FUNCTIONAL NEUROLOGICAL DISORDERS:

From a disorder of the mind to a disorder of the brain

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THOUGHT EXPERIMENT

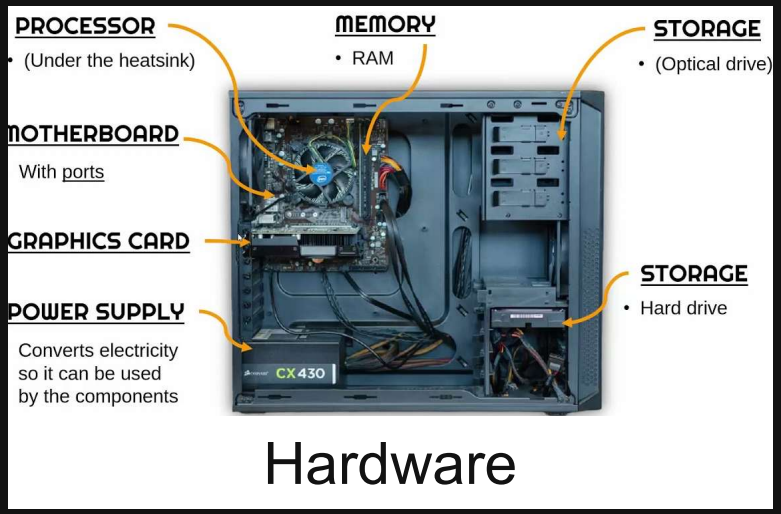
Functional neurological disorder (FND) is a genuinely experienced medical condition in which there is a problem with the *functioning* of the nervous system and how the brain and body sends and/or receives signals.

Symptoms involve motor or sensory problems that are **incompatible** with recognized neurological disorders and are **internally inconsistent**.

What is a functional disorder?

Structural

Brain tumor, stroke



Functional

FND, migraine

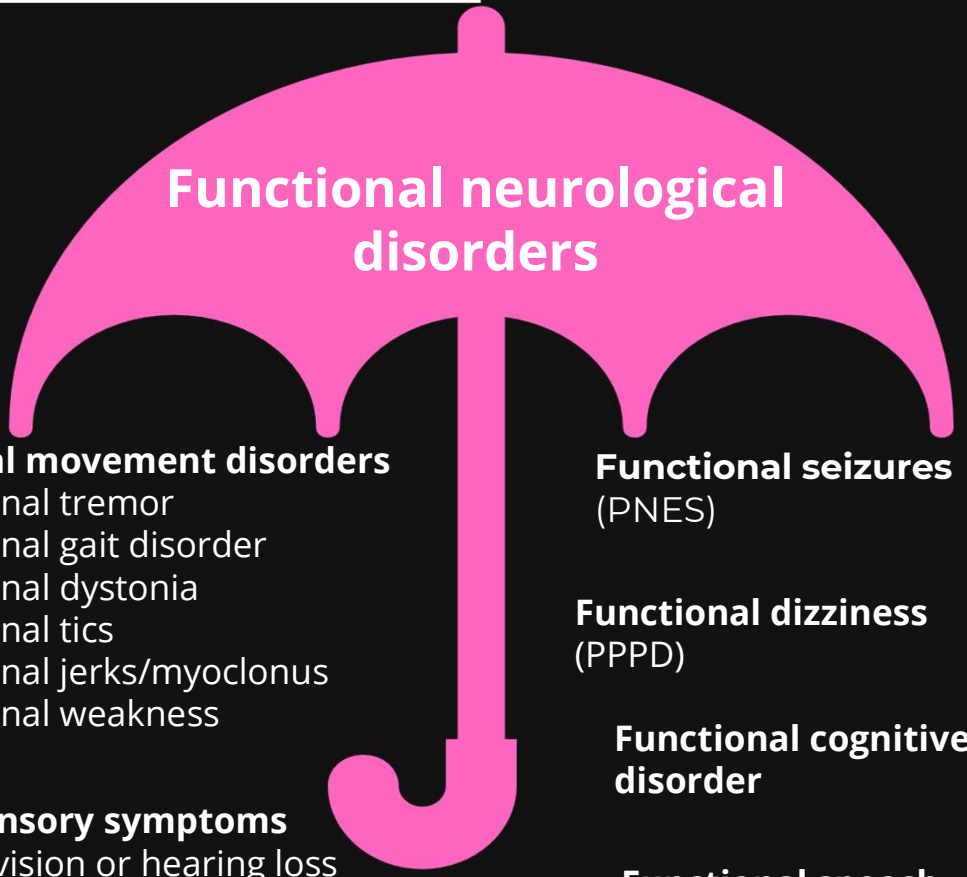
FND subtypes

Not a small problem.

- 12-30% of outpatient neurology clinics
- 10% of stroke admissions
- 25-30% at epilepsy centers

ED & inpatient treatment alone **>$2 billion** for FND in the US annually

Stephen et al., 2025 Neurology
O'Mahoney et al., 2023 Neurology



Functional movement disorders
- Functional tremor
- Functional gait disorder
- Functional dystonia
- Functional tics
- Functional jerks/myoclonus
- Functional weakness

Functional sensory symptoms
- Functional vision or hearing loss
- Anesthesia
- Other abnormal sensations

Functional seizures (PNES)

Functional dizziness (PPPD)

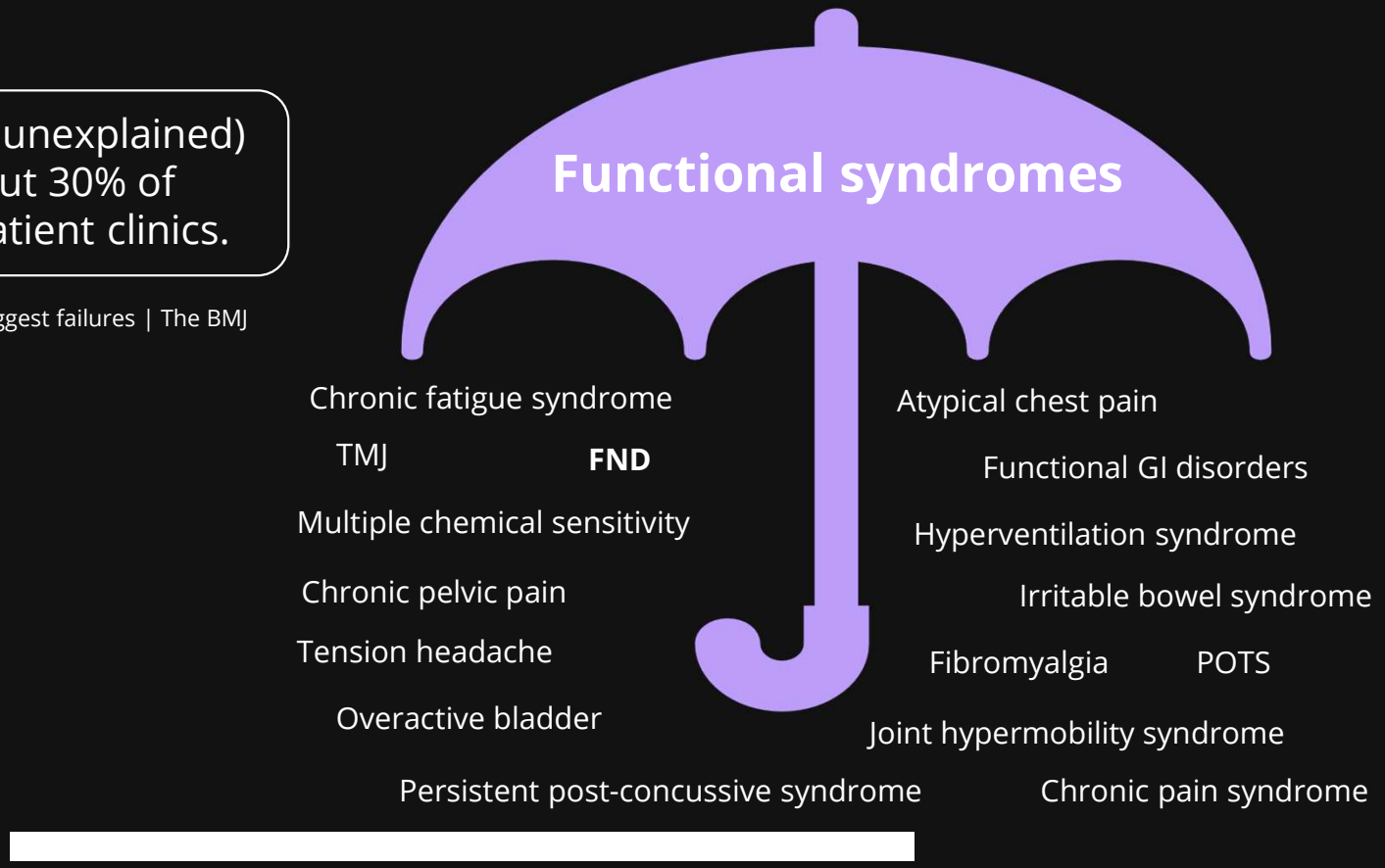
Functional cognitive disorder

Functional speech disorder

Functional disorders are ubiquitous.

Functional (or medically unexplained) symptoms make up about 30% of patients attending outpatient clinics.

"Functional disorders": one of medicine's biggest failures | The BMJ



1. Background & history

A brief history of FND

History

1200 BC
First written account of functional symptoms
→ Supernatural forces

4th/3rd centuries BC
Hysteria
→"Wandering womb"

1400's-1600's
→ Witchcraft

1800's
Charcot's hysteria
→ "Dynamic" brain lesion

Early 1900's - Sigmund Freud
Conversion disorder
→ Conversion of unconscious psychological urges/conflicts into physical manifestation

Late 1900's
The disappearance of conversion disorder?

Early 2000's
Psychogenic, pseudo-, nonorganic
→ Symptoms arise from "the mind" or are not real

2013-present
Functional
→ Problem with function, not structure

How it used to be...

Freud: A Secret Passion - 1962

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2013-present
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The problems with conversion disorder

Diagnosis of exclusion

- Required extensive testing to rule out everything else

Needed to identify a psychological stressor that preceded symptoms

- Stressor/trauma not always present (like describing stroke as "smokogenic stroke")
- Considered a disorder of the "mind" and outside of neurologists' purview

Needed to rule out “malingering” or feigning

- Unnecessary focus on malingering
- Unrealistic to do in a clinic visit

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Dynamic" brain lesion

"Fits and paralyses that had been summoned from the symptom pool since the Middle Ages – spreading almost epidemically during the 19th century, virtually came to an end by the 1930's."

- Edward Shorter

Late 1900's
"Hysteria" disapp

2013-present
Functional
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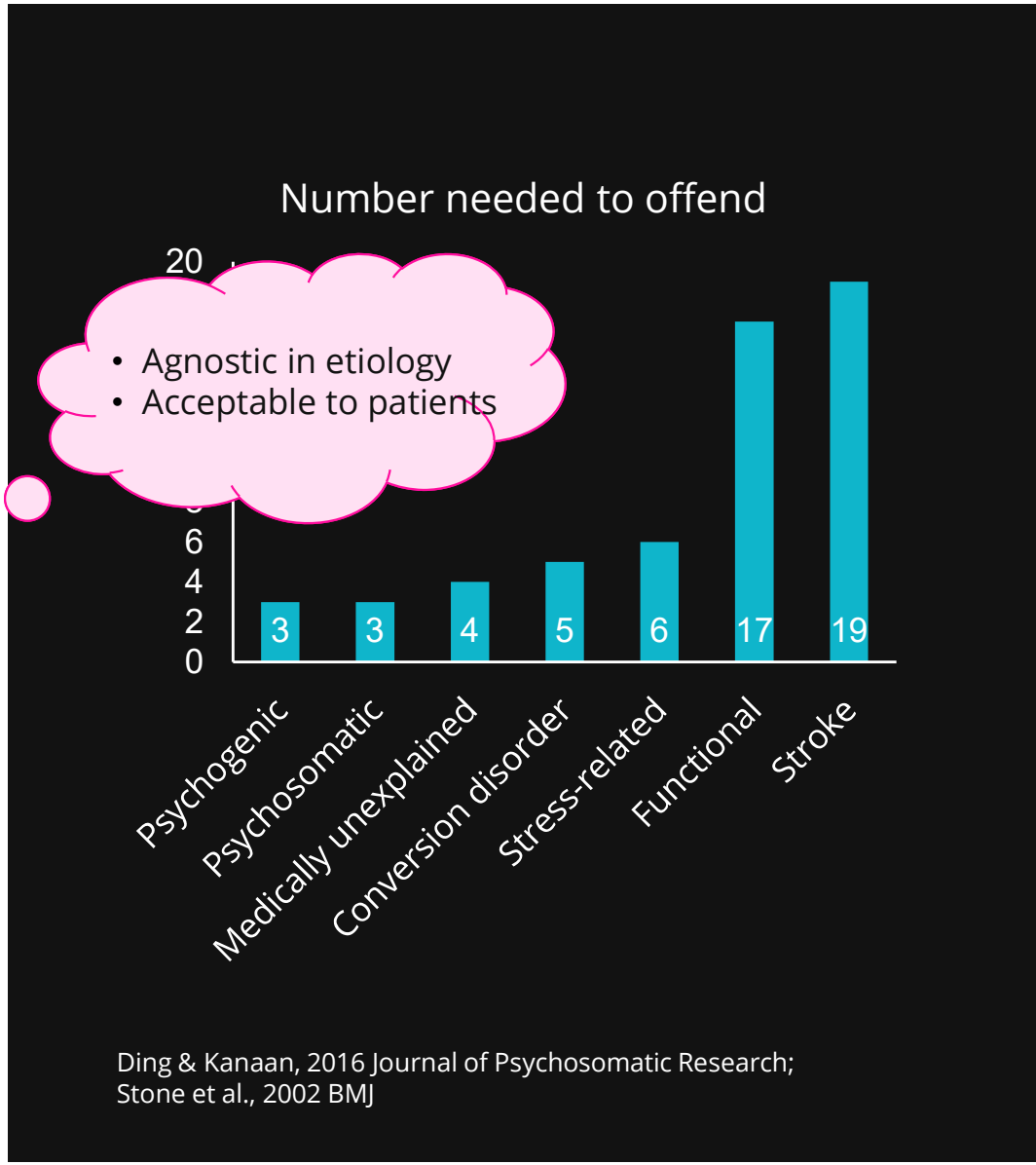
Terminology…

Pseudo-neurological
Somatoform Dissociative
Medically unexplained
Psychogenic Supratentorial
Functional
Conversion disorder
Hysteria Psychosomatic
Non-organic



Ding & Kanaan, 2016 Journal of Psychosomatic Research;
Stone et al., 2002 BMJ

Yet problems remain…

"It's All in Your Head"—Medicine's Silent Epidemic

"Functional disorders": one of medicine's biggest failures

Richard Smith *chair*

Functional neurological disorder: psychiatry's blind spot

Roxanne C Keynejad • Alan J Carson • Anthony S David • Timothy R Nicholson

Published: March, 2017 • DOI: https://doi.org/10.1016/S2215-0366(17)30036-6

NO MAN'S LAND BETWEEN PSYCHIATRY AND NEUROLOGY: FUNCTIONAL NEUROLOGICAL DISORDERS AND CONVERSION DISORDER IN EMERGENCY DEPARTMENT SETTINGS

Tomás Teodoro[1,2,3*], Sara Vilas Boas Garcia[1,2], Renato Oliveira[3,4,5] & João Miguel Oliveira[2,6,7]

Psychogenic Movement Disorders: A Crisis for Neurology

Mark Hallett, MD

"The nature of the crisis is that there are **many patients**, we **don't understand** the pathophysiology, we often **don't know how to make the diagnosis**, **don't know how to treat** the patients, the **patients don't want to hear** that they have a psychiatric disorder and go from **doctor to doctor**, psychiatrists **don't seem interested** anyway, and the **prognosis is terrible**."

Hallet, M. Psychogenic movement disorders: a crisis for neurology. Current neurology and neuroscience reports, 2006

Typical medical encounter for a person with FND

- “There’s nothing wrong…”
- ”It’s a psychological problem…”
- “Your tests are normal… Goodbye”

What was it like for you to receive a diagnosis of FND?

Communication Challenges

Clinician perspective:

- Time consuming
- Not sure if patient is faking
- Worried about missing an “organic” disorder
- Not confident explaining the diagnosis
- Worried about angry patient

Patient perspective:

- Not enough time to discuss symptoms
- Feels symptoms were dismissed
- Perception that doctor thought it was all psychological or “in their head”
- Not given a diagnosis
- Given a diagnosis with no follow up, treatment, or educational resources

Sources of iatrogenic harm in FND

Misdiagnosis/unnecessary medical treatment

- 53% of patients with functional seizures (FS) were treated with anti-epileptic medications
- 15% of patients with FS admitted to ED are intubated

Delayed diagnosis and treatment:

- Average 4 years to correct diagnosis (vs. 1 year in other neurological disorders)
- Outcomes worse for those with long duration of symptoms (80% symptomatic at 14-year follow up)
- FND often an “exclusion criteria” for services (mental health & neurological)

Direct harm in medical settings

- Deceptive strategies
- Unnecessary tests to assess response to painful stimulation
- "Arm drop test"

Psychological harm from diagnosis

- “Nobody wants to deal with them” in outpatient clinics
- 38% PCPs and ED doctors believe patients are faking
- 34% psychiatrists worry patients are faking

Mcloughlin et al., 2025. Brain

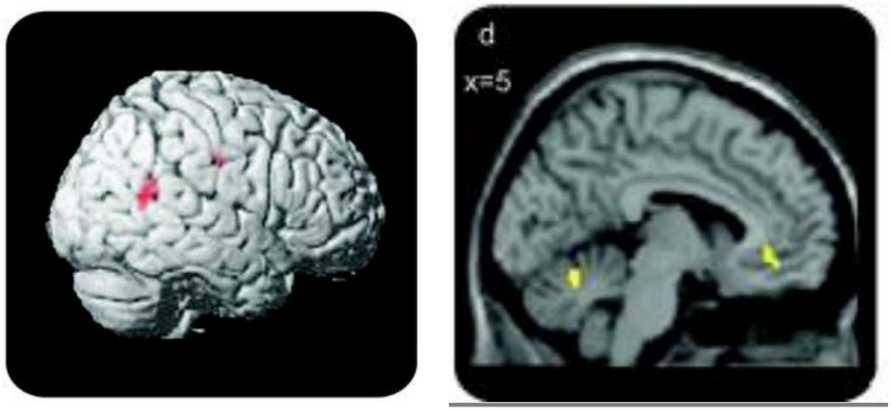
Stigma around FND

2.
Pathophysiology and Etiology

A brief overview of the “how” and “why”

The involuntary nature of conversion disorder

Neurology, 2010 V. Voon, MD



Why functional neurological disorder is not feigning or malingering

Mark J. Edwards, Mahinda Yogarajah & Jon Stone

Nature Reviews Neurology **19**, 246–256 (2023) | Cite this article

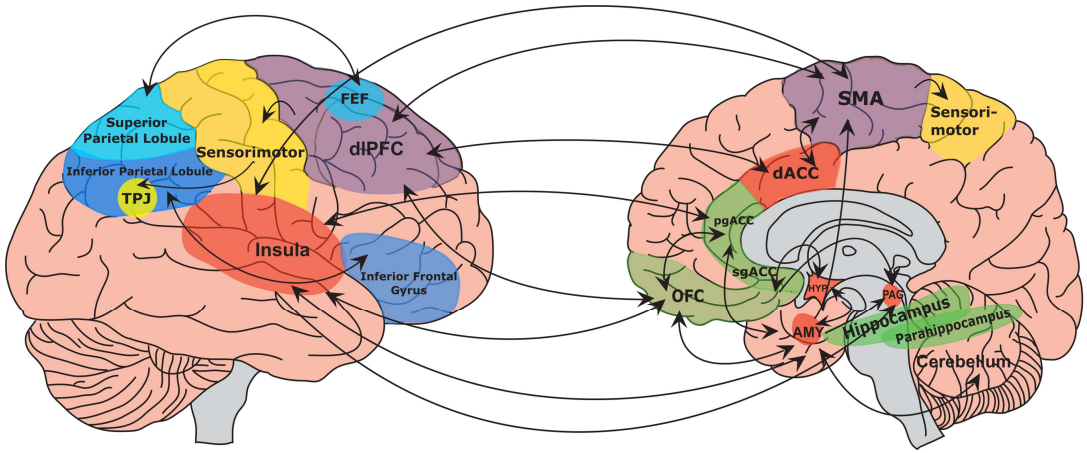
fMRI comparison of volitional tremor vs. functional tremor:

- **Decreased right TPJ activity** during functional – but not volitional – tremor. (TPJ is associated with **sense of agency** over one's actions.)
- **Decreased** functional connectivity between **TPJ**, **motor/somatosensory** regions, and **attention networks**.
- **Hyperconnectivity** between areas involved in **emotion processing and motor preparation**

Pathophysiology (the “how”) of FND

Functional network alterations in:

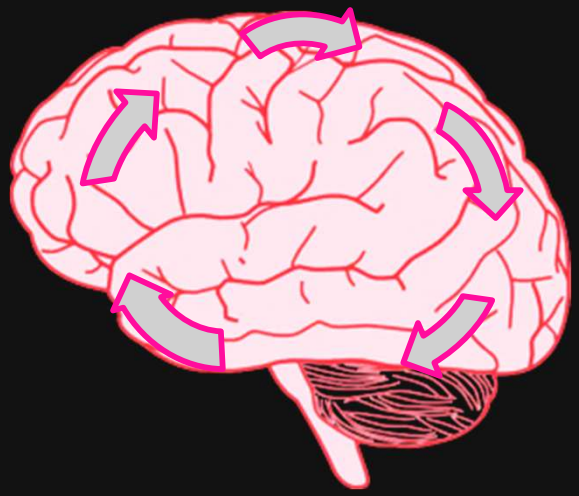
- **Sensorimotor & self-agency**
- **Interoception**
- **Emotion regulation/processing**
- **Attention processes**
- **Motor planning**



Drane et al., 2021; Perez et al., 2020; Weber et al., 2022

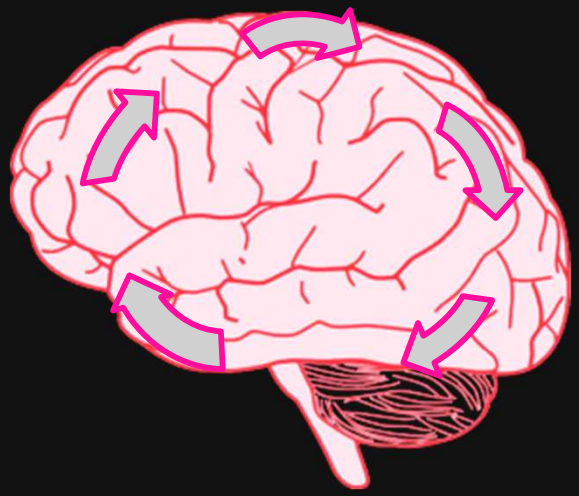
Etiology (the “why”) of FND

Bio-psycho-social model



1. Predisposing factors:

- Genetics
- Neurological disorder
- Comorbid functional disorders (IBS, CFS, pain)
- Mood, anxiety, trauma disorders
- Dissociation
- Alexithymia
- Perfectionism/OCPD
- Neuroticism
- Childhood abuse
- Trauma history
- Health beliefs



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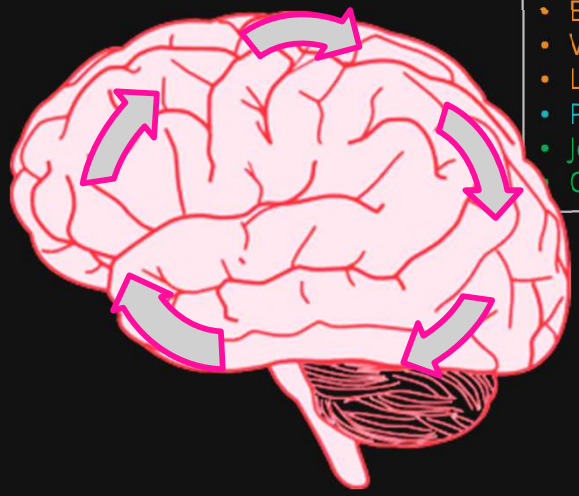

2. Precipitating event:

- Concussion → Functional cognitive disorder
- Syncope → Functional seizures
- Epilepsy → Functional seizures
- Vestibular pathology → Functional dizziness
- Limb injury → Functional movement disorder
- Panic attack → Functional tremor
- Job loss
  Other loss

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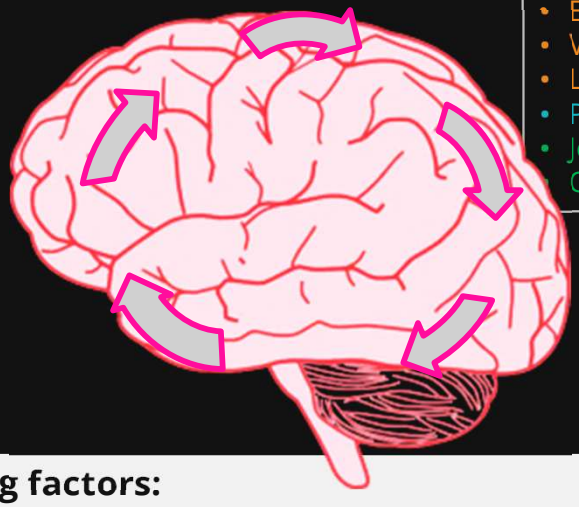


3. Perpetuating factors:

- Neuroplasticity
- Entrenched abnormal motor programs
- Chronic pain and fatigue
- Sensitization
- Negative expectations
- Fear of/hypervigilance to symptoms
- Catastrophizing
- Avoidance patterns
- **Diagnostic uncertainty**
- **Feeling misbelieved**
- **Iatrogenesis**
- Reinforcement from family
- Compensation seeking

3.
Diagnosis & Treatment

How it *should* be done

Currently a “Rule in” not “Rule out” diagnosis

- Diagnosis is made from **positive signs** on exam and history that demonstrate:

  Inconsistency: Variability of symptoms over time/situation/task, usually between performance in a voluntary versus an automatic scenario

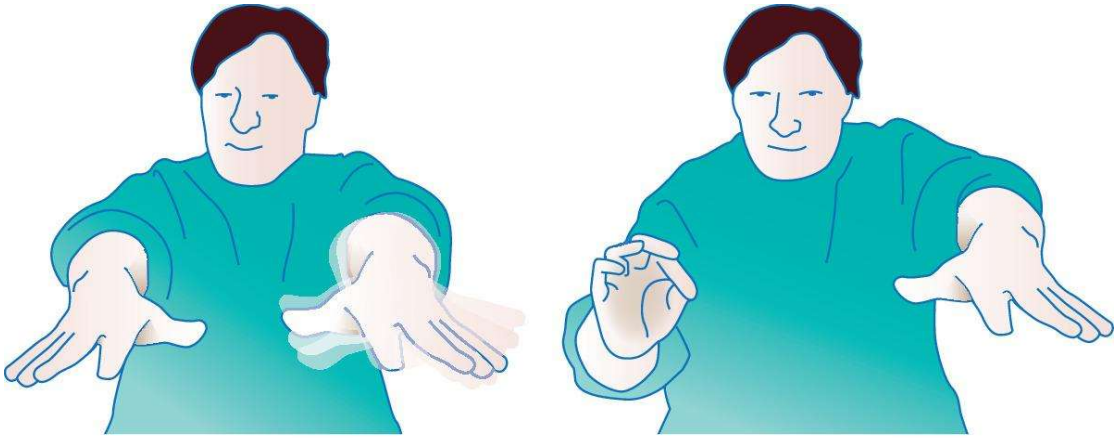
  Distractibility: suppression of symptoms during another cognitive or motor task, and/or worsening of symptoms with attention to the affected body part

  Incongruence with recognized neurological diseases or “laws” of anatomy and physiology

- Diagnosis can be made **reliably** based on positive exam findings, with only a 4% misdiagnosis rate.

Hoover’s sign for functional weakness

Positive signs for functional tremor



Entrainment:

- Tap a rhythm with your hands and ask the patient to follow it by tapping an unaffected limb. Vary the rate of your tapping and check that the patient's voluntary tapping matches your frequency. Functional tremors tend to become "entrained" to this external frequency or stop altogether.

Distractibility

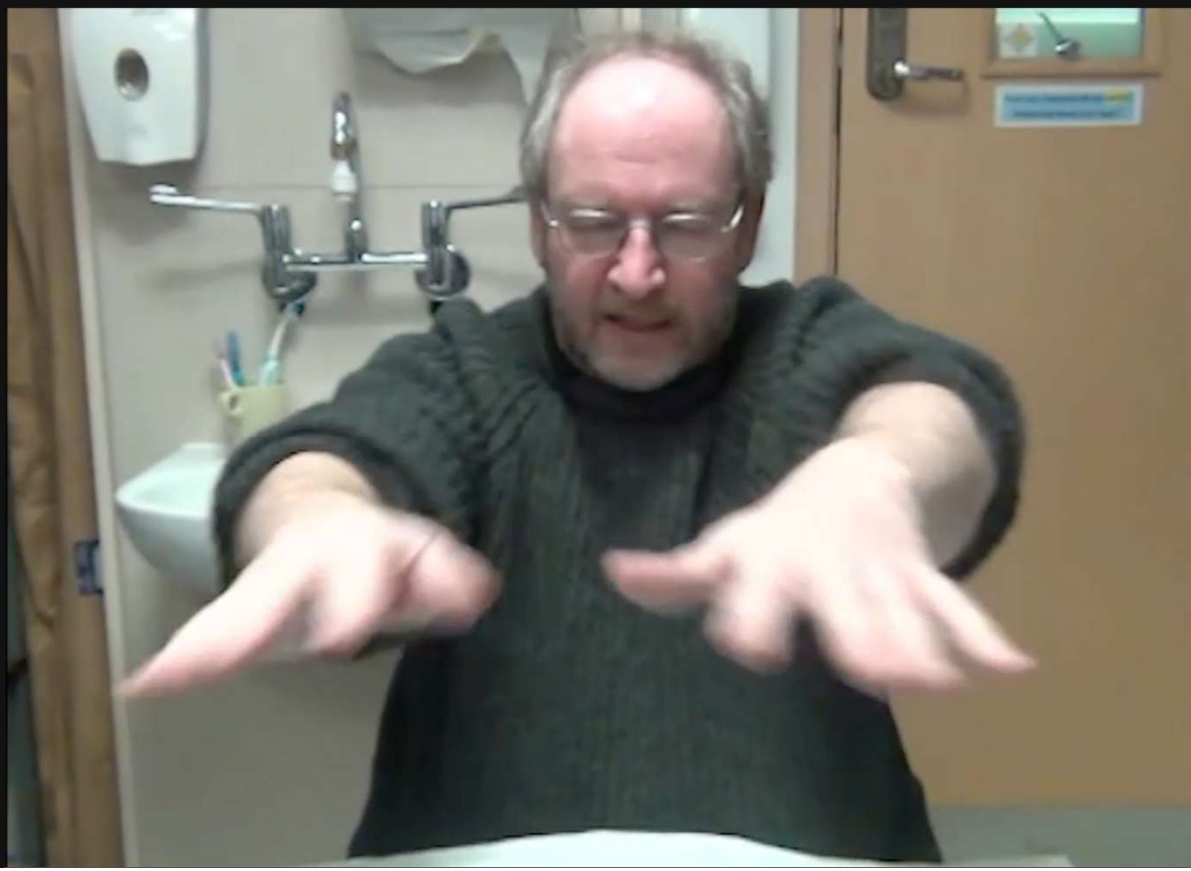
- Ask patient to perform a simple motor task (e.g., finger tapping, ballistic movements with the other hand) or cognitive task (e.g., months backward, serial 7's). Functional tremors decrease or pause during distraction.

Positive signs for functional tremor

Entrainment to an externally cued rhythm

Cessation of tremor with distraction

Variability of tremor amplitude, frequency, & axis



Step 1 of treatment: Explain the diagnosis

Name the diagnosis. Don't just say what they don't have.	"You have a functional tremor."
Emphasize that FND is **real** and **common**.	"This is a very **real** and **common** reason people see neurologists."
Describe the mechanism rather than the etiology.	"FND is due to a problem with the **functioning** of the CNS, rather than the physical structures." (*implies the potential for full recovery*)
Explain how the diagnosis was made, emphasizing positive signs. *Don't just say that all tests were normal.*	"Did you notice how your tremor paused briefly when you were tapping with the other hand? This shows me that the basic wiring of your nervous system is intact. The problem is that your brain is not able to communicate with your body normally."
Provide written or online **educational material** & support **self-management.**	Printable fact sheets from www.neurosymptoms.org + "homework"

Multidisciplinary treatment is ideal

Contents lists available at ScienceDirect

Seizure

journal homepage: www.elsevier.com/locate/yseiz

Psychological interventions for psychogenic non-epileptic seizures: A meta-analysis

Perri Carlson*, Kathryn Nicholson Perry

Australian College of Applied Psychology, Level 11, 255 Elizabeth Street, Sydney, NSW 2000, Australia

Occasional essay

Occupational therapy consensus recommendations for functional neurological disorder

Clare Nicholson [1] Mark J Edwards,[2] Alan J Carson,[3] Paula Gardiner,[4] Dawn Golder,[5] Kate Hayward,[1] Susan Humblestone,[6] Helen Jinadu,[7] Carrie Lumsden,[8] Julie MacLean,[9] Lynne Main,[10] Lindsey Macgregor,[11] Glenn Nielsen,[2] Louise Oakley,[12] Jason Price,[13] Jessica Ranford,[9] Jasbir Ranu,[1] Ed Sum,[14] Jon Stone [3]

Neuropsychiatry

VIEWPOINT

Physiotherapy for functional motor disorders: a consensus recommendation

Glenn Nielsen,[1,2] Jon Stone,[3] Audrey Matthews,[4] Melanie Brown,[4] Chris Sparkes,[5] Ross Farmer,[6] Lindsay Masterton,[7] Linsey Duncan,[7] Alisa Winters,[3] Laura Daniell,[3] Carrie Lumsden,[7] Alan Carson,[8] Anthony S David,[9,10] Mark Edwards[1]

General neurology

Review

Management of functional communication, swallowing, cough and related disorders: consensus recommendations for speech and language therapy

Janet Baker,[1,2] Caroline Barnett,[3] Lesley Cavalli,[4,5] Maria Dietrich,[6] Lorna Dixon,[7] Joseph R Duffy,[8] Annie Elias,[9] Diane E Fraser,[10] Jennifer L Freeburn,[11] Catherine Gregory,[2] Kirsty McKenzie,[12] Nick Miller,[13] Jo Patterson,[14] Carole Roth,[15] Nelson Roy,[16,17] Jennifer Short,[18] Rene Utianski [19,20] Miriam van Mersbergen,[21] Anne Vertigan,[22,23] Alan Carson,[24] Jon Stone [24] Laura McWhirter [24]

Case before and after rehab

Conclusions

- FND is common, genuinely experienced, and often disabling.
- Functional symptoms are ubiquitous in medicine, and are everyone's responsibility.
- The cause is not always psychological, but rather complex interactions at the biological, psychological, and social levels.
- Diagnosis can now be made reliably, and is no longer a diagnosis of exclusion.
- History taking and diagnostic explanation can be therapeutic and actually influence outcomes.

Inova FND Clinic (ICPH and Alex

REF311 – Referral to Functional Neurological Disorder Clinic

Initial visit (1.5-2 hrs):

- Assessment: neuropsychiatric interview, motor exam demonstrating positive signs
- Intervention: Education, development of biopsychosocial formulation, and care plan.

If appropriate for treatment, options include:

- Individual time-limited therapy with neuropsychology
- Referral/consult with PT/OT/ST
- Both neuropsych + PT/OT/ST
- Follow up/check-ins every 3-6 months PRN

If already in treatment:

- Self-management plan
- Consultation with therapists or providers
- Check-ins PRN

If NOT appropriate for treatment:

- Referral to another therapist for non-FND symptoms
- Self-management plan
- Check-ins or delayed treatment offered

Starting in July: interdisciplinary diagnostic and treatment clinic for functional movement disorders

FUNCTIONAL NEUROLOGICAL DISORDER SOCIETY

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Because the FND picture needs you

https://www.fndsociety.org/membership

Education/webinars available

FUNCTIONAL NEUROLOGICAL DISORDER SOCIETY

Membership

Next International FNDS Meeting: **Baltimore, MD in June 2026**