

Functional Neurological Disorder

Chadrick Lane, MD

Neuropsychiatry

UT Southwestern Medical Center

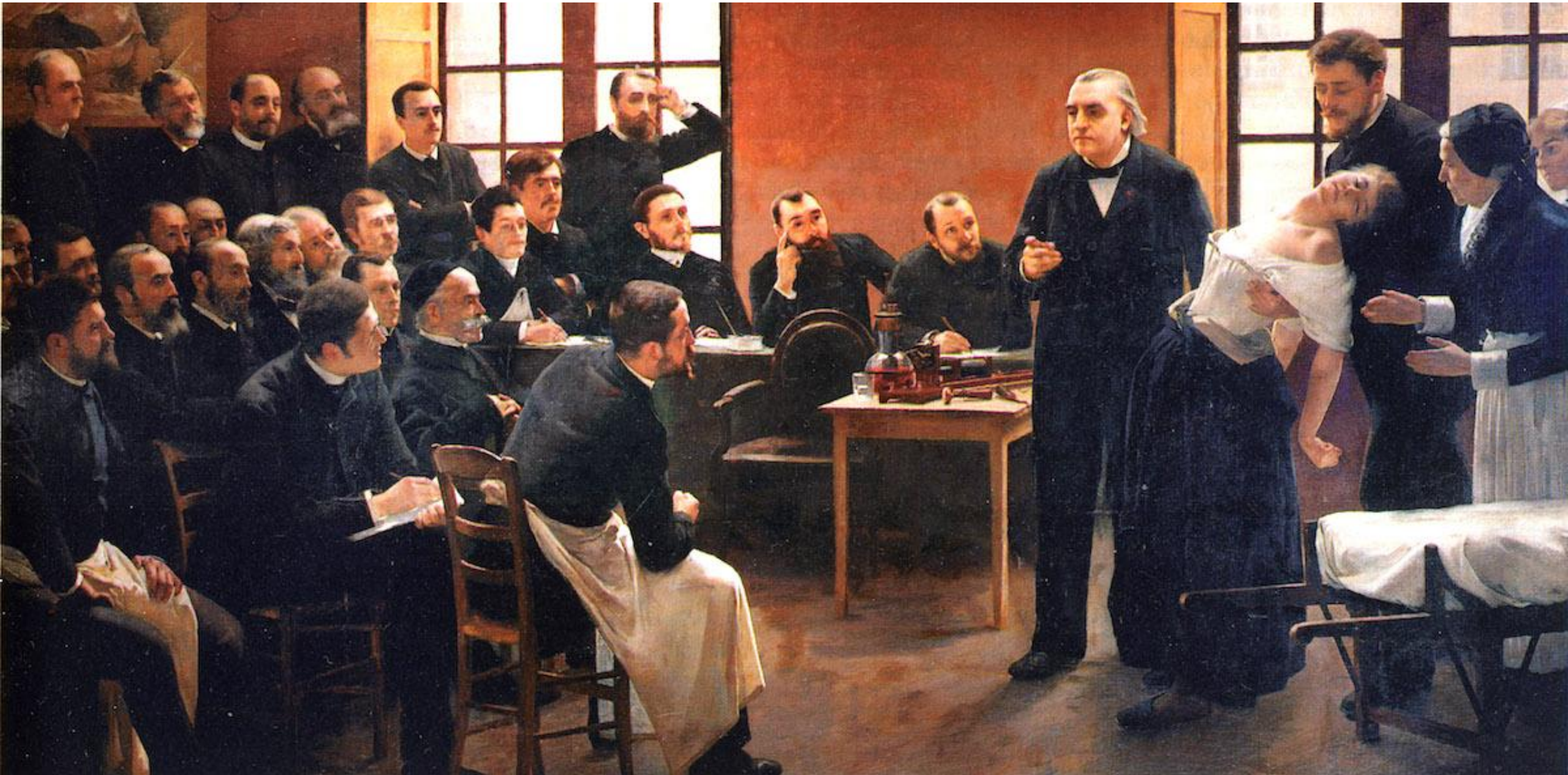


Jean-Martin Charcot
1825-1893

Lésion Dynamique

“Hysteria”

A Clinical Lesson at the Salpêtrière
-Pierre Aristide André Brouillet





Jean-Martin Charcot
1825-1893



Sigmund Freud
1856-1939



Nervous and Mental Disease Monograph Series No. 61

STUDIES IN HYSTERIA

BRITISH MEDICAL ASSOCIATION Library

BY

DR. JOSEPH BREUER AND DR. SIGMUND FREUD

AUTHORIZED TRANSLATION WITH AN INTRODUCTION

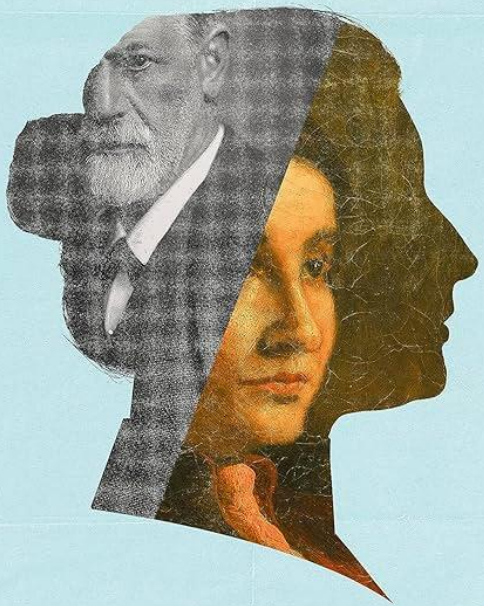
BY

A. A. BRILL, PH.B., M.D.

NEW YORK AND WASHINGTON
NERVOUS AND MENTAL DISEASE PUBLISHING COMPANY
1936

COLLEGE OF PHYSICIANS 5092

The Secret Mind of Bertha Pappenheim



The Woman Who Invented Freud's Talking Cure

Gabriel Brownstein



Jean-Martin Charcot
1825-1893



Sigmund Freud
1856-1939



Barbara Dworetsky



Gaston Baslet



Curt LaFrance



David Perez

"Hysteria"

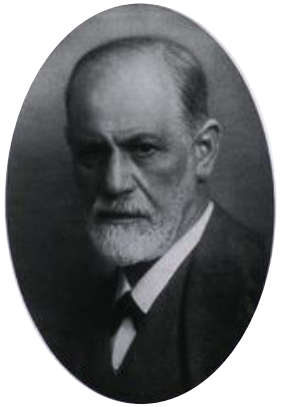
Conversion Disorder and Psychodynamics

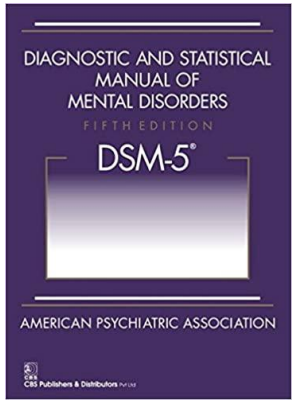
Neurocircuit and Biopsychosocial Revolution

What's in a name? That which we call a rose/ By any other name would smell as sweet. - Juliet

Hysteria → Conversion Disorder → Functional Neurological Symptom Disorder







Functional Neurological Symptom Disorder

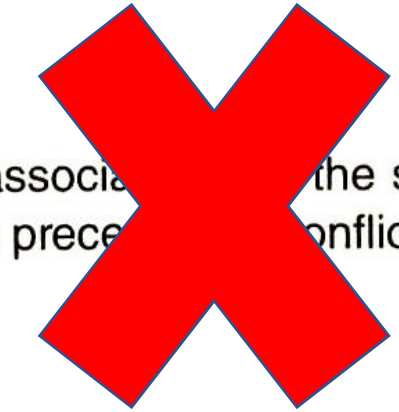
most often shortened to Functional Neurological Disorder (FND)

DSM-5-TR Diagnostic 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.

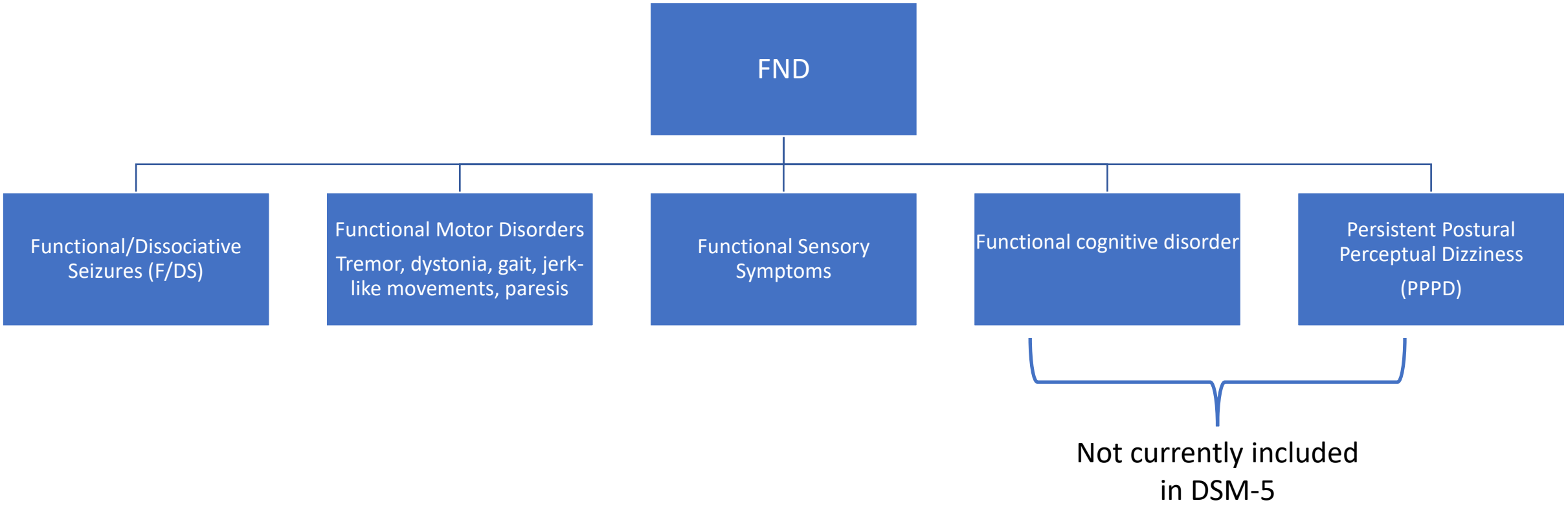
Important Change from earlier DSM editions…

Psychological factors are judged to be associa[illegible] the symptom or deficit because the initiation or exacerbation of the symptom or deficit is prece[illegible]onflicts or other stressors.



The presence of a trauma history does not rule in FND, nor does the absence of a trauma history rule out FND

FND Phenotypes



Why raising awareness is so important:

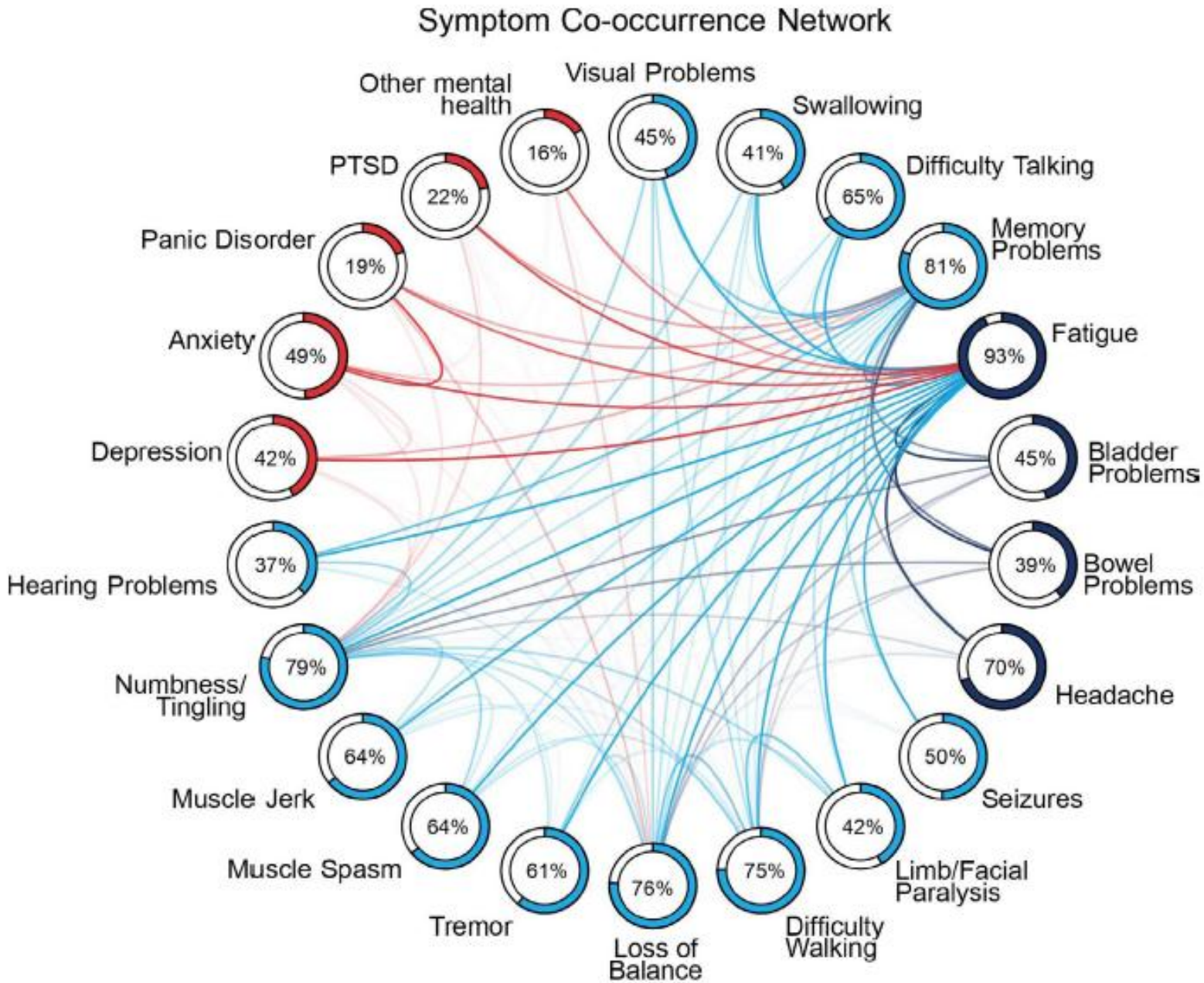
- At least **50,000–100,000 people in the UK and over 250,000 in the U.S. living with FND.**
- FND accounts for 16% of referrals to ambulatory neurology, 2nd to headaches
- 20-40% admitted to EMU for refractory seizures found to have functional seizures.
- Rates of disability and diminished quality of life similar to those with structural neurological illness
- Higher medical utilization and health care costs

(Baslet et al., 2016; Martin et al., 2003; Reuber et al., 2002; Seneviratne et al., 2019; Zhang et al., 2022; Finkelstein et al., 2024)

Risk factors

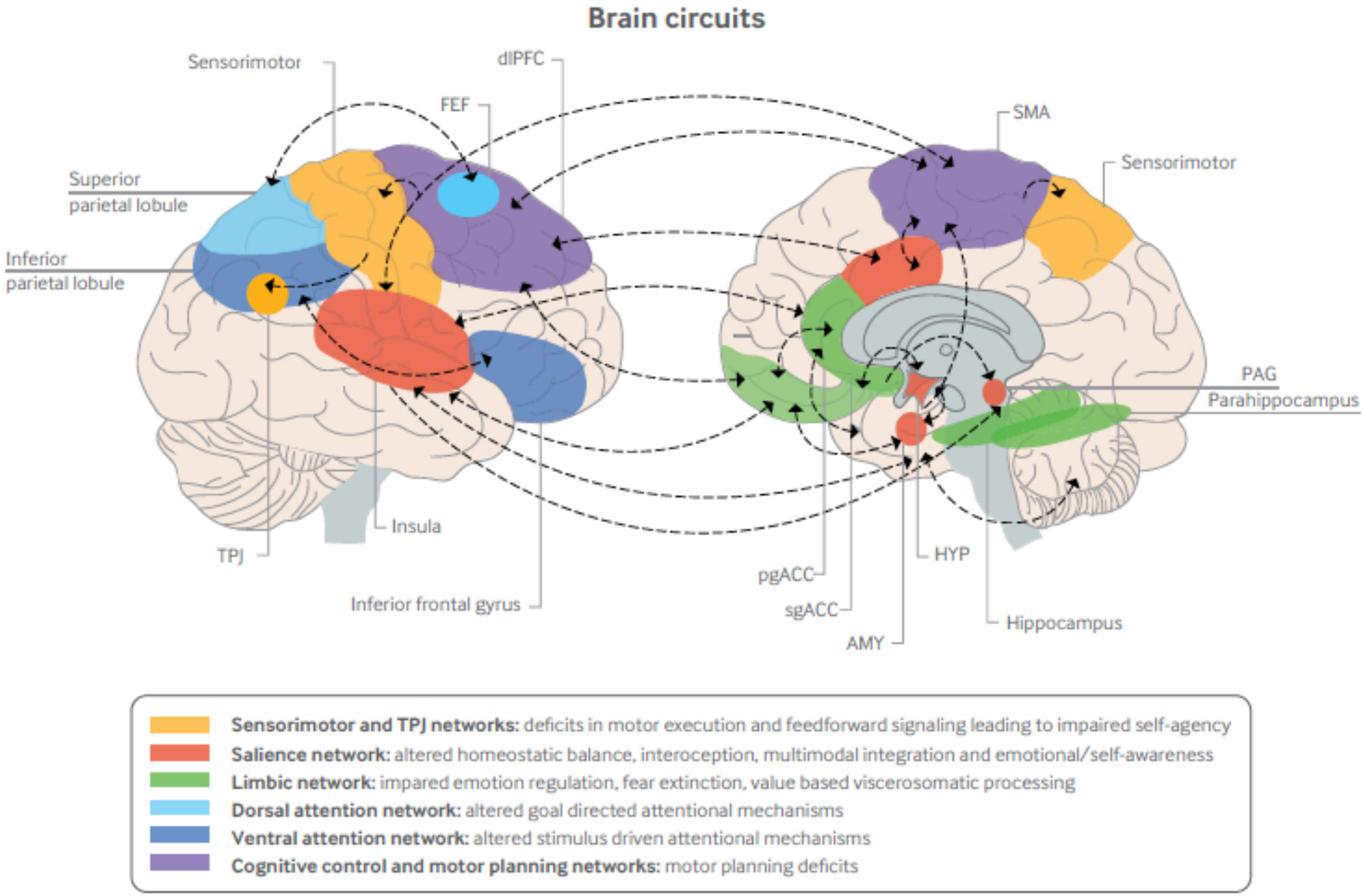


High as 77% in those with functional seizures

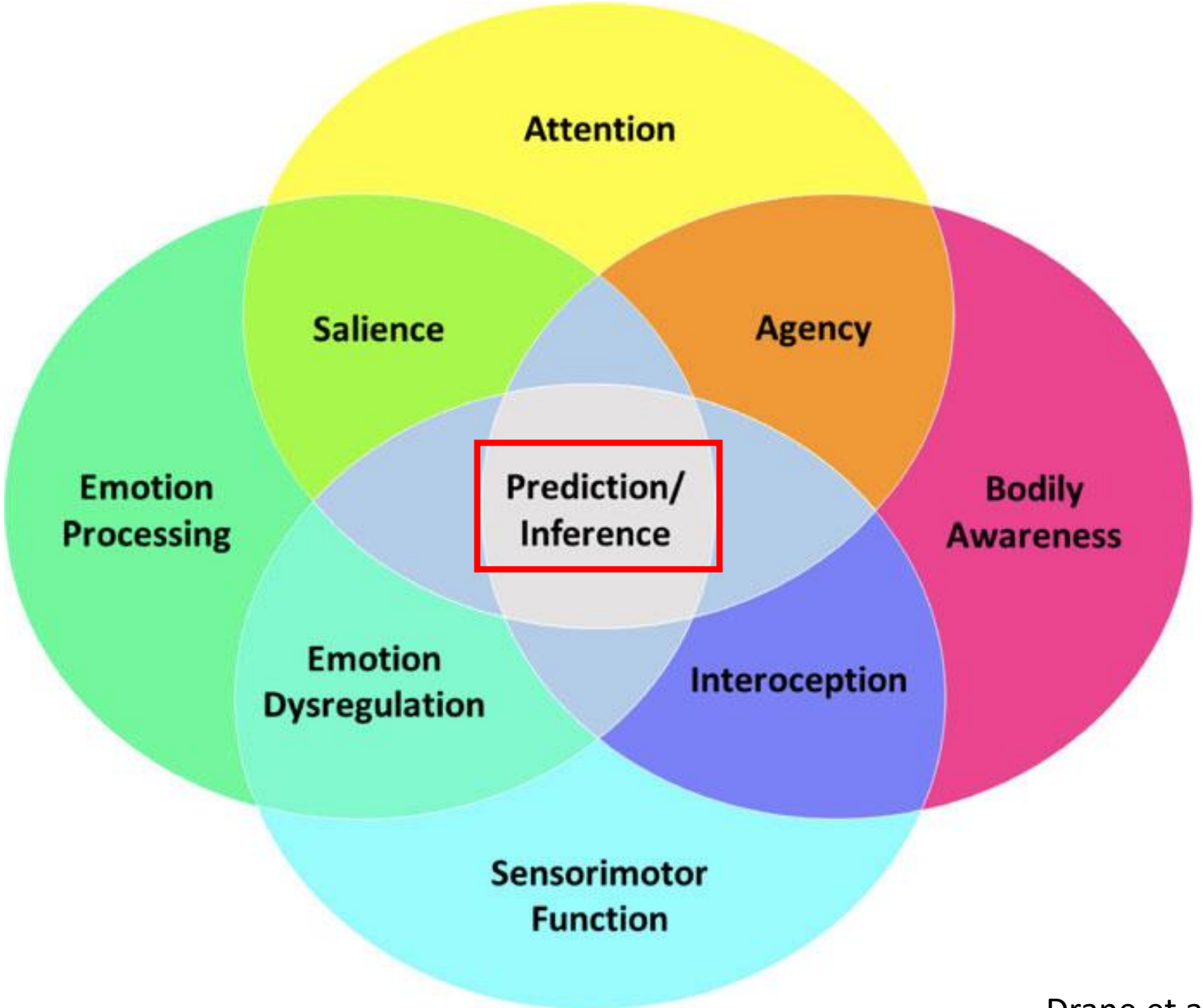


Butler et al., 2021

Pathophysiology



Aybek & Perez, 2022



Drane et al., *CNS Spectrums* 2020



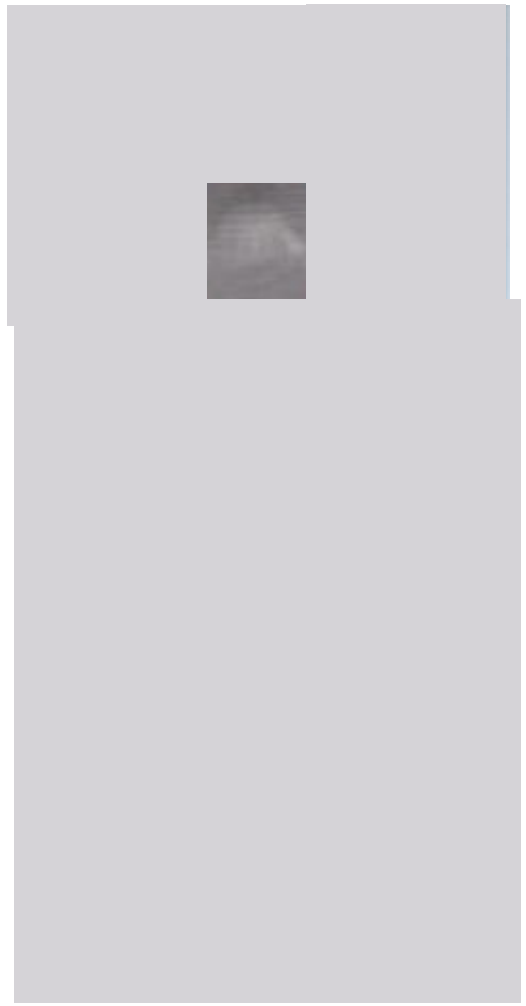
Karl Friston

$$\dot{\mu} = -\frac{\partial F}{\partial \mu}$$

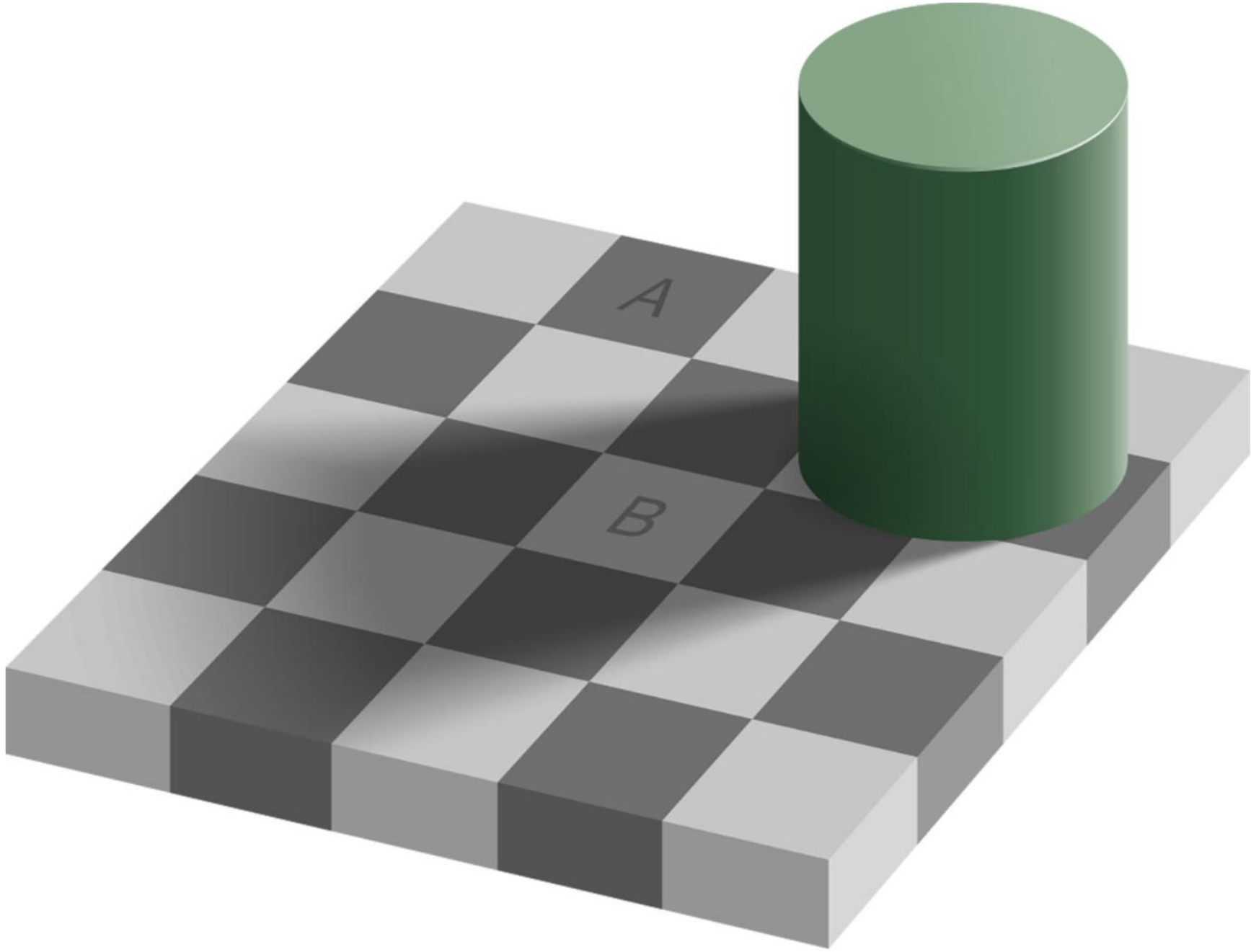


Ralph Waldo Emerson

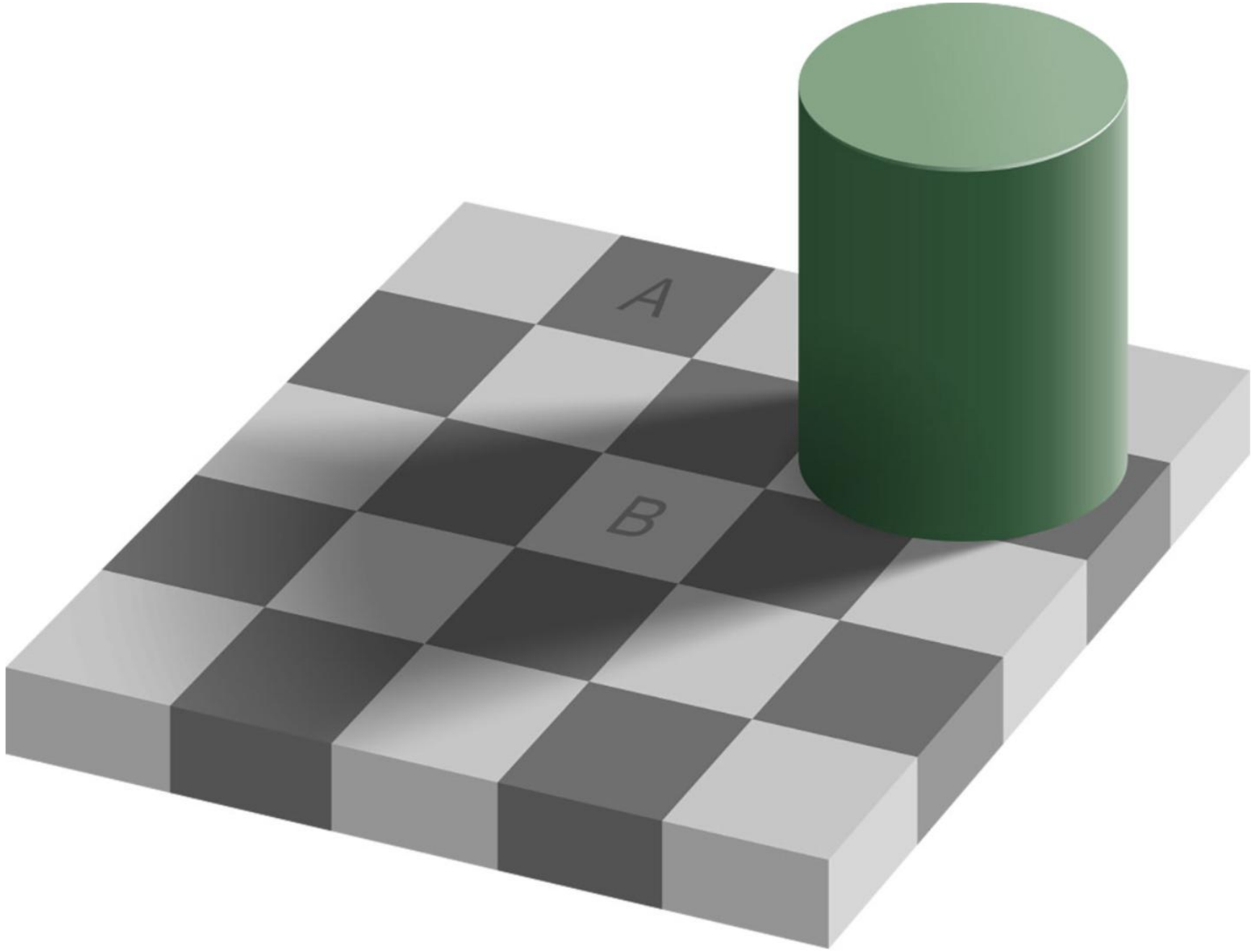
Perception is a mirror not a fact. And what I look on is my state of mind, reflected outward.



Credit: Illusionist Dean Jackson


A
B

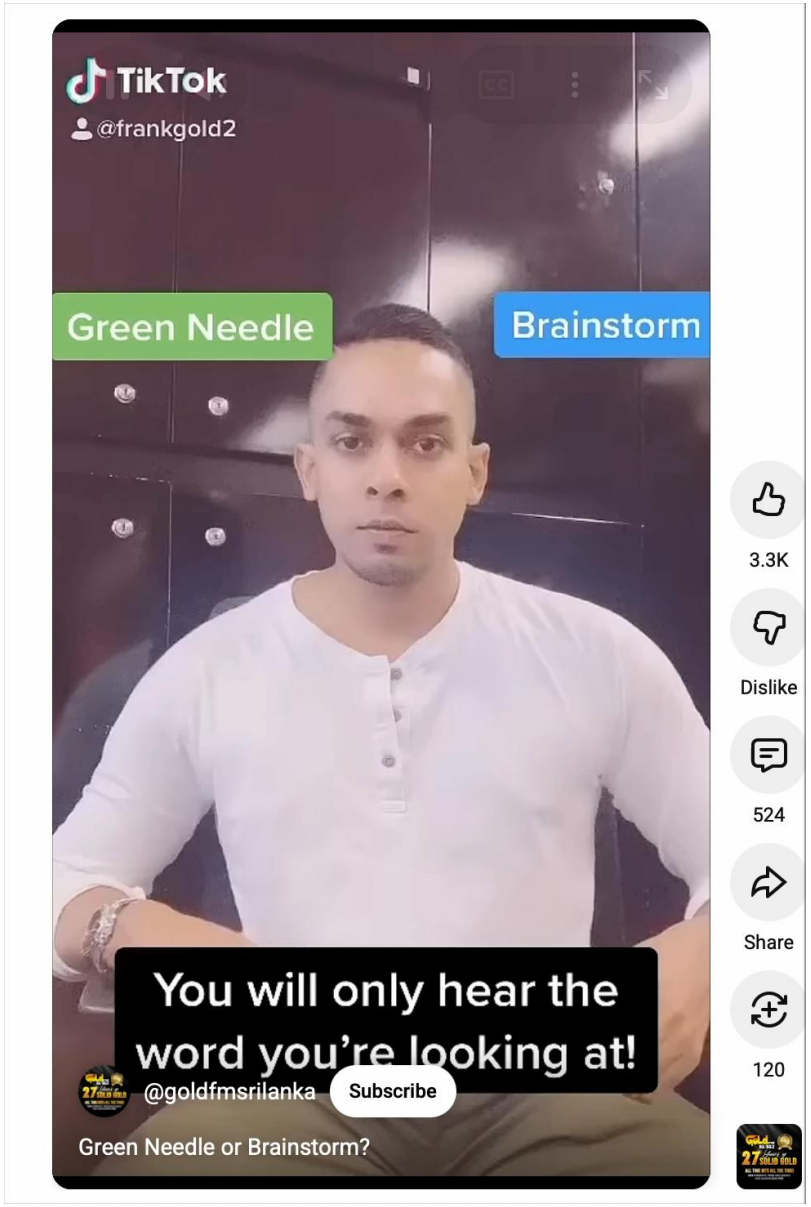

A
B


A
B

What do you hear?

Did you hear the name Laurel?

Or did you hear the name Yanny?


TikTok
@frankgold2
Green Needle
Brainstorm
You will only hear the word you're looking at!
@goldfmsrilanka
Subscribe
Green Needle or Brainstorm?
3.3K
Dislike
524
Share
120

Top – Down prior experience, beliefs



Bottom – Up Sensory Inputs



= Your Conscious Perception

Top – Down prior experience, beliefs

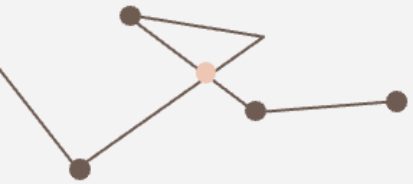


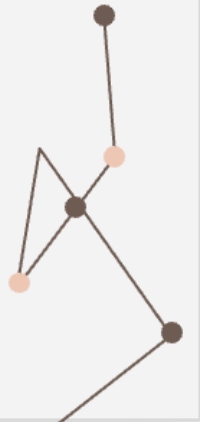
Bottom – Up Sensory Inputs



= Prediction error

Updating predictions for the future based on novel inputs is called ....

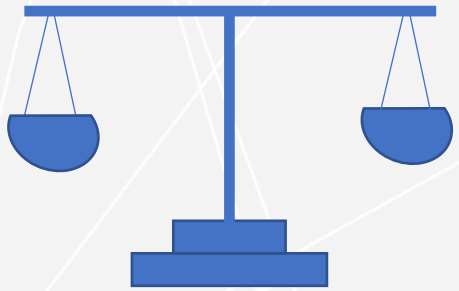


Learning!

Top – Down prior experience, beliefs



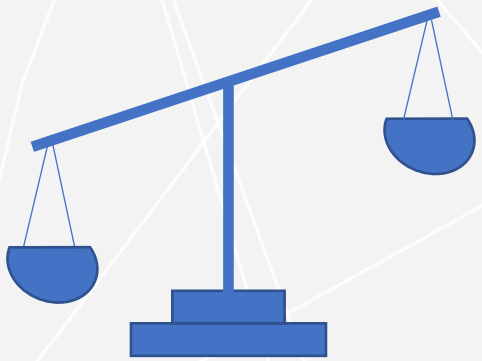


Precision Weighting

Bottom – Up Sensory Inputs



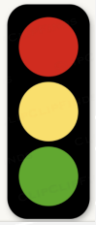
Top – Down prior experience, beliefs

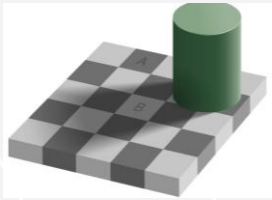


Precision Weighting



Examples





Brain-Mind-Body Interface Disorders

- **FND**
- **DGBI**
- **Fibromyalgia**

Bottom – Up Sensory Inputs

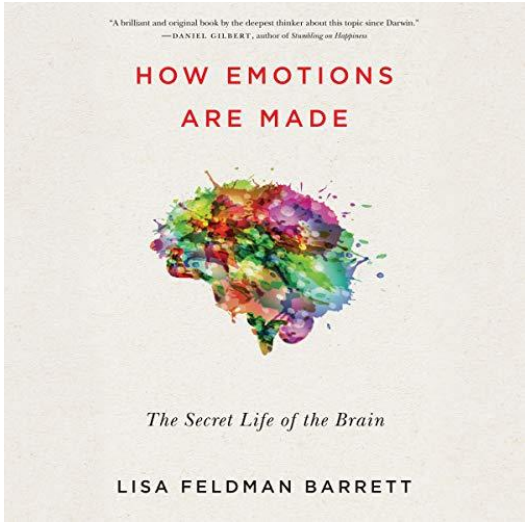


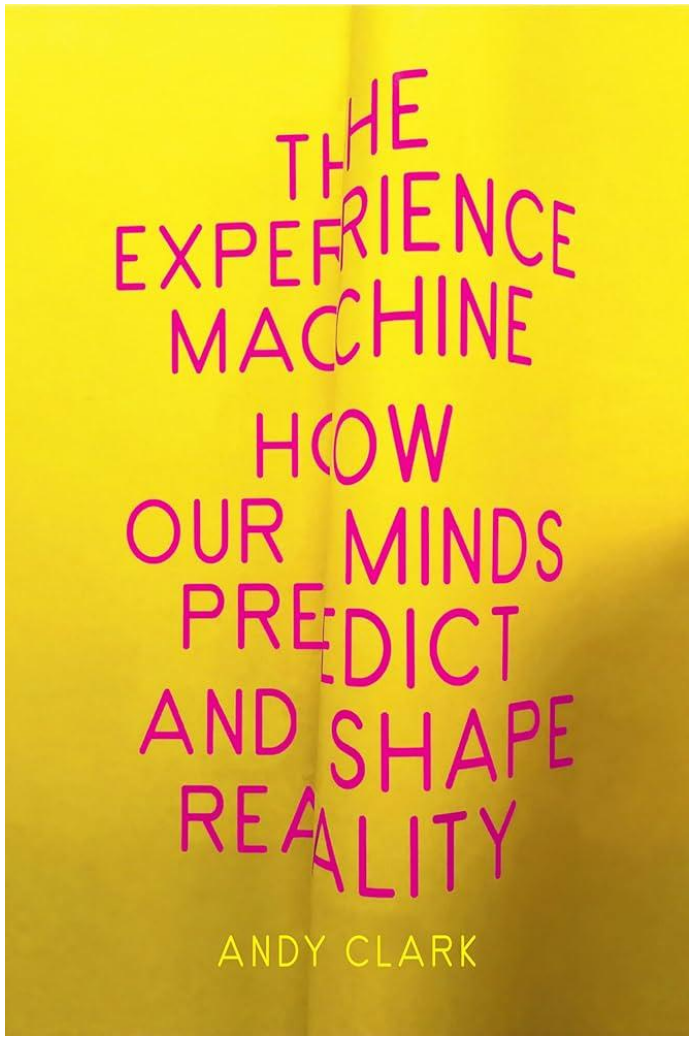
https://doi.org/10.1093/brain/awag101 BRAIN 2026: 149; 3311–3324 | 3311

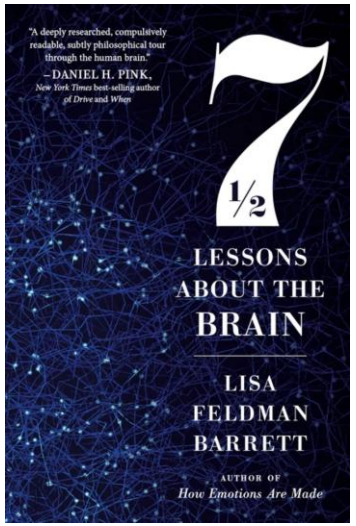
BRAIN
REVIEW ARTICLE

Precision dynamics of predictive coding in functional neurological disorder

Stanley Lyndon[1,2,3]







Biol Cybern (2010) 102:227–260
DOI 10.1007/s00422-010-0364-z

ORIGINAL PAPER

Action and behavior: a free-energy formulation

Karl J. Friston · Jean Daunizeau · James Kilner · Stefan J. Kiebel

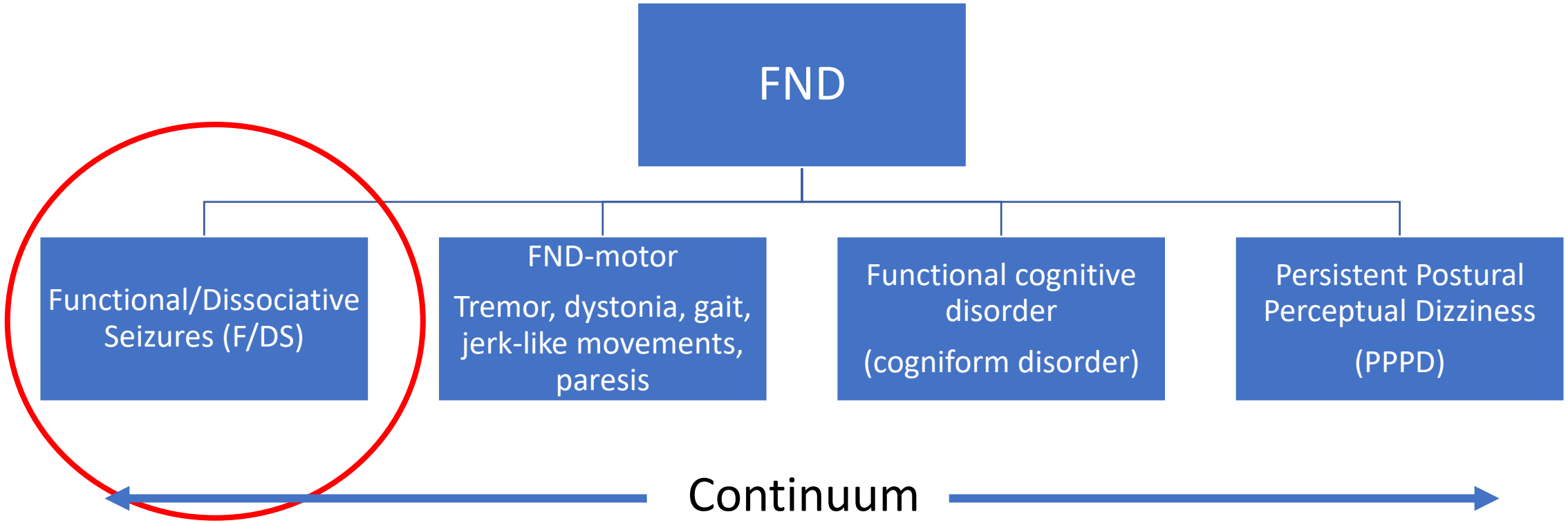
JOURNAL ARTICLE ACCEPTED MANUSCRIPT

Precision dynamics of predictive coding in functional neurological disorder

Stanley Lyndon

Brain, awag101, https://doi.org/10.1093/brain/awag101
Published: 13 March 2026 **Article history** ▾

FND Phenotypes



More on naming

Hystero-epilepsy → dated, gendered, pejorative

Pseudoseizures → dated, pejorative

Functional/Dissociative Seizures

Psychogenic nonepileptic attacks

Psychogenic nonepileptic seizures

Functional Seizures Course of Illness

Onset in second or third decade, mean ~ mid 20s; can be dx in pediatric and older adult patients

F:M 3:1 (Female 70-80%), except late-onset (>55) ratio more even

Delay in diagnosis 5-7 years

Diagnosis

Important take-home point

FND of any subtype should be based on positive assessment findings, not a dx of exclusion.

Diagnosis

Level of Certainty	Witnessed Event	EEG
Possible	By another witness or self-report	No epileptiform activity on routine **interictal** EEG
Probable	By clinician in person or video recording; + functional semiology	No epileptiform activity on routine **interictal** EEG
Clinically established	By experienced clinician in person or video recording; + functional semiology	No epileptiform activity on routine or ambulatory **ictal** EEG **during typical event**
Documented	By experienced clinician, + functional semiology while on vEEG	No epileptiform activity **before, during, or after ictus on vEEG with typical event**

(LaFrance et al., 2013)

Diagnosis Using Positive Signs

Table 1 | Clinical features that help separate functional seizures in functional neurological disorder (FND) from epilepsy (based on Avbersek et al 2010[18]). Syncope usually lasts less than 30 seconds and with eyes open. Clinical features usually need to be assessed in combination. A smartphone video taken by a friend or family member with consent may help

Clinical feature	Common in FND and rare in epilepsy or syncope	Common in epilepsy and rare in FND	May be present in either
Eyes Closed during event	Yes	—	—
Resistance to eyelid opening	Yes	—	—
Duration longer than 2 minutes	Yes	—	—
Hyperventilation during episode	Yes	—	—
Crying after the event	Yes	—	—
Guttural Cry at onset	—	Yes	—
Stertorous (snoring) breathing after the event	—	Yes	—
Synchronous EEG evidence of epilepsy	—	Yes (although interictal EEG often normal)	—
Report of tongue biting	—	—	Yes
Urinary incontinence	—	—	Yes

EEG = electroencephalogram.

(Avbersek et al, 2010; Stone et al, 2020)

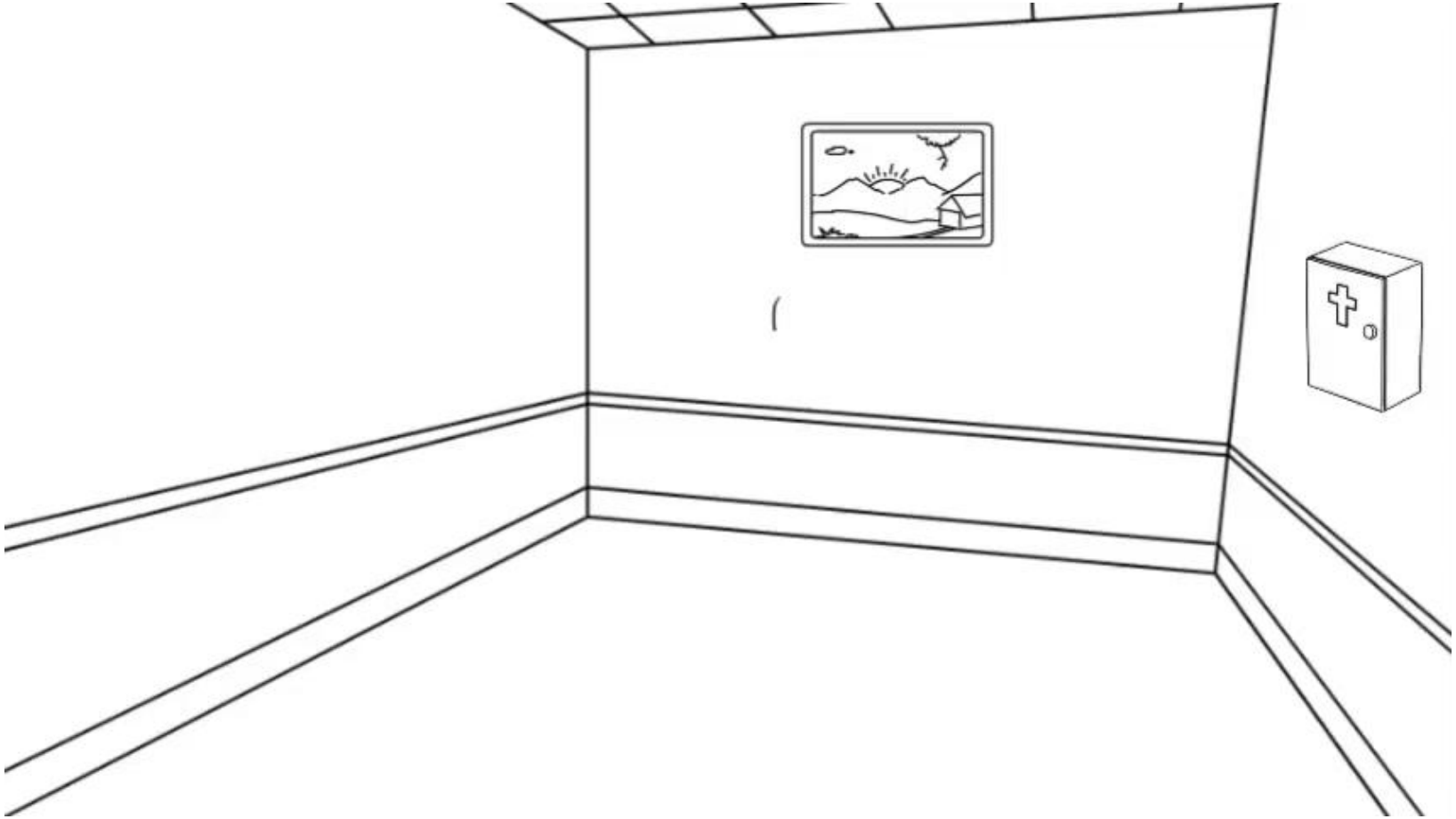
General Signs Suggestive of FND

FND-szr

Long duration	Observe if >2 minutes	In 341 FND *v* 441 epilepsy patients: specificity 93% sensitivity 65%	Seneviratne 2017[64]
Waxing and waning/ fluctuating course	Observe seizure course: a decrease/ increase of motor events and/or pauses in the seizure course is suggestive of FND	In 50 FND *v* 20 epilepsy patients: specificity 100% sensitivity 94%	De Paola 2016[68]
Clues that the patient has preserved awareness			
External influence on attack course	Observe if others can intensify or alleviate the symptoms	In 12 FND *v* 23 epilepsy patients: specificity 99% sensitivity 83%	Syed 2011[65]
Eye contact	Observe if eyes respond to environment and stimuli	In 12 FND *v* 23 epilepsy patients: specificity 77% sensitivity 79%	Syed 2011[65]
Responsiveness	Observe if patient can respond during an attack	In 50 FND *v* 20 epilepsy patients: specificity 100% sensitivity 36%	De Paola 2016[68]
Shaking without loss of consciousness	Observe if semiology looks like generalized seizure (shaking of limbs) but with NO loss of consciousness	In 20 FND *v* 20 epilepsy patients: specificity 100% sensitivity 20%	Devinsky 1996[74]
Recall of event	Ask the patient if she/he recalls the event	In 50 FND *v* 20 epilepsy patients: specificity 100% sensitivity 60%	De Paola 2016[68]
Recall of a named item	During the attack, name a color, object, or phrase and ask the patient afterwards if he/ she can recall it; if yes suggestive of FND	In 20 FND *v* 20 epilepsy patients: specificity 85% sensitivity 90%	Devinsky 1996[74]
Motor behavior			
Closed eyes	Observe if eyes are closed and/or resist attempted opening by examiner, and or eyelids flutter during seizure	In 52 FND *v* 156 epilepsy patients: specificity 98% sensitivity 96%	Chung 1996[76]
Asynchronous limb movements	Observe if arm or leg movements are synchronous: if not, suggestive of FND	In 50 FND *v* 20 epilepsy patients: specificity 100% sensitivity 84%	De Paola 2016[68]
Pelvis thrusting	Observe if rhythmical movements of pelvis occur	In 12 FND v 23 epilepsy patients: specificity 99% sensitivity 8%	Syed 2011[65]
Side-to-side head movements	Observe if head (or body) has side-to-side lateral movements	In 50 FND *v* 20 epilepsy patients: specificity 100% sensitivity 66%	De Paola 2016[68]
Arching back ("Arc de cercle")	Observe if the patient arches back in opisthotonos-like posture	In 50 FND *v* 20 epilepsy patients: specificity 100% sensitivity 38%	De Paola 2011[68]
Rotation in bed	Observe if the patient rotates/changes position in bed	In 50 FND *v* 20 epilepsy patients: specificity 100% sensitivity 26%	De Paola 2016[68]
Accompanying behavior			
Ictal crying	Observe if the patient cries during seizure	In 12 FND *v* 23 epilepsy patients: specificity 98% sensitivity 8%	Syed 2011[65]
Ictal whispering	If the patient talks, observe if whispering	In 12 FND *v* 23 epilepsy patients: specificity 91% sensitivity 49%	Syed 2011[65]
Ictal stuttering	If the patient talks, observe if stuttering	In 117 FND *v* 113 epilepsy patients: specificity 100% sensitivity 9%	Vossler 2004[82]
Ictal hyperventilation	Observe if patients hyperventilates throughout the seizure	In 50 FND *v* 20 epilepsy patients: specificity 100% sensitivity 14%	De Paola 2016[68]

(Aybek & Perez, 2022)

Treatment of Functional Seizures Begins with Delivering the Diagnosis



(Aybek & Perez, 2022)

Treatment of Functional Seizures Begins with Delivering the Diagnosis

Remission in ~ 40% by 6-12 months following clear communication of dx

Mckenzie et al., *Neurology* 2010

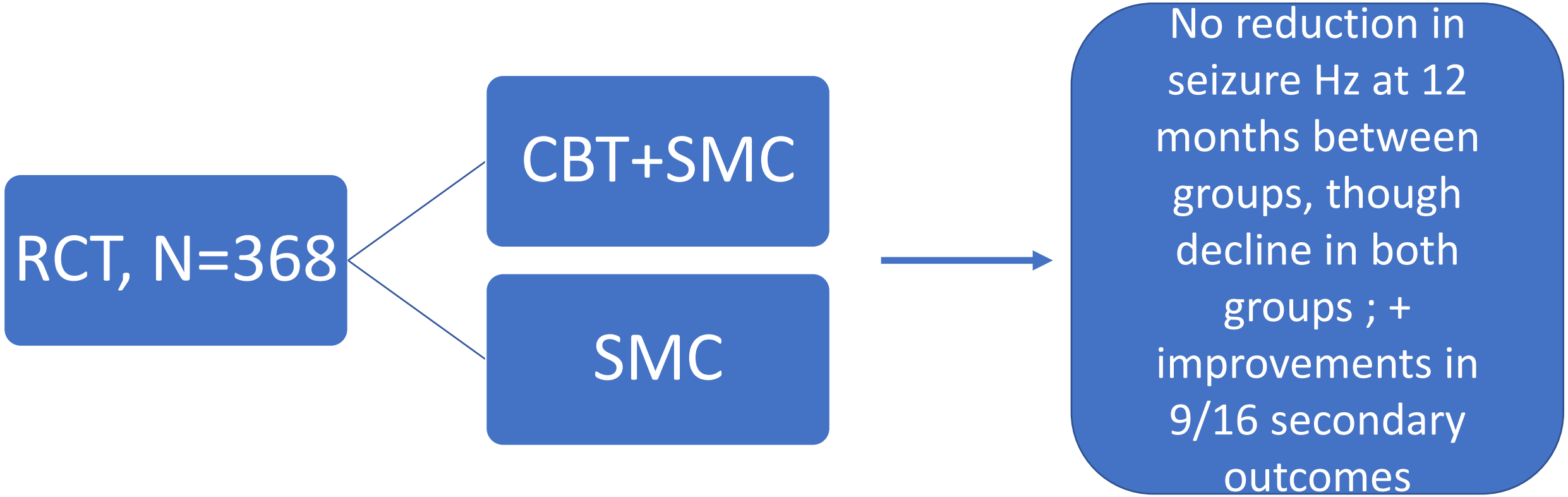
Following dx delivery: 94% reduction in ED visits, 100% reduction in admissions

Razvi et al., *Epilepsy & Behavior* 2012



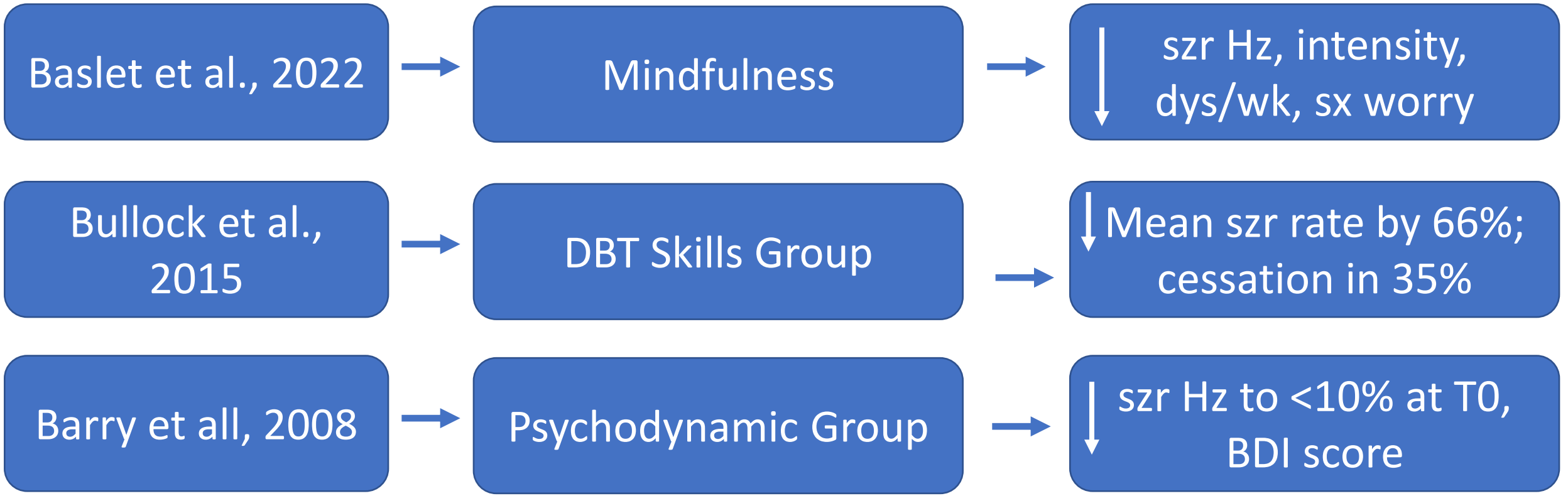
Evidence for Treatments: Psychotherapy

Goldstein et al., 2020 (CODES Trial)

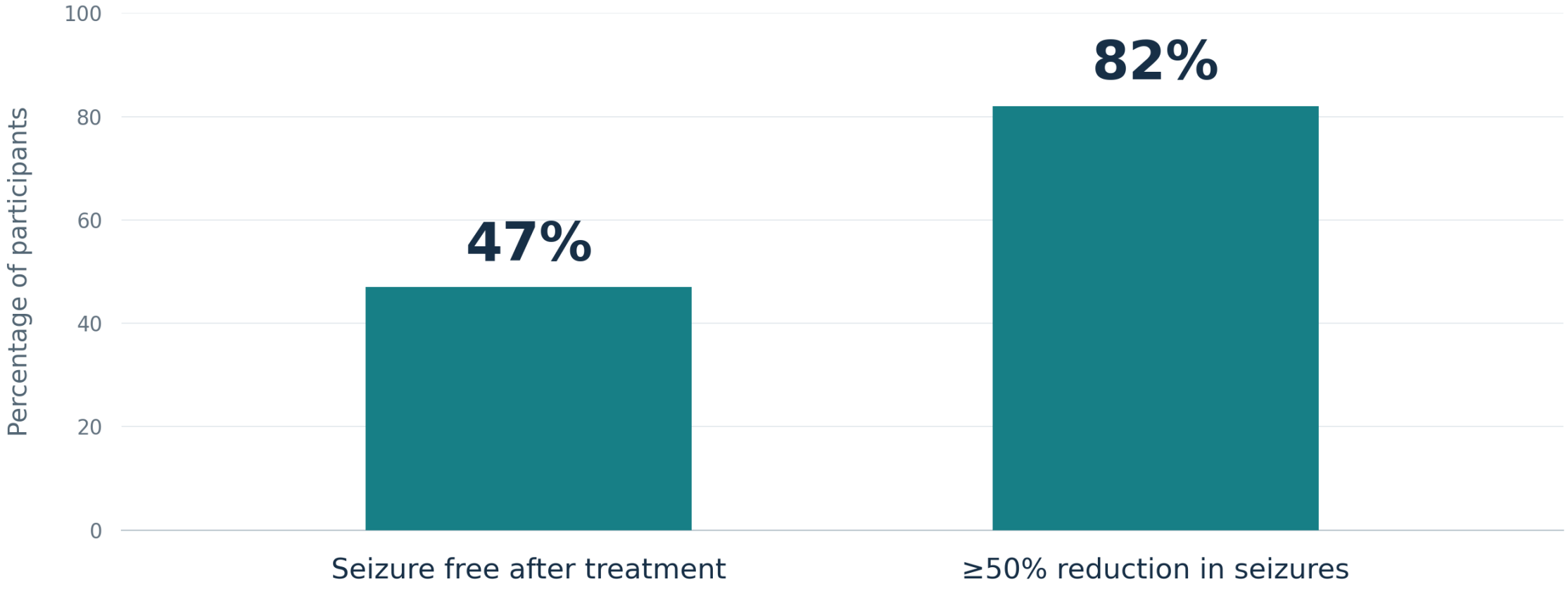


CBT-cognitive behavioral therapy; SMC-standard medical care

Other Psychotherapy Trials



Outcomes of Psychological Treatment for Functional Seizures



(Carlson & Nicholson Perry, 2017)

Evidence for Treatments Pharmacotherapy



Evidence for Treatments Pharmacotherapy



No strong evidence to support pharmacotherapy specifically for FS or other FND phenotypes

Treating Psychiatric & Non-Motor Comorbidities



Depression, Anxiety, PTSD, Personality Disorders

Pain, Fatigue, Cognitive

Confirmed FS → 22% comorbid epilepsy

I Refer All Patients To…

FND HOPE
FUNCTIONAL NEUROLOGICAL DISORDER

www.FNDHope.org

FND Guide
neurosymptoms.org

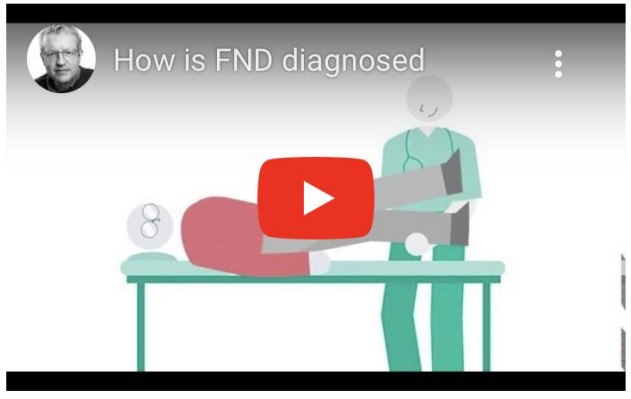
www.neurosymptoms.org

FND videos



What is FND?

Read more >>



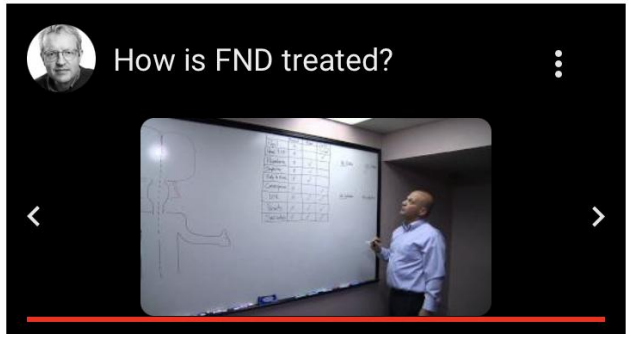
How is FND Diagnosed?

Read more >>

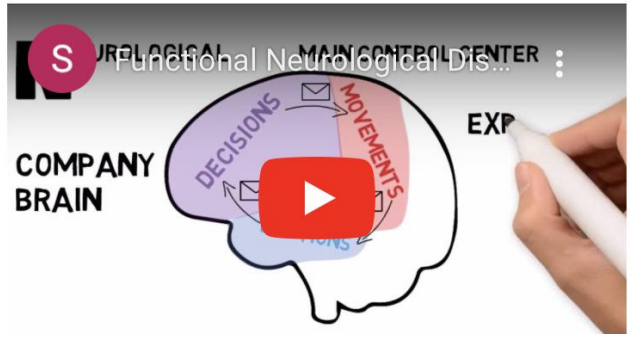


Can you have FND and another neurological condition?

Read more >>





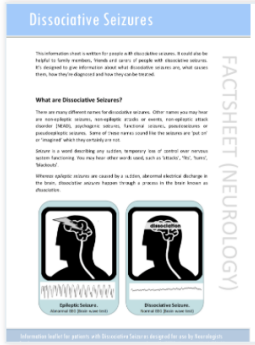


Fact Sheets



Functional Limb Weakness

Download



Functional (Dissociative) Seizures

Download



Functional Tremor

Download



Drop Attacks

Download



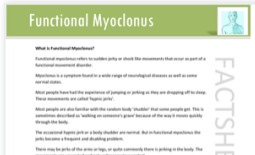
Functional Dystonia

Download



Functional Cognitive Symptoms

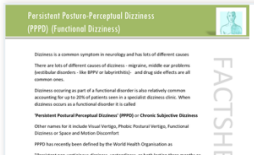
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Functional Myoclonus

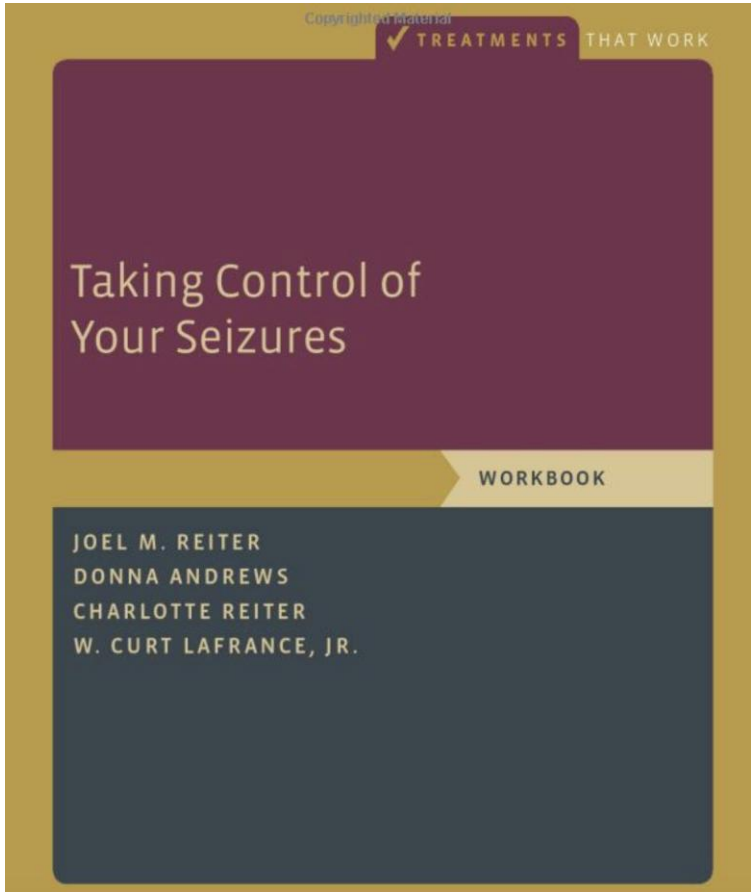


Functional Facial Spasm

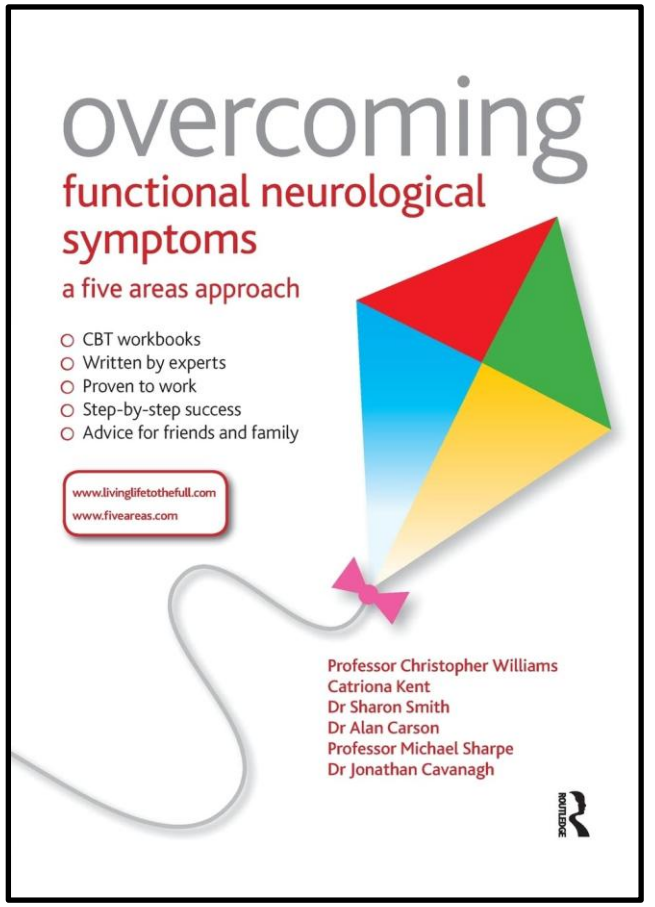


PPPD (Functional Dizziness)

Important Resources for Patients

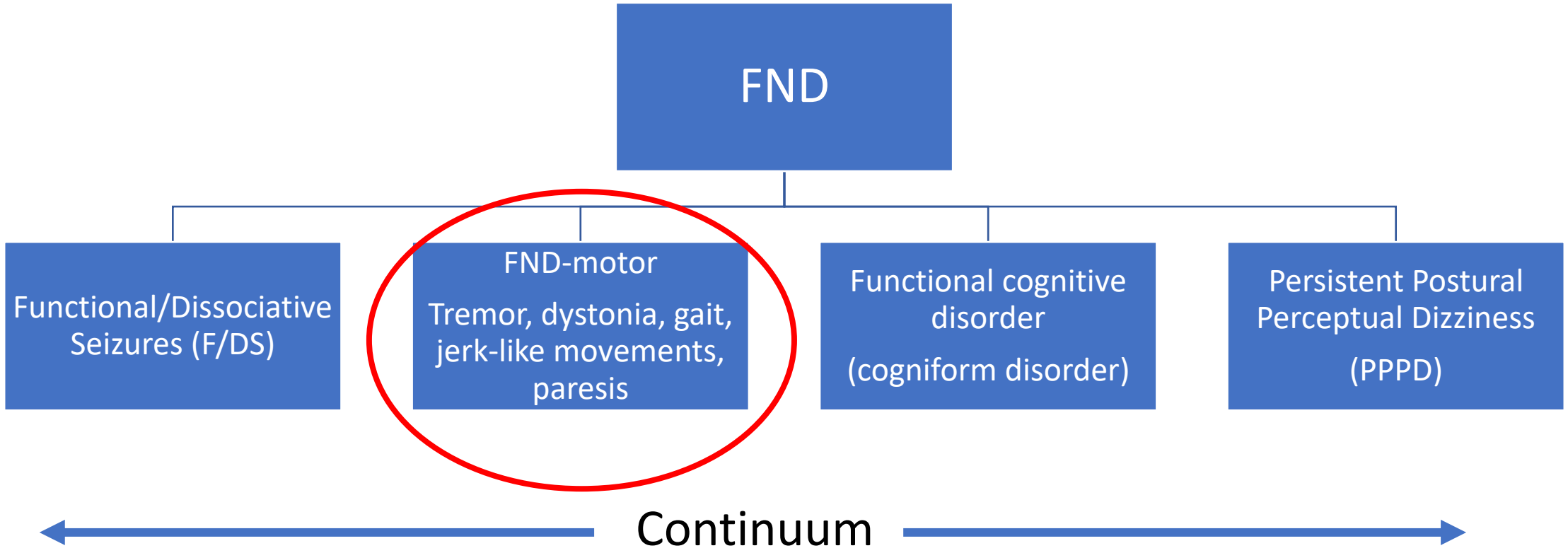


With a therapist



With a therapist or self-guided

FND Phenotypes



Functional Tremor



Video: Elan Louis, *Distractibility with Motor Tasks*. Vimeo. https://vimeo.com/431201284

Hoover’s Sign for functional limb weakness



Evidence Based Treatments Physical Therapy (PT)



Motor Retraining

Retraining abnormal movements in small, incremental steps

Bringing abnormal movements back under volitional control

Avoiding adaptive equipment as much as possible

Maximize healthy movements when at home

Encourage early weight bearing

Focus on task completion and automatic movements

Leveraging diverted attention

(Finkelstein et al, 2022)

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]

Nielsen et al, 2015

Evidence Based Treatments Occupational Therapy (OT)

Education

Rehabilitation within functional activity

Taught self-management strategies

Use of distraction, fostering healthy movements, and relaxation techniques

Cognitive rehab for functional cognitive disorder

(Nicholson et al, 2020)



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]

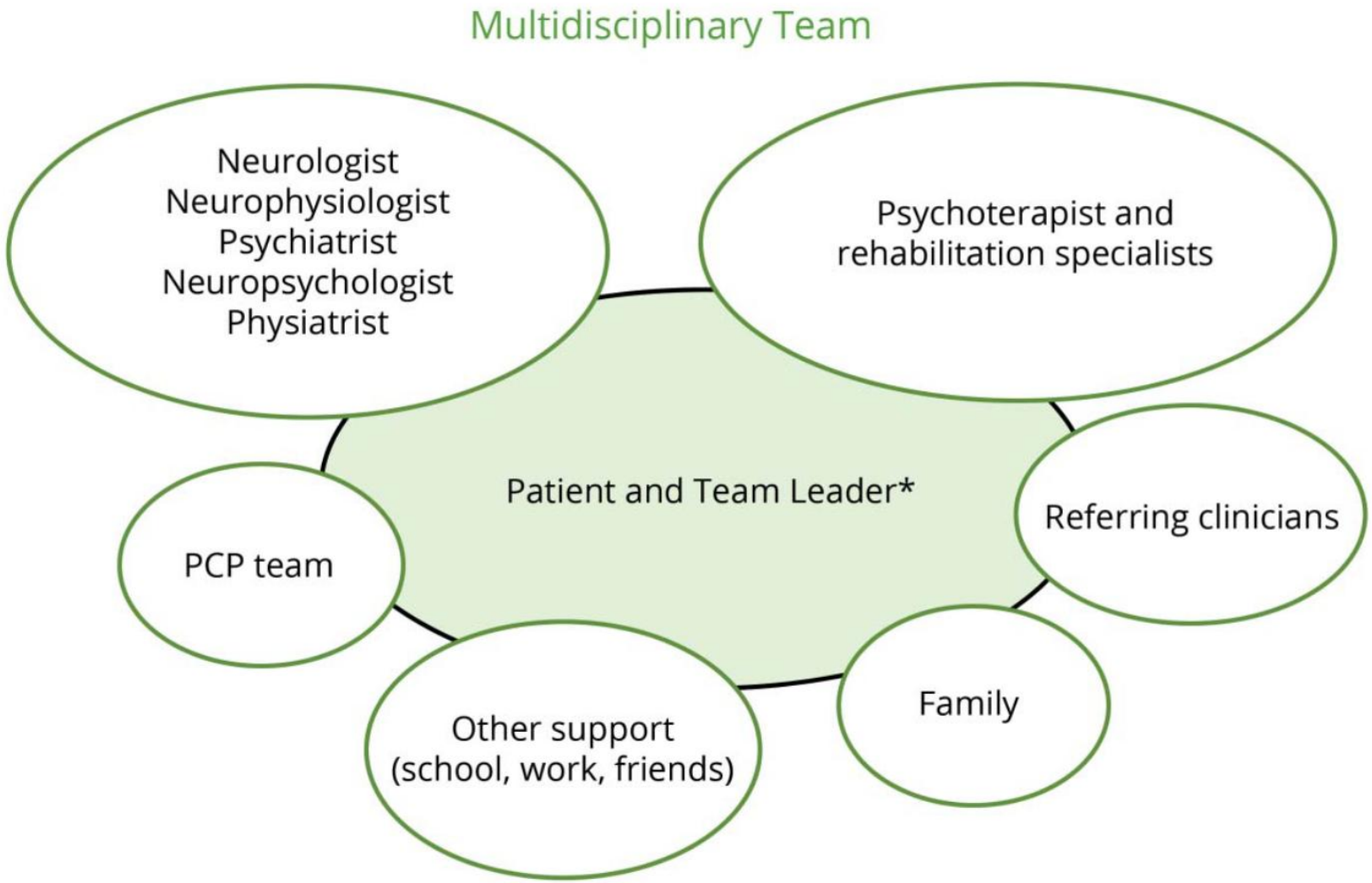
Nicholson et al, 2020

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]

Baker J,et al 2021



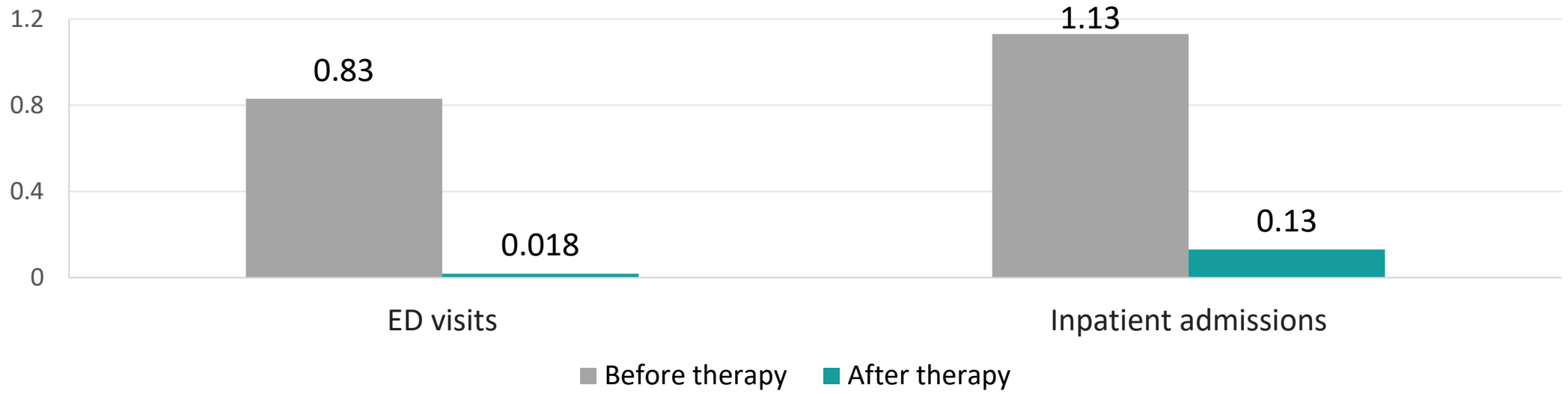
(O'Neal et al, 2021)

Healthcare utilization after specialty FND care

Preliminary data

Retrospective study of 46 adults who completed group or individual therapy

Mean encounters per patient in the 6 months before and after therapy



ED visits: p = .02, d = .53

Inpatient admissions: p < .001, d = .81



Anusha Tanneru



Vishal Thakkar, PhD



Crysta Weidner, PhD



Chadrick Lane, MD



Russel Dykema, MD



Kenneth Dekleva, MD



Jasmine Moore, LMFT



Libby Kay, MSSW



Crysta Weidner, PhD



Lyna Nguyen, PMHNP



Andrea Jones, LMSW



Jimmy Watkins