case is interfering with his motivation to improve.

Case B: Complex Regional Pain Syndrome ("CRPS")/Functional Neurological Disorder

A 47-year-old right-handed woman slips on ice and sustains a fracture of the left wrist. The fracture is reduced (re-aligned) and the arm treated in a cast for six weeks. After removal of the cast, she finds that it is too painful to move the arm and holds it immobile, flexed against her body and protected. The arm becomes more and more painful, but also feels "different", as if it is not really her own arm. Her hand feels weak and clumsy, and her fingers begin to curl in towards her palm. On examination, the arm is a little thinner than the other and the left hand feels cooler than the right. Any touch or attempts to move the hand and wrist are met with complaints of severe burning pain. She receives a diagnosis of Complex Regional Pain Syndrome from a Pain Medicine specialist, but a neurologist considers that elements of her condition are better explained as a functional neurological disorder. There are debates about whether she has a psychiatric or medical disorder and whether a neurologist, psychiatrist or pain medicine expert is best placed to provide a diagnosis and prognosis.

Case C: Functional cognitive disorder as part of a "post-concussion syndrome"

A 23-year-old man is struck by a falling object at work. He is "knocked out" for a few seconds and has no external injury. He feels "dazed" after he comes round, but is not confused and has clear recall of his journey in an ambulance to the hospital emergency department. He returns home the same day and spends several days off work, mostly in bed, as he feels "groggy", dizzy, and tired. When he returns to work the following week he feels "spaced out", unwell, has a headache when using the computer and has to go home. Over the following weeks and months his memory gets worse and worse. He walks into rooms and forgets what he went in for, misses appointments, forgets passwords and pin numbers, and starts to depend on lists and a calendar where he didn't need to before; his partner notices that he sometimes loses the thread of what he is saying in conversation. Crowded environments make him feel worse, and he stops going to the supermarket and the gym. He has a neuropsychological assessment which concludes that he has widespread deficits in executive function, attention and memory compatible with a traumatic brain injury. Following this he joins a head injury support group and fails to improve. Neuropsychiatric assessment finds him to be anxious and slightly depressed. There is a discrepancy between his neuropsychological test performance and his "real world" cognitive abilities. His "post-concussional" symptoms are assessed as being primarily the result of a functional disorder, including functional cognitive disorder, with onset precipitated by the mild traumatic brain injury from which most people would ordinarily recover within three months.

Case D: Post-Traumatic Stress Disorder with dissociative seizures (also called Non-Epileptic Attacks or functional seizures)

A 31-year-old women is a restrained driver in a car which rolls down an embankment following a collision. She sustains bruising but no serious injury. Over the following months she is unable to drive or travel in a car because of memories of the accident. Distressing memories of being inside the car as it rolled jump into her head without warning, together with physical symptoms of shakiness, dry mouth, and "butterflies" in the stomach. She is generally nervous and quick to startle, and sleeps poorly. One day, two months after the accident, she feels strange and then falls to the ground with eyes closed and arms and legs shaking irregularly. The episode is witnessed by her partner who reports the event lasted at least five minutes and that she was tearful but not confused afterwards. These seizures—subsequently diagnosed as dissociative or non-epileptic attacks—continue until she undergoes psychological treatment for Post-Traumatic Stress Disorder ("PTSD"), during which seizures initially become more frequent but then resolve completely.

Case E: Wilful exaggeration of symptoms of Complex Regional Pain Syndrome/Functional Neurological Disorder

A 28-year-old mechanical engineer trips over equipment at work and sustains an ankle fracture, treated with open reduction and internal fixation by the orthopaedic surgeons. After six months he is unable to return to work and reports severe ongoing pain, inability to bear weight, extreme sensitivity to touch over the foot and ankle, and his foot is held twisted inwards in an abnormal position. He walks with crutches, dragging the top of his foot behind him on the ground and says that he can never mobilise better than this. The orthopaedic surgeons cannot identify an orthopaedic cause, and he is referred to a consultant neurologist who makes a diagnosis of functional neurological disorder. However, contemporaneous surveillance footage is obtained in which the man can be seen walking normally, and apparently comfortably, without crutches, over a distance of 500m, and without any abnormal position of the foot. With this additional information, the neurologist determines that it seems more likely that the man is wilfully exaggerating his symptoms and therefore no diagnosis can be made.

Terminology and classification

Two main diagnostic classification systems are used when a precise definition is required for a neuropsychiatric disorder. The *Diagnostic and Statistical Manual of Mental Disorders* ("DSM 5") is produced by the American Psychiatric Association,[1] and the *International Classification of Diseases* ("ICD 11") by the World Health Organisation.[2] Broader discussion of the validity of the operationalised diagnoses contained in these systems lies outside the scope of this article. However, it is worth noting that functional and somatoform or "'psychosomatic"' disorders have always sat awkwardly in these classification systems, both for metaphysical reasons (are mind and body really separate?) and practical reasons (are these conditions the domain of neurologists or psychiatrists?).

The 2013 (5th) edition of DSM replaced the previous edition's "Conversion Disorder", with origins in Freud's theory of conversion of psychological distress into physical symptoms, with "Conversion Disorder (Functional Neurological Symptom Disorder)". ICD 11, released in 2018, replaced the 10th version's "Conversion Disorder" with "Dissociative Neurological Symptom Disorder": the term "dissociative" here denoting abnormal separation of neurological function from conscious awareness. These terms essentially describe the same condition. The move away from "conversion" is the result of a better understanding

[1] *Diagnostic and Statistical Manual of Mental Disorders*, 5th edn (American Psychiatric Association).
[2] *International Classification of Diseases*, 11th edn (World Health Organisation).

that functional disorders often occur in the absence of a psychological stressor, and correspondingly DSM-5 dropped the requirement for a psychological stressor in order to fulfil diagnostic criteria.

There are terms used in the past which we tend to avoid: "medically unexplained" is outdated, as with the research gains of the last 20 years we can now make a positive diagnosis of FND and explain the cause of symptoms with as much precision as we can for most other neurological disorders. The terms "psychogenic" and "psychosomatic" are often used by specialists but reflect a theoretical division between body and mind which has not been substantiated by neuroscientific research.

The term "functional disorder" is now widely understood by health professionals, and is generally acceptable to patients, who lead several support groups under the banner of FND.[3] Within neurological practice the term FND is increasingly diagnosed and treated in the same way that gastroenterologists might diagnose and treat irritable bowel syndrome.

Related and overlapping diagnoses

Patients considered to have excessive distress and disability following injury attract other relevant diagnoses. Complex Regional Pain Syndrome is a post-injury pain syndrome in which symptoms of sensory change and weakness are often present, and share the characteristic internal inconsistency of FND; many neurologists consider CRPS and FND to be overlapping conditions with shared pathophysiology, although this has been resisted by other specialities because of the stigma attached to FND diagnoses in the past.[4] "Post-concussion syndrome", particularly that which persists for months or years after the most minor of head injuries, usually presents with a variety of symptoms such as headache, fatigue, dizziness and cognitive symptoms which benefit from careful assessment but are, in broad terms, often part of a functional disorder. Somatic Symptom Disorder, in DSM-5, describes the presence of symptoms (which may be caused by recognised pathophysiological disease) associated with excessive worry and distress; this diagnosis can be criticised for being unhelpfully broad and commonly a consequence as much of a dysfunctional health care system as the patient's condition. Illness anxiety disorder (previously hypochondriasis) describes excessive worry and anxiety about health, often with a preoccupation that underlying disease is present, and with a characteristic inability to be reassured by explanation or normal investigations. Chronic pain syndromes, chronic fatigue syndrome, occurring in the absence of structural explanation as well as depressive and anxiety disorders are also common concomitants of FND.

Diagnosis

The diagnosis of a functional neurological disorder should usually be made by a neurologist, or a neuropsychiatrist with particular expertise in this area.

Historically, functional neurological disorder (then "hysteria" or "conversion disorder") was diagnosed on the basis of an absence of evidence of disease, with an assumption or the presence of a psychological stressor. The last 20 years, however, have seen a sea-change in the approach to diagnosis of FND. The requirement for a psychological stressor is gone, and diagnosis is now made on the basis of positive clinical signs (Table 1): clinical features which are only present in FND. These signs commonly involve demonstrating internal inconsistency, for example: weakness that is present during voluntary movement, but is not present during "automatic" movements (Figure 1). One strength of this approach is that the presence of one or more positive clinical signs can indicate that FND is present even in patients with

[3] J. Stone, W. Wojcik and D. Durrance, "What should we say to patients with symptoms unexplained by disease? The 'number needed to offend'" (2002) 325 B.M.J. 1449–50.

[4] S. Popkirov, I. Hoeritzauer, L. Colvin, A. J. Carson and J. Stone, "Complex regional pain syndrome and functional neurological disorders—time for reconciliation" (2019) 90 J Neurol Neurosurg Psychiatry 608–614.

structural neurological injury or neurological disease, where the FND comorbidity is sometimes called "functional overlay".

Table 1: Examples of positive signs in Functional Neurological Disorder

Functional symptom	Example of positive sign
Weakness/paralysis	Intermittent/ "give-way"/"collapsing" weakness: On examination, muscle strength varies from second to second between "collapsing" and brief moments of full strength.
	Hoover's sign: (Figure 1) Hip flexion (pushing down on the chair while seated) is weak, but returns to full strength when asked to extend opposite hip (raise opposite leg from chair).
Gait (walking) abnormality	Walking with the foot of the weak leg dragging behind.
	Gait that improves dramatically when walking backwards, or if asked to slide, as if on ice skates (in absence of better explanation).
Tremor	Variable in frequency and amplitude.
	When asked to copy a rhythm with opposite hand or foot the tremor may "entrain" (join in) or transiently cease.
Dissociative (non-epileptic) seizures	Sudden "fall down lie still with eyes closed for longer than 60 seconds"; eyes closed, hyperventilation during generalised shaking.

Figure 1: Hoover's sign of functional leg weakness is one of the positive signs of FND. It shows that voluntary movement is impaired but automatic movements are normal

Wilful exaggeration

Deliberate exaggeration or falsification of symptoms is generally considered more frequent in people assessed as part of personal injury litigation than in routine NHS care. Ultimately, the court must decide whether wilful exaggeration is present. However, for medical professionals working in this area, clinical

decisions involving the veracity of symptom description area are part of day-to-day practice, so providing their personal view may be a legitimate component of a report to the court.

There are no tests which can confidently identify symptoms which are intentionally produced. An additional challenge, in FND, is that internal inconsistency or symptom variability is characteristic of the condition and often a requirement for confident diagnosis. The important question, therefore, is: What is the difference between internal inconsistency in FND, and internal inconsistency due to wilful exaggeration?

The strongest evidence in support of suspected wilful exaggeration is the observation of major discrepancy between reported and observed function. For example, where a person who attends clinical assessment in a wheelchair, and reports during the assessment that they are unable to walk at all, but who is observed in other circumstances walking without difficulty; or a person who is unable to move their arm during assessment (and, importantly, who reports that the arm is weak at all times) is observed playing golf. Evidence of this level of discrepancy might also be supported by evidence of lying or unreliability in other areas of the history, such as denying employment since the injury on direct questioning, despite evidence to the contrary.

In our experience, medical experts often make errors in assessment about wilful exaggeration for one of the following reasons:

- **Observing discrepancy between reported and observed symptoms.**

  Patients with functional disorders may characteristically have difficulty reporting the severity and duration of symptoms over time. In a study of people with functional or organic tremor, wearing tremor-recording devices and keeping tremor diaries over five days, both groups, but especially those with functional tremor, recorded that their tremor was present for much more of the day than it actually was (83% v 4%)—even though they knew that the tremor was being recorded.[5] This suggests that symptom report can be inaccurate (and importantly, *involuntarily* inaccurate), especially in those with functional disorders, where is seems that the more attention is paid to the symptom the more it is present. Recent theories suggest that functional symptoms are, at one level of brain functioning, the product or consequence of abnormal attention. The same person with a functional tremor should however be able to accurately report what they can and cannot do in day to day life.

- **Noting discrepancy between reported severity of symptoms and reported function.**

  Lack of "credibility" of reported severity of symptoms is also unhelpful in assessing whether wilful exaggeration is present. People communicate about illness in different ways, and this is undoubtedly also influenced by the perceived purpose of the assessment. Patients in ordinary clinical settings, and pursuers in medicolegal cases, often omit or exaggerate information even when they are fully aware that we have been provided with their medical records. Although it may seem unlikely that a person sitting comfortably is experiencing pain of "10 out of 10" severity, this might be a communication of total distress, or a representation of the worst severity of a pain which has fluctuated over time, especially (and paradoxically) in a situation where the patient fears they may not be taken seriously.

- **Reliance on cognitive performance validity/effort tests.**

  In our experience, effort tests (also called symptom validity tests or performance validity tests) are often given undue weight in discriminating functional symptoms from wilful

[5] I. Parees, T. A. Saifee and P. Kassavetis, "Believing is perceiving: mismatch between self-report and actigraphy in psychogenic tremor" (2012) 135 *Brain* 117–123.

exaggeration. A minority of people with "medically unexplained" symptoms fail effort tests.[6] Performance in effort tests can also be confounded by pain, fatigue, and attitude toward the examination. However, it is worth noting that failure in effort tests makes other cognitive tests difficult to interpret, and very low scores—especially in tests of forced choice—can be taken in to account in an overall opinion.

In balancing evidence for and against wilful exaggeration, a presentation with a cluster of symptoms typically encountered in clinical practice might require more evidence to reach a conclusion of wilful exaggeration than an atypical presentation.

If a person is overwhelmingly assessed to be wilfully exaggerating or simulating symptoms of illness, the next question will be "Why?" Malingering describes simulation or deliberate exaggeration of illness for external (financial, material, or social) benefit and is not a medical diagnosis. In contrast, a person with factitious disorder simulates or consciously exaggerates illness for complex psychological reasons which they may or may not be aware of.

Causation

Where Functional Neurological Disorder occurs after an injury, the important question for the medical expert is: "But for the injury, what might have happened to this person?". To address this question, we must address the extent to which predisposing, precipitating and perpetuating factors contribute to the clinical presentation at the time of the medical examination (Figure 2).

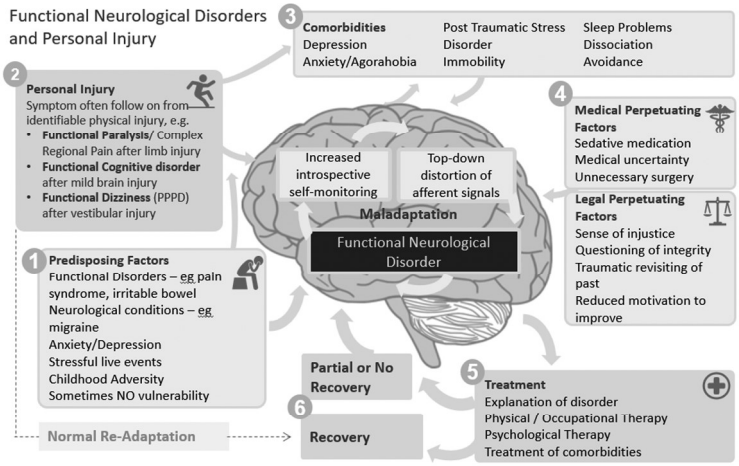

Figure 2: Functional Neurological Disorders and Personal Injury. Aetiology, Mechanism and Treatment

Predisposing factors

People who develop FND are more likely to have experienced stressful events or maltreatment during childhood or adult life than healthy controls or controls with other diseases; however, importantly, a

[6] S. Kemp, A. K. Coughlan, C. Rowbottom, K. Wilkinson, V. Teggart and G. Baker, "The base rate of effort test failure in patients with medically unexplained symptoms" (2008) 65 J Psychosom Res 319–325.

proportion of people with FND report no previous such stressors.[7] Previous functional symptoms including in other body systems (for example, irritable bowel syndrome, atypical/non-cardiac chest pain), chronic pain or health anxiety, or recurrent or persistent anxiety and depression increase probability of developing a functional disorder in the future.

An assessment of resilience in response to this and previous illness and injury is also important. Functional symptoms and anxiety and depression are common in the population. Is this a person who has retained employment and relationships despite previous setbacks? Or is this a person who has experienced catastrophic escalations in pain, fatigue, irritable bowel, mood or anxiety symptoms, with long absences from work, in response to minor injuries and illnesses? These previous responses are important considerations in establishing the extent to which the current symptoms and disability might be considered to have been caused by the injury in question.

In addition, it is important to assess the patient's general social and occupational vulnerability. Severe bullying or disciplinary proceedings at work, intolerable stress at home related to illness or impaired relationships may need to be factored in to decisions about the extent to which the individual was vulnerable to illness with either a functional or psychiatric disorder.

Precipitating factors

Functional neurological disorders can occur de novo without apparent trigger, but up to 40% of functional motor disorders are preceded by a physical injury.[8] There is not a linear relationship between injury severity and risk of FND; even seemingly insignificant physical injuries, with no permanent structural disfigurement or disability, can precipitate FND in the presence or absence of predisposing factors. This is similar to the situation with Complex Regional Pain Syndrome.

Where a minor injury precedes FND, it might be important to consider whether the injury was nevertheless out of the ordinary. This is because if, on the other hand, the injury was innocuous and might have occurred in everyday life, the vulnerability to developing FND (for whatever other reasons) must have been such that this specific injury cannot be considered the cause of the symptoms.

Although severity of injury does not predict risk, the nature and circumstances of the injury may be significant to the symptoms which develop thereafter. In our experience, although the injury may be mild, there (or, in some cases, the consequent medical assessments or interventions) may be a plausible description of why it was distressing for some reason or another: painful, threatening, associated with a "dazed" feeling, or with perceived subsequent poor medical care, injustice, humiliation, or loss of control.

Perpetuating factors

Functional neurological disorders can present acutely after injury and resolve quickly—within days or weeks—or may persist for longer or even become chronic. The predisposing factors described above also increase probability of a prolonged symptom course. In addition, we recognise a number of post-injury factors which may prevent recovery or worsen symptoms and disability in FND. Indeed, a gradually worsening presentation is common.

Strong opiate (morphine-like) medication may be given in the immediate aftermath of an injury, but continuation and escalating doses of these medications after tissue healing is not beneficial. It can lead to increased sensitivity to pain in general (opiate-induced hyperalgesia) and, in our experience, commonly, a worsening of FND.

[7] L. Ludwig, J. A. Pasman and T. Nicholson, "Stressful life events and maltreatment in conversion (functional neurological) disorder: systematic review and meta-analysis of case-control studies" (2018) 5 *The Lancet Psychiatry* 307–320.

[8] J. Stone, A. Carson and H. Aditya, "The role of physical injury in motor and sensory conversion symptoms: A systematic and narrative review" (2009) 66 J Psychosom Res 383–390.

The behavioural response to injury significantly influences recovery. Where rest and withdrawal from usual activities may be necessary in the first instance, prolonged avoidance of activities (particularly those feared to worsen symptoms) often worsens FND, causes physical deconditioning, and leads to subsequent fatigue and anxiety when normal activities are later attempted.

Psychiatric illnesses such as depression, generalised anxiety disorder or phobic anxiety disorder can worsen symptoms of FND and prevent effective engagement in treatment or return to normal activities. When significant Post-Traumatic Stress Disorder ("PTSD") develops after traumatic injury, functional symptoms seem more likely to develop and to persist. It is likely that PTSD strengthens links between psychological re-experiencing (in "flashbacks") and somatic re-experiencing (persistent bodily pain and dysfunction), in part by amplifying fear-arousal processes. In a medicolegal setting, the presence of PTSD can therefore strengthen a causal link for both the psychological *and* physical symptoms.

There is a consensus that ongoing litigation and receipt of disability benefits are also associated with symptom persistence and poorer outcomes. Even in genuine claimants the litigation process is designed in a way that is highly anti-therapeutic. Individuals in whom therapeutically one would be trying to help move on from the past or blame for an event, are constantly asked to reconsider and describe past events. The questioning of integrity, including discovery by claimants that they have undergone surveillance, is particularly problematic for individuals whose symptoms are the subject of suspicion by many doctors even in routine clinical care.

Current scientific understanding

There have been great leaps in understanding about what happens in the brain in Functional Neurological Disorder over the last 10–20 years.[9] It is no longer appropriate to call these conditions "medically unexplained". Although we have some way to go in understanding why FND develops in a particular individual at a particular time, the same can be said of many other neurological conditions, such as multiple sclerosis or Parkinson's disease, and people with FND should be treated with the same care and respect as those with other neurological conditions.

Functional MRI scans (showing areas of brain activation and connectivity in real time) in groups of people with FND compared with healthy controls have demonstrated abnormal activity in areas of the prefrontal cortex (involved with planning, behaviour and control of movements); central "limbic" areas (involved with emotion and memory); and in areas of the parietal lobe involved with self-agency (the feeling of ownership of one's own actions).[10] Laboratory studies of brain physiology (neurophysiology) in patients with FND have shown that although parts of the brain responsible for movement and sensation (primary motor and sensory cortex) are unimpaired in FND, areas responsible for modulation and planning of movements (premotor and association areas) are abnormal.[11] Additional studies have shown differences between patients with FND and those feigning similar symptoms.

Disordered attention is a key feature of FND. The importance of attention can be seen clinically, when we observe a temporary improvement in symptoms when attention is diverted to another task, or experimentally, as in the Parees study described previously, where patients with functional tremor seemed to experience the tremor as present whenever they paid attention to it.[12] A compelling and commonly accepted contemporary theory is that, at one level functional symptoms arise as a result of abnormally

[9] A. J. Espay, S. Aybek and A. Carson, "Current Concepts in Diagnosis and Treatment of Functional Neurological Disorders" (2018) JAMA Neurol at *https://www.ncbi.nlm.nih.gov/pubmed/29868890* [accessed 21 April 2020].

[10] A. Aybek and P. Vuilleumier, "Imaging studies of functional neurologic disorders" in M. Hallett, J. Stone and A. Carson (eds), *Handbook of Clinical Neurology* Vol.139, 3rd series Functional Neurologic Disorders (Amsterdam: Elsevier, 2016), 73–84.

[11] M. Hallet, "Neurophysiologic studies of funtional neurologic disorders" in M. Hallett, J. Stone and A. Carson (eds), *Handbook of Clinical Neurology* (Elsevier, 2016), 61–68.

[12] I. Parees, T. A. Saifee and P. Kassavetis, "Believing is perceiving: mismatch between self-report and actigraphy in psychogenic tremor" (2012) 135 *Brain* 117–123.

precise prior, and involuntary, expectations about movements or sensations, combined with excessive attention towards the affected body part, causing brain "processing errors" which appear in the form of symptoms like weakness, numbness and tingling, or abnormal movements.[13] If one accepts that the brain is largely a "predictive organ" that is usually correct with its guesses about movement and sensation in relation to the body and the outside world, FND is an expected consequence of that process going wrong.

Treatment

Treatment of FND begins with a clear explanation of the diagnosis by the treating neurologist or neuropsychiatrist. Demonstration and explanation of positive clinical signs is often helpful. Patients should also be offered additional printed or online information about the diagnosis; free comprehensive patient-information website about functional neurological disorders can be found at *www.neurosymptoms.org*, and similar advice for those who have sustained a mild traumatic brain injury can be found at *www.headinjurysymptoms.org*.[14] There are also several patient-led FND organisations with good information. Ideally, after this step, there is a patient who has confidence in their diagnosis, understands there is potential for reversibility and is motivated to change with the help of rehabilitation. In reality, helping some patients gain confidence in a heavily stigmatised diagnosis such as FND can be difficult, especially in personal injury situations where a patient has had a structural injury triggering the symptoms.

Medical treatment often includes optimising medications—reducing unhelpful opiates and sedative medications, and in some cases, where appropriate introducing antidepressant medication for anxiety, mood, pain or sleep issues.

For some usually with mild symptoms, explanation and advice will be enough treatment to allow a recovery. For those with more severe or persistent symptoms, additional treatments might be necessary, and Cognitive Behavioural Therapy or Physiotherapy are those with the current best evidence of effectiveness. It is crucially important, however, that these therapies are provided by therapists with experience in treating FND, as there are important differences compared with treatment for other conditions. In physiotherapy for FND, whole body exercises which prevent abnormal attentional focus and require the person to depend on "automatic" movements are employed rather than the sort of focussed strength exercises such as might be used for a musculoskeletal injury.[15] For example, in physiotherapy for FND the patient might be supported to run on a treadmill (where "automatic" movements take over from the faulty effortful movements) even if they are usually unable to walk. Early trial data are encouraging.[16] Alternatively, Cognitive Behavioural Therapy provides a framework to address unhelpful patterns in the inter-relations between thought, emotion, behaviour, and symptoms: such as avoiding activity because of anxiety and catastrophic thoughts about one's health. There is specific CBT for some types of FND such as dissociative (non-epileptic) seizures.[17] Although a range of patient and symptom factors inform clinical judgement as to the most suitable modality of treatment, ultimately, it is likely that both physiotherapy and psychotherapy (CBT) work by reducing fear and avoidance of activity.[18]

The stressful process of litigation, which requires pursuers to describe the injury, symptoms, and disability repeatedly, and perceived financial incentive to maximise symptoms and disability, can also prevent effective engagement with the goals of treatment, although—as in NHS treatment—patients with

[13] M. J. Edwards, R. A. Adams, H. Brown, I. Parees and K. J. Friston, "A Bayesian account of 'hysteria'" (2012) 153 *Brain* 3495–3512.

[14] Both free sites made by the authors of this article.

[15] G. Nielsen, J. Stone and A. Matthews, "Physiotherapy for functional motor disorders: a consensus recommendation" (2015) 86 J Neurol Neurosurg Psychiatry 1113–1119.

[16] G. Nielsen, M. Buszewicz and F. Stevenson, "Randomised feasibility study of physiotherapy for patients with functional motor symptoms" (2017) 88 J Neurol Neurosurg Psychiatry 484–490.

[17] L. H. Goldstein, T. Chalder and C. Chigwedere, "Cognitive-behavioral therapy for psychogenic nonepileptic seizures: A pilot RCT" (2010) 74 *Neurology* 1986–1994.

[18] T. Chalder, K.A. Goldsmith, P. D. White, M. Sharpe and A. R. Pickles, "Rehabilitative therapies for chronic fatigue syndrome: a secondary mediation analysis of the PACE trial" (2015) 2 *The Lancet Psychiatry* 141–152.

limited motivation to improve may still "go through the motions" of treatment. Although starting treatment prior to conclusion of litigation may seem desirable in order to help establish treatability and prognosis, our experience is that recovery is unlikely in the late stages of litigation. While we have successfully treated patients with ongoing legal claims, more often it is better to wait until conclusion of litigation in order to maximise the long-term benefits of treatment for that person, and also to ensure that post-litigation treatment is not prejudiced by failure under unfavourable circumstances during litigation. In some ways it is not surprising that some patients with these disorders, when faced with treatment of uncertain outcome, and a possibility of relapse after settlement, may prefer to wait until they have some financial security before focusing on treatment.

Outcome/prognosis

Functional neurological disorders are potentially reversible, but outcomes are highly variable. For those with symptoms severe enough to be clinically referred to a neurologist, prognosis is poor: a recent follow-up study of 107 people with functional motor disorder found 80% still symptomatic after 14 years.[19] It is not clear to what extent this cohort aligns with the population of individuals receiving a diagnosis of FND only as part of a personal injury claim.

Those with a better prognosis, in whom a more or less complete recovery might be predicted, are more likely to have had a good level of social and occupational function premorbidly, to agree with the diagnosis of FND, to demonstrate motivated engagement with treatments offered, and to have made efforts to re-engage with activities. Those with a poor prognosis may disagree with the diagnosis of FND, or be preoccupied with ideas that there is a dangerous, permanent, or undetected underlying cause of their symptoms, fail or struggle to engage with treatment, have withdrawn from activities and employment and to have become dependent on mobility aids, opiate painkillers and other sedative agents, and disability welfare benefits. Some patients with FND fail to improve despite a good understanding and motivation.

The largest longitudinal study of functional neurological disorder reported higher death rates than expected in the general population, and although the reasons for this may be complex—most deaths were due to cardiovascular, rather than neurological causes, possibly due to immobility or confounding lifestyle factors—on balance, available evidence suggests that FND is independently associated with a slight reduction in life expectancy.[20]

Need for care

The question of whether ongoing care is needed in FND often arises during the process of a legal claim. This needs to be assessed on an individual basis, and poses a dilemma, in that provision of excessive care and assistance can be an obstacle in some individuals with FND to returning to activity.[21] Ideally the goals of care should be rehabilitative, supporting the person to regain independence with a reduction in provision of care and support over time. In our experience, however, this is not often the case, but nevertheless for those with severe and disabling FND, or those who have not benefited from treatment, provision of care and disabled adaptations should be similar to those with comparable neurological conditions, with the proviso that improvement may still be possible at some stage.

For a condition with such a variable prognosis, it may be appropriate for the expert to provide the court with a range of possible outcomes and different care needs.

[19] J. M. Gelauff, A. Carson, L. Ludwig, M. A. J. Tijssen and J. Stone, "The prognosis of functional limb weakness: a 14-year case-control study" (2019) *Brain* at *https://academic.oup.com/brain/article/142/7/2137/5510175* [accessed 21 April 2020].

[20] J. M. Gelauff, A. Carson, L. Ludwig, M. A. J. Tijssen and J. Stone, "The prognosis of functional limb weakness: a 14-year case-control study" (2019) *Brain* at *https://academic.oup.com/brain/article/142/7/2137/5510175* [accessed 21 April 2020].

[21] P. Gardiner, L. MacGregor, A. Carson and J. Stone, "Occupational therapy for functional neurological disorders: a scoping review and agenda for research" (2018) 23 CNS Spectr 205–212.

Conclusion

Functional neurological disorder is common, but not always well understood or described by medical professionals, particularly in fields other than neurology and psychiatry. Functional neurological disorder challenges the assumption that brain/body and mind operate independently from each other—the concept of dualism described by Descartes. Clinical work with people with functional disorders teaches us daily that the body and brain respond to injury as a united but complex unit. When this already complex disorder becomes entangled with a legal process further complexity arises, but ultimately it is a disorder with its own set of diagnostic rules and where treatment outside the context of a personal injury claim, can provide surprisingly good outcomes.