

The Aspen Course

International Parkinson and Movement Disorder Society Pan American Section

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Comprehensive Review of Movement Disorders for the Clinical Practitioner

Functional Movement Disorders

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UofT NEUROLOGY

UHN Krembil Brain Institute

Disclosures

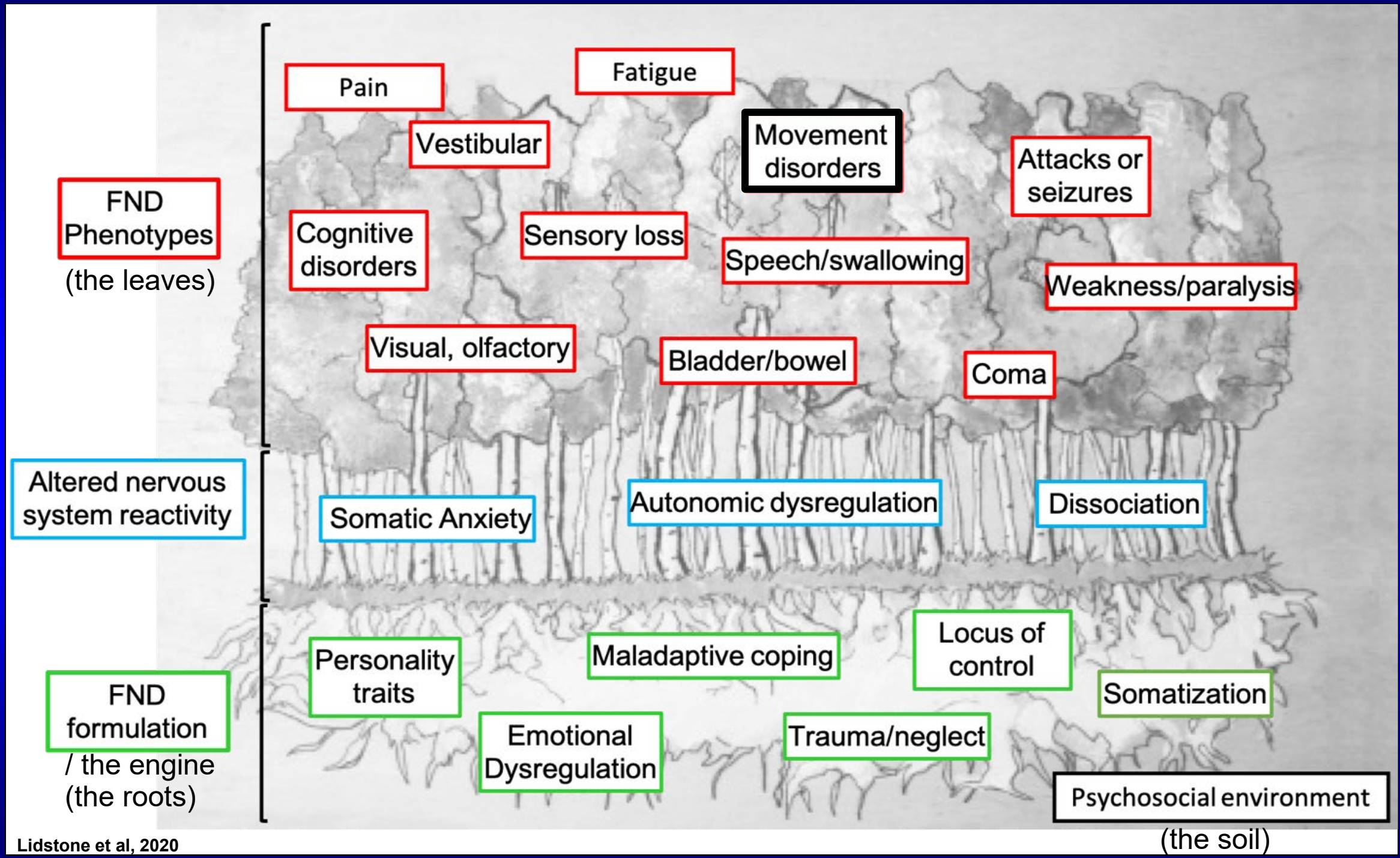
- Advisor for AbbVie, AFFiRis, Alector, Amylyx, Aprinoia, Biogen, BioAdvance, Biohaven, BioVie, BlueRock, BMS, Cavion, CoA Therapeutics, Denali, Janssen, Jazz, Lilly, Novartis, Paladin, Pharma 2B, PsychoGenetics, Roche, Sun Pharma, and UCB.
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Nothing relevant to this lecture

Special thanks to

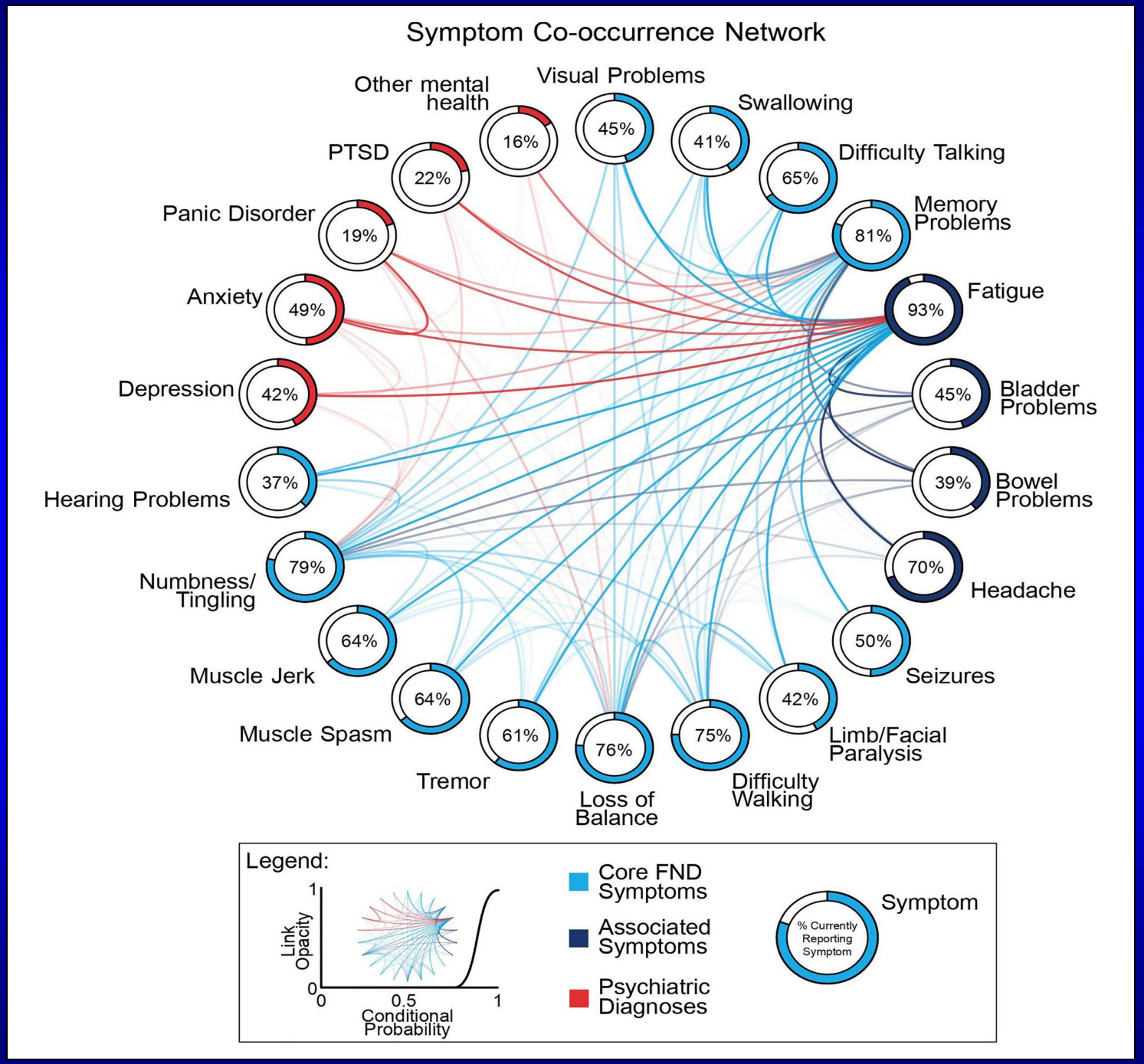
- Sarah Lidstone (UHN, Toronto)

Clinical Features



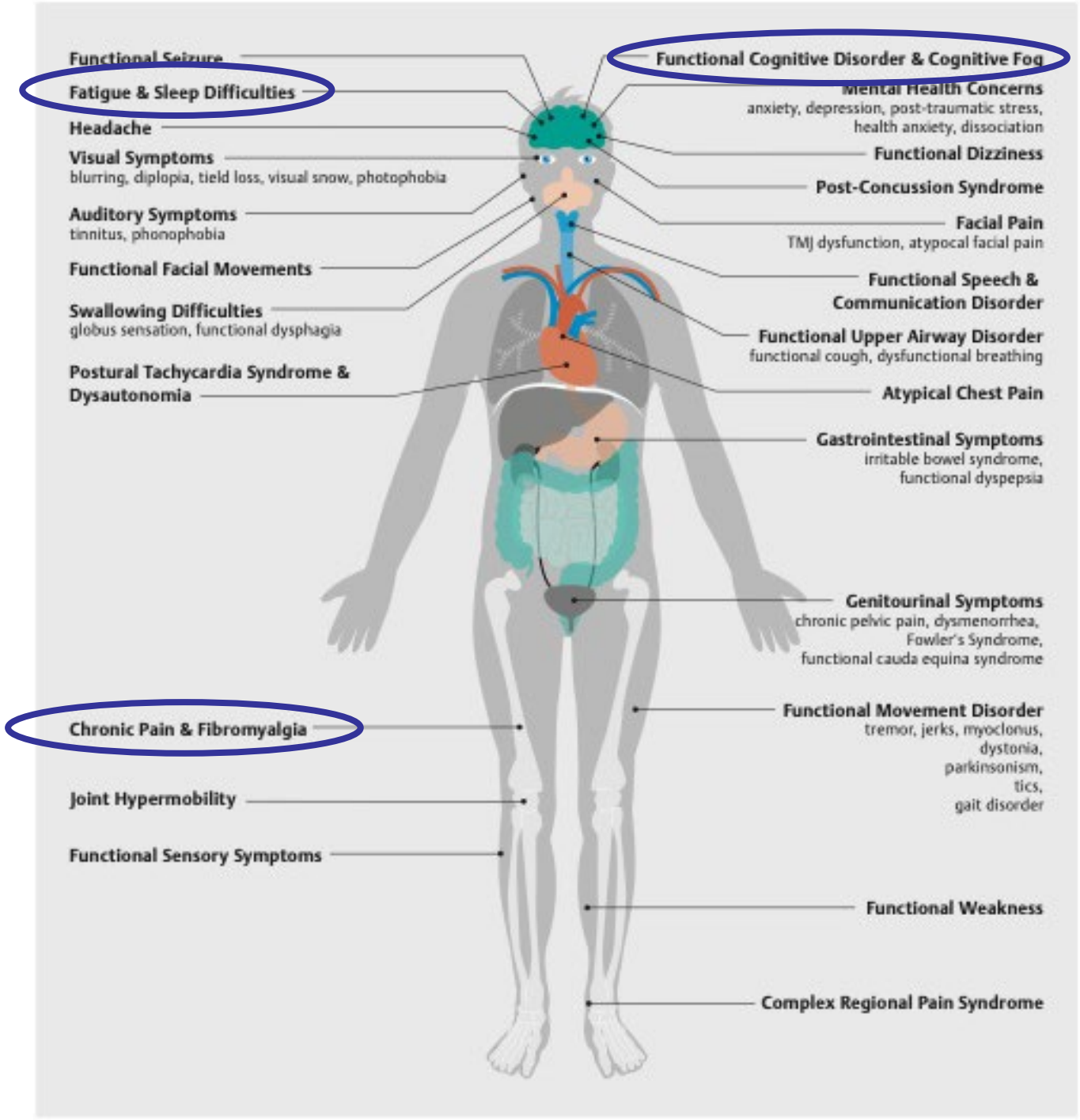
Lidstone et al, 2020

Online Survey of 1048 Individuals with FND



Butler et al, 2021

FMD is a syndrome



Gilmour and Lidstone in press

Symptoms 'unexplained by organic disease' in 1144 new neurology out-patients: how often does the diagnosis change at follow-up?

Jon Stone,[1,*] A. Carson,[1,*] R. Duncan,[2] R. Coleman,[3] R. Roberts,[4] C. Warlow,[1] C. Hibberd,[1] G. Murray,[5] R. Cull,[1] A. Pelosi,[6] J. Cavanagh,[7] K. Matthews,[4] R. Goldbeck,[3] R. Smyth,[1] J. Walker,[1] A. D. MacMahon[8] and M. Sharpe[1]

Brain 2009: 132; 2878–2888

One thousand four hundred and forty-four patients (30% of all new patients) were rated as having symptoms 'not at all' or only 'somewhat explained' by 'organic disease'. The most common categories of diagnosis were: (i) organic neurological disease but with symptoms unexplained by it (26%); (ii) headache disorders (26%); and . At follow-up only 4 out of 1030 patients (0.4%) had acquired an organic disease diagnosis that was unexpected at initial assessment and plausibly the cause of the patients' original symptoms.

Table 7 Comparison of previous studies of the frequency of symptoms unexplained by organic disease in neurology out-patients

Study, year of publication	Location	*n*	Per cent unexplained by organic disease
Carson *et al.*, 2000*b*	Edinburgh, UK	300	30% (11% 'not at all' and 19% 'somewhat' explained by organic disease)
Bateman and Harrison, 2000	Bath, UK	356	26% no neurological disorder
Nimnuan *et al.*, 2001	London, UK	103	62% had 'medically unexplained' symptoms
Stone *et al.*, 2002	Edinburgh, UK	89	36% (7% 'not at all' and 29% 'somewhat' explained by disease)
Stone *et al.*, 2004	Colchester, UK	100	45% had a 'non-neurological' diagnosis
Snijders *et al.*, 2004	Utrecht, Netherlands	208	35% considered to have 'medically unexplained' symptoms
Fink *et al.*, 2005	Vejle, Denmark	198[a]	61% had 'medically unexplained' symptom, 39% had a somatoform disorder
This study, 2009	Aberdeen, Dundee, Edinburgh, Glasgow, UK	3781	30% (12% 'not at all' and 18% 'somewhat' explained by organic disease)

a Mixture of in- and out-patients.

Epidemiology of Functional Neurological Disorders

- Incidence: 4-12/100,000 (motor 4-5; PNES 1.5-4.9)
- Prevalence: 50/100,000 population
- 15-62% of new neurological consultations (higher incl. all medically unexplained Sx)
- Movement disorders clinics: FMD frequency 3% - 10 %
- Women 60-75% of cases
- Functional parkinsonism & myoclonus may be more common in men

Systematic review

J Neurol Neurosurg Psychiatry 2024

Incidence and prevalence of functional neurological disorder: a systematic review

Sara A Finkelstein [1,2] Clare Diamond,[3] Alan Carson,[4] Jon Stone [4]

Table 2 Summary of studies of incidence of FND

Study	Country	Cases	Population	Mean age at diagnosis (SD); age range	% F	Incidence/100 000 (95% CI)*
All FND†—adult and paediatric‡						
Stefánsson *et al*[26]	USA Iceland	1374 200	710 917§ 204 578§	NR; <14 to >65 NR; <14 to >65	68 83	22.0 11.0
All FND—adult only						
Beharry *et al*[20]	New Zealand	125	369 000	40 (17); NR	69	11
Stevens[25]	UK	164	512 200	NR; NR	NR	10.7¶
All FND—paediatric only (<16 years)						
Yong *et al*[24]	UK	64	116 720	13; 5–15	70	18.3 (13.8 to 22.8)
Raper *et al*[21]	UK	124	600 000	NR; 4–19	56	6.0
Ani *et al*[22]	UK	204	12 542 420	12.5; 7–15	76	1.30 (1.11 to 1.52)
Kozlowska *et al*[23]	Australia	194	4 250 000	11.8 (2.7); 3.1–15.9	71	2.3 (2.0 to 2.6) (Aus) 4.2 (3.5 to 5.0) (NSW)
Motor FND—adult only						
Stone *et al*[36]	UK	107	800 000	39.1; NR	79	3.9
Binzer *et al*[37]	Sweden	30	260 000	38.8; NR	60	4.8¶
Functional seizures—adult and paediatric						
Villagrán *et al*[27]	Norway	79	265 238	27; 11–78	77	3.1 (2.4 to 3.7)
Duncan *et al* (age 13+ years)[28]	UK	68	367 566	32.6; 14.0–71.1 (at onset)	82	4.90
O'Sullivan *et al*[29]	Ireland	50	1 100 000	32.4 (11.8) FS 34.8 (11.1) FS and epilepsy	61	0.91
Kotsopoulos *et al* (age 14+ years)[30]	The Netherlands	63	190 860	NR; NR	67	19.8¶
Sigurdardottir and Olafsson (age 15+ years)[31]	Iceland	14	1 000 955	27.6; 16–54	79	1.4
Functional seizures—adult only						
Lehn *et al*[35]	Australia	46 114	1 600 000	33; 23.25–44.5 34.5; 26–49	41 63	11.5¶ ('all comers') 7.1¶ ('status')
Szaflarski *et al*[32]	USA	77	600 000	37.2; 16 to >65	73	3.03
Forsgren[33]	Sweden	4	191 356	NR; NR	NR	2.4¶
Functional seizures—paediatric only (<18 years)						
Hansen *et al*[34]	Denmark	386	NR**	15.7; NR	83	2.4
Stroke-like symptoms—adult only						
Gargalas *et al*[38]	UK	98	900 000	49.1 (18.8); NR	63	10.9¶

*Where reported.
†'All FND' indicates studies that did not limit results by FND symptom type.
‡Unless otherwise specified in table, studies including paediatric populations did not specify a minimum age cut-off.
§Population as reported at the end of study, which spanned over 10 years. Lower population at beginning of study period was taken into account when calculating overall incidence.
¶Incidence calculated based on data provided in study.
**Population not reported but was stated as equal to the total population of persons aged 5–17 years in Denmark, based on the Civil Person Registration number, which is provided to every person born or immigrating to Denmark.
Aus, Australia; CI, Confidence interval; F, female; FND, functional neurological disorder; FS, functional seizures; NR, not reported; NSW, New South Wales; SD, Standard deviation.

FMD phenotype frequency

Original research *J Neurol Neurosurg Psychiatry* 2022;**93**:609–616

Functional movement disorder gender, age and phenotype study: a systematic review and individual patient meta-analysis of 4905 cases

Sarah C. Lidstone [1,2] Michael Costa-Parke,[1] Emily J. Robinson,[3,4] Tommaso Ercoli [5] Jon Stone [6] FMD GAP Study Group

Table 1 Descriptive summary statistics and one-stage individual patient data meta-analysis mixed-effects linear regression model for age of symptom onset, with 'tremor' and 'female' as the reference categories

	n (%)	Age of onset Mean (SD)	Gender Women (%)	Coefficient (95% CI)	Standardised effect size (95% CI)	P value
Gender						
Women	3558 (72.5)	39.1 (15.9)	–	–	–	–
Men	1347 (27.5)	41.0 (16.5)	–	1.66 (0.71 to 2.62)	0.10 (0.04 to 0.16)	0.001*
Phenotype						
Mixed	1127 (23.0)	42.1 (16.3)	848 (75.2)	0.32 (–1.05 to 1.69)	0.02 (–0.07 to 0.10)	0.649
Tremor	1056 (21.6)	40.7 (16.6)	752 (71.2)	–	–	–
Weakness	887 (18.1)	36.4 (13.4)	647 (72.9)	–3.74 (–5.35 to 2.14)	–0.23 (–0.33 to to 0.13)	<0.001*
Dystonia	578 (11.8)	34.5 (14.8)	453 (78.4)	–4.31 (–5.98 to 2.65)	–0.27 (–0.37 to to 0.16)	<0.001*
Gait	405 (8.3)	43.2 (18.4)	284 (70.1)	3.21 (1.39 to 5.03)	0.20 (0.09 to 0.31)	0.001*
Jerks/myoclonus	223 (4.5)	39.8 (18.7)	142 (63.7)	1.03 (–1.19 to 3.25)	0.06 (–0.07 to 0.20)	0.363
Parkinsonism†	83 (1.7)	44.6 (12.9)	43 (51.8)	–	–	–
Facial symptoms†	67 (1.4)	37.3 (12.6)	56 (83.6)	–	–	–
Other/unknown	479 (9.8)	40.3 (15.8)	333 (69.5)	–1.11 (–3.19 to 0.98)	–0.07 (–0.20 to 0.06)	0.298
Total sample	4905 (100.0)	39.7 (16.1)				

Coefficients are to be interpreted in terms of age at onset in years; and standardised coefficients are interpreted in SD. Positive coefficient means that the variable was associated with a later age of onset and negative coefficient with an earlier age of onset.

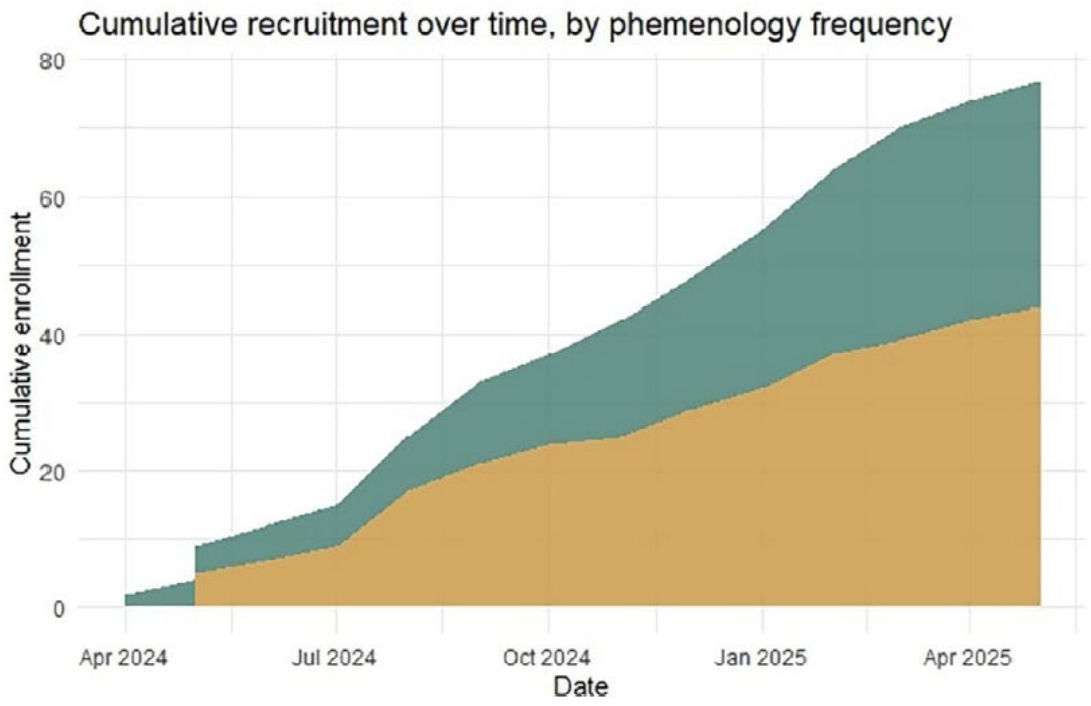
*Statistically significant at the $p<0.05$ level.

†Not inputted into linear regression model.

From Disability to Diagnosis: Baseline Findings from the Calgary Functional Movement Disorder Registry

Andrea Soumbasis, MD, BSc,[1,2] Brian Steele, MSc,[3] Megan Howlett, MD,[1,4] Kate Kain, RN, BN,[5] Davide Martino, MD, PhD,[1,2] Kimberly G. Williams, MD, MSc,[1,2,4] and Gabriela S. Gilmour, MD[1,2,]*

MOVEMENT DISORDERS CLINICAL PRACTICE 2026



1 yr: 77 patients
58% female
Median age: 43 yrs
Median diagnostic delay: 12 mo

Phemenology frequency
Constant
Episodic **(57%)**

Motor phenotype changes in 40% of patients

Not associated with duration between appointments (p = 0.58)

Supplemental Table 1. Functional movement disorder phenotypic change between assessments

Phenotype	Change			No change
	Any change	Gained	Lost	
All phenotypes (n = 139)	58 (42%)	33 (24%)	45 (32%)	81 (58%)
Movement phenotype				
Appendicular jerks	19 (33%)	9 (16%)	10 (17%)	39 (67%)
Gait	18 (26%)	6 (9%)	12 (17%)	52 (74%)
Weakness	13 (35%)	2 (5%)	11 (30%)	24 (65%)
Tremor	10 (17%)	4 (7%)	6 (10%)	50 (83%)
Facial	7 (29%)	5 (21%)	2 (8%)	17 (71%)
Fixed dystonia	4 (36%)	1 (9%)	3 (27%)	7 (64%)
Parkinsonism	3 (43%)	0	3 (43%)	4 (57%)
Tics	2 (40%)	1 (20%)	1 (20%)	3 (60%)
Axial jerks	1 (8%)	1 (8%)	0	11 (92%)
Episodic/constant symptoms				
Episodic	21 (21%)	11 (11%)	10 (10%)	78 (79%)
Constant	17 (28%)	4 (7%)	13 (21%)	44 (72%)

Gilmour et al. 2023

Historical Clues Suggesting a Functional Movement Disorder

- Abrupt onset
- Minor trauma (litigation, compensation)
- Static course
- Purely paroxysmal (caution) or paroxysmal worsening
- Spontaneous remissions/cures
- Multiple somatizations/undiagnosed conditions
- Other psychiatric illness
- Clear secondary gain
- Employed in allied health profession


Courtesy A. Espay




Courtesy A. Schrag

Familial Psychogenic Movement Disorders

Maria Stamelou, MD, PhD,[1,2,3§*] Giovanni Cossu, MD,[4§*]
Mark J. Edwards, MD,[1] Daniela Murgia, MD,[4]
Isabel Pareés, MD,[1] Maurizio Melis, MD[3] and
Kailash P. Bhatia, MD, FRCPn[1*]

Mov Disord 2013

- **10 cases in 5 families**
- **Phenomenology similar in members of the same family**

- 10% of pts with FND have FHx of FND → +ve FHx:
  - Does not necessarily imply an "organic" disorder
  - ? A risk factor – a model; underlying psychopatholgy

? Genetic / epigenetic factors:

- e.g., COMT polymorphisms, endocannabinoid system (FAAH – CRF release with stress); FK506 Binding Protein 5 (glucocorticoid response to stress)

Clinical Clues Suggesting a Functional Movement Disorder

- Movement **Incongruous** with organic disorders
  - Mixed (often bizarre) movement disorders
  - Paroxysmal attacks (incl. pseudoseizures)
  - Precipitated paroxysms (often suggestible/ startle)
- Movement **Inconsistent**
  - Over time - variability
  - Selective disabilities
  - Distraction - Reduces or Resolves
  - Attention - Increases
  - Complex repetitive motor task - Entrains

Journal of Neurology (2026) 273:256
https://doi.org/10.1007/s00415-026-13795-0

REVIEW

Systematic review of movement disorders mislabeled as functional: when incongruence misleads

Daniel S. Marín-Medina[1,2] · Joselyn Miño Zambrano[2] · Alberto J. Espay[3] · Marcelo Merello[2,4,5]

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Abstract

Background Misdiagnosis of functional movement disorders (FMD) remains a concern for clinicians. We sought to review the phenomenology and clinical features associated with FMD misdiagnosis.

Methods We conducted a systematic review of case reports, case series, and observational studies of adults diagnosed with FMD and subsequently reclassified as having another neurological or medical condition. PubMed was searched from inception to September 13, 2025, focusing on reported features of inconsistency, incongruence with known diseases, and low-validity features. Isolated (iMD) and mixed (mMD) movement disorders were analyzed separately.

Results Forty-two included studies comprised 150 patients, of which 73 cases underwent detailed analysis. Gait disturbance (35%) and dystonia (27.5%) were the most common iMD phenomenologies (n = 40), while jerks and rigidity (24%) were the most common mMD phenomenology (n = 33). Incongruence with known diseases (50.7%), psychological factors (34.2%), and symptom variability (31.5%) were the main factors associated with misdiagnosis. Application of incongruence alone was associated with the highest rate of FMD misdiagnosis, similar to that of applying neither incongruence nor inconsistency (49% in both cases). Conversely, reliance on inconsistency alone was least associated with an FMD misdiagnosis (13.7%). Misdiagnoses of iMD were more likely in the absence of documented inconsistency (OR 3.94, 95% CI 1.32—12.82).

Conclusions FMD misdiagnoses, particularly of gait disorders and dystonia, were most commonly associated with the application of incongruence as diagnostic criterion. The lowest rate of FMD misdiagnosis was associated with ascertaining at least two positive neurological signs of inconsistency.

Neuromythology

Incongruence in FND: time for retirement

Jon Stone

Pract Neurol 2024;0:1–3.

Most reliable diagnosis

- Positive demonstration of multiple internally inconsistent features distinctive to FMD
- Less reliance on incongruence with known disease with low validity features:
  - Psychiatric Hx
  - Psychological factors
  - Normal Neuro exam
  - Normal ancillary tests

Variability
Inconsistency
Distractibility
Incongruency

Functional tremor

Co-contraction

Entrainment

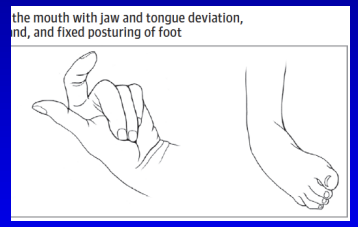
Contralateral ballistic movement

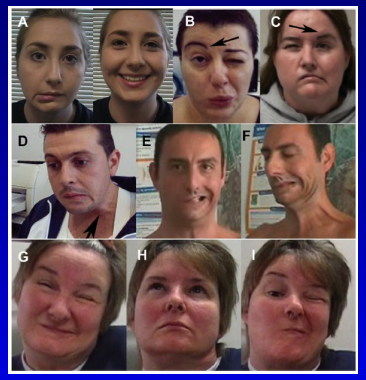
"Whack-a-mole"

Coherence

Functional dystonia

Resistance to passive ROM



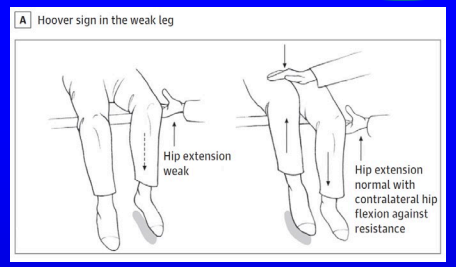


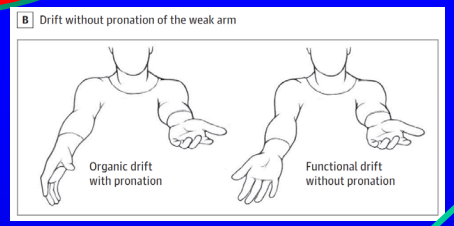
Functional weakness

Hip abductor sign

Hoover's sign

Collapsing weakness





Functional gait disorder

Astasia-abasia

Uneconomical gait

Knee buckling

Walking on ice

Tight-rope

Leg dragging

Excessive slowness

Functional jerks

Entrainment

Axial/facial distribution

Functional tics

Self-injury

Adult onset

Wide repertoire, lack of stereotype

Lack of urge*

Not suppressible

Functional "parkinsonism"

Slowness without decrement

Paratonia

Preserved speed

Automatic tasks

Espay et al. 2018; Fasano et al. 2012; Gilmour, Lidstone, Lang, 2022

Movement Disorders
CLINICAL PRACTICE

BRIEF REPORT

MOVEMENT DISORDERS CLINICAL PRACTICE 2024; 11(2): 166–170.

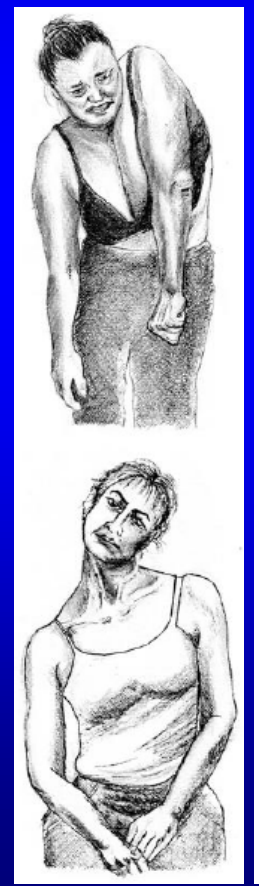
Arm Swing while Walking and Running: A New Clinical Feature to Separate Parkinson's Disease from Functional Parkinsonism

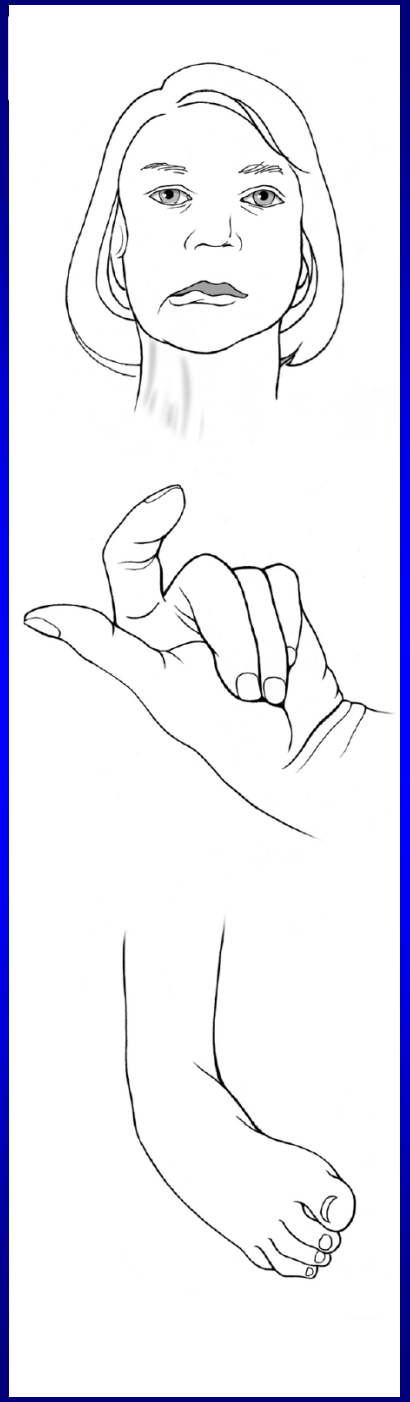
Conor Fearon, MB, PhD,[1] Suvorit S. Bhowmick, MD,[1] Anouk Tosserams, MD,[2] Daniel G. Di Luca, MD,[1] Jane Liao, MD,[1] Jorik Nonnekes, MD, PhD,[3,4] Bastiaan R. Bloem, MD, PhD,[2] and Anthony E. Lang, MD, FRCPC[1,*]



Clinical Clues Suggesting a Functional Movement Disorder

- Phenotypes suggestive of FMD (examples)
  - Fixed posture (particularly if abrupt onset, painful, and early contractures are seen)
  - Selected patterns of tremor (incl palatal tremor)
  - Stuttering speech
  - Bizarre gait (various subtypes; energy, balance)
  - Pulling of mouth to side / down
  - Propriospinal myoclonus; cross body arm jerks
  - Essential / Isolated palatal tremor
- Suggestive therapeutic responses:
  - Unresponsive to appropriate medications
  - Response to placebos
  - Remission with psychotherapy





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Photobiomodulation Therapy for Symptom Management in Essential Palatal Myoclonus: Two Case Studies with Long-Term Follow-Up Two Cases: 7-Year/2-Month Follow-Up

Cases:

The two cases were managed by different clinicians in separate clinical settings under standardized protocol guidance from the primary author, allowing assessment of inter-operator reproducibility. Two patients with essential PM were treated using near-infrared diode laser PBMT. Case 1: A 26-year-old female presented with persistent PM (2.5 Hz) accompanied by dysphagia, audible clicking, and sleep disturbance. Pharmacotherapy (clonazepam and gabapentin) was discontinued due to intolerance. PBMT using a 940 nm diode laser (8.7 J/cm^2) was applied over 20 sessions. Case 2: A 28-year-old male developed PM-like symptoms (3 Hz) following third molar extraction, associated with clicking, migraine, and myofascial pain. Neurological investigations were inconclusive. PBMT with a 980 nm diode laser (13.3 J/cm^2) was administered over 2-month period.

Results:

In Case 1, contraction frequency decreased from 2.5 Hz to 0.11 Hz after treatment and remained stable between 0.12–0.36 Hz over a 7-year follow-up, with marked improvement in swallowing and sleep quality. In Case 2, contraction frequency decreased from 3 Hz to 0.3 Hz within 60 days, accompanied by functional and symptomatic improvement.

Conclusion:

Near-infrared PBMT produced a substantial and sustained reduction in PM activity without adverse effects. Comparable outcomes using 940 nm and 980 nm wavelengths suggest a neuromodulatory rather than purely tissue-heating mechanism.

Functional Tic-Like Behaviors vs Tic Disorders

Clinical Characteristics

- Mass sociogenic illness - influences of:
  - social media and influencers (Tik-Tok tics); COVID 19 pandemic and vaccinations

	Patients with FTLB	Patients with TD
Sex	Predominantly female (Germany – males 2^0 to YT influencer)	Predominantly male
Age	Older than 12 years at symptom onset	Younger than 12 years at symptom onset
Family history of tics	Not commonly	Commonly
Comorbidities	Typically anxiety and depression	Typically ADHD and OCD
Symptom onset	Rapid progression	Gradual progression
Phenomenology	Predominantly complex movements and vocalizations with lack of rostrocaudal distribution	Predominantly simple tics with rostrocaudal distribution
Presence of socially inappropriate and harmful behaviors	Frequent presence of harmful behaviors including socially inappropriate words and gestures (coprophenomena), self-harming behavior, or behavior that harms others	Rare occurrence of harmful tic behaviors

Functional Movement Disorders
Other Clinical Clues

- Suggestibility
- Effortful production or deliberate slowness (without fatiguing) of movement
- Delayed and excessive startle response to a stimulus
- Burst of verbal gibberish or stuttering speech
- False (give away) weakness
- Non-anatomical sensory loss or spread of movement
- Atypical pain / tenderness
- Functional disability out of proportion to examination findings
- Self-inflicted injury (caution: tic disorders)
- (Recurrent Headache: 78% of FMD patients; Riva et al, 2025)

What other criteria distinguishes conversion from physical disorders?

Valid	Not Valid
Prior conversion	Emotional stressor
Recurrent somatic complaints	Symbolism
Model for symptoms	La belle indifference*
Prior remission with conflict resolution	Overdramatization
	Secondary gain
	Improved by suggestion
	Improved by sedation

* Stone et al, 2006: **21%** of 356 conversion vs **29%** of 159 organic

(Cloninger, 2001)

Functional Movement Disorders in **Children**

- Age of onset: ~ 12 yrs
- Features similar to adults:
  - Phenotypes, onset, gender, etiology, disability, outcomes (especially related to time from onset to Dx)
- ? Dissimilar to adults (variable dependent on series):
  - Female > > male (not < 13 yrs)
  - Dominant limbs more often than in adults
  - Involvement in competitive sports
- 23% of acute MDs in children (tremor and myoclonus dominate)
- ? More common in children with intellectual disability than N IQ

Functional Movement Disorders Are Not Uncommon in the Elderly

Amit Batla, MD DM (Neuro),[1] Maria Stamelou, MD, PhD,[1]
Mark J. Edwards, MD,[1] Isabel Pareés, MD,[1]
Tabish A. Saifee, MRCP,[1] Zoe Fox, PhD[2] and
Kailash P. Bhatia, MD FRCP[1]*

Mov Disord 2013

TABLE 1. Summary of Clinical Characteristics in the Two Groups Divided by Age of Onset After Age 60 Years and Earlier

	Age of onset		
Clinical characteristics	<60 Years, N=118	≥60 Years, N=33	*P* value
Age: Mean [range], y	35.5 [10–58]	63.5 [60–84]	0.009
No. of Women (%)	89 (75.4)	24 (72.7)	
Time to diagnosis, y	3.55	5.13	0.044
Precipitating factors: No. (%)			
Trauma	25 (21.2)	9 (27.3)	0.71
Surgery	6 (5.1)	3 (9.1)	
Infection	8 (6.8)	1 (3.0)	
Emotional/life events	17 (14.4)	3 (9.1)	
None	62 (52.5)	17 (51.5)	
Type: No. (%)			
Tremor	46 (38.9)	11 (33.3)	0.54
Dystonia	40 (33.9)	9 (27.3)	
Myoclonus	13 (11.0)	4 (12.1)	
Gait ataxia	3 (2.5)	3 (9.1)	
Blepharospasm	3 (2.5)	2 (6.1)	
Mixed movements	9 (7.6)	3 (9.1)	
Facial spasm	1 (0.9)	1 (3.0)	
Paroxysmal dyskinesia	3 (2.5)	0 (0.0)	
Functional gait abnormality: No. (%)	27 (23.5)	23 (69.7)	< .0001
Psychogenic nonepileptic seizures: No. (%)	15 (13.0)	6 (18.2)	0.06
Psychiatric comorbidity: No. (%)	66 (55.9)	22 (66.7)	0.07

- 21% of cases
- Tremor: = Young
- No fixed dystonia
- Gait: > Young
- Non-Epileptic Sz: > Y

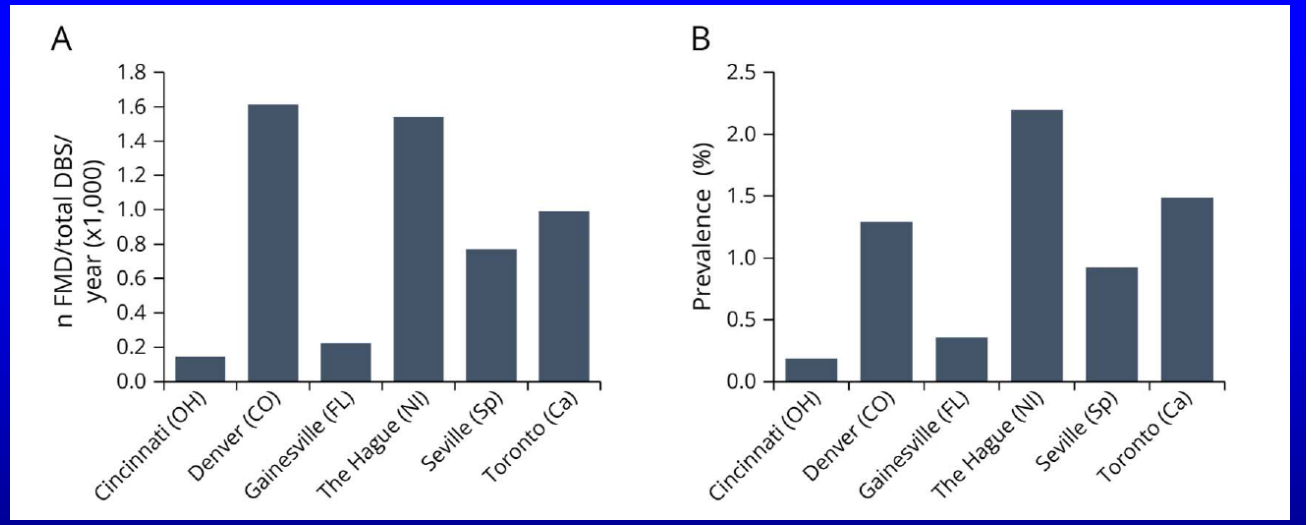
Functional Movement Disorders and Deep Brain Stimulation

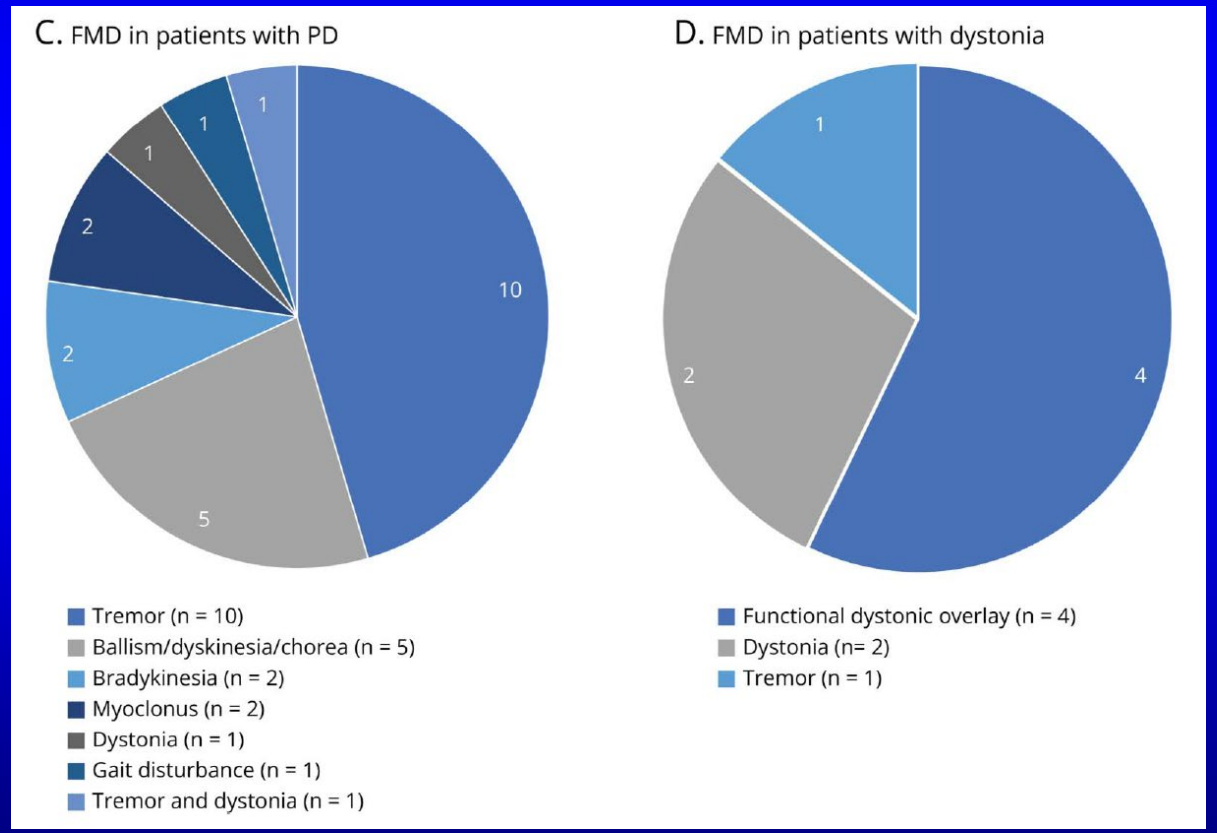
A Review

Alexandra Boogers, MD, PhD, and Alfonso Fasano, MD, PhD, FAAN

Neurology: Clinical Practice 2025;15:e200367. doi:10.1212/CPJ.0000000000200367

Heterogeneity in Prevalence and Phenomenology of FMD After DBS Surgery Across 6 DBS Centers





Data modified from Marsili et al., 2023

Clinical Diagnosis

Diagnosis

- NOT one of exclusion - Requires ***positive features*** and considerable *expertise* in MD phenomenology; *laboratory* may be helpful but can also mislead – advances needed
- NOT made in the presence of concomitant psychopathology without unequivocal clinical support
- NOT refuted in the absence of overt psychological disturbances when unequivocal positive clinical evidence is present

Movement Disorders, Vol. 27, No. 4, 2012

Diagnostic Agreement in Patients with Psychogenic Movement Disorders

Francesca Morgante, PhD,[1] Mark J. Edwards, PhD,[2]
Alberto J. Espay, PhD,[3] Alfonso Fasano, PhD,[4]
Pablo Mir, PhD,[5,6] and Davide Martino, PhD,[7,8*]
on behalf of the DISMOV-SIN study group on psychogenic movement disorders[8†]

FW = Fahn-Williams
SG = Shill-Gerber

Table 2. Level of Agreement Based on FW and SG Categories of Clinical Certainty

Dichotomous Judgment	MDS Experts κ (SE, 95% CI)	Non-MDS Experts κ (SE, 95% CI)
Video	0.40 (0.06, 0.34–0.46)	0.34 (0.08, 0.27–0.42)
Video+historical details	0.81 (0.04, 0.78–0.85)	0.74 (0.03, 0.71–0.7)
Degree of Clinical Certainty	**MDS Experts κ (SE, 95% CI)**	**Non-MDS Experts κ (SE, 95% CI)**
FW criteria		
Weighted	0.57 (0.021, 0.543–0.597)	0.57 (0.033, 0.537–0.603)
Not psychogenic	0.73 (0.036, 0.699–0.77)	0.72 (0.048, 0.672–0.768)
Possibly psychogenic	0.04 (0.036, 0.004–0.071)	0.07 (0.051, 0.019–0.121)
Probably psychogenic	0.22 (0.036, 0.186–0.258)	0.26 (0.048, 0.217–0.313)
Definitely psychogenic	0.59 (0.036, 0.556–0.628)	0.69 (0.048, 0.642–0.738)
Panel unanimous	0.67 (0.05, 0.62–0.73)	0.98 (0.01, 0.97–0.99)
Panel not unanimous	0.53 (0.04, 0.49–0.58)	0.48 (0.02, 0.46–0.50)
SG criteria		
Weighted	0.53 (0.023, 0.508–0.554)	0.43 (0.031, 0.399–0.461)
Not psychogenic	0.83 (0.032, 0.79–0.862)	0.74 (0.048, 0.692–0.788)
Possibly psychogenic	0.14 (0.032, 0.101–0.173)	0.22 (0.048, 0.172–0.268)
Probably psychogenic	0.1 (0.032, 0.066–0.138)	0.12 (0.048, 0.072–0.168)
Definitely psychogenic	0.56 (0.032, 0.522–0.594)	0.31 (0.048, 0.262–0.358)
Panel unanimous	0.74 (0.05, 0.69–0.79)	0.51 (0.04, 0.47–0.55)
Panel not unanimous	0.43 (0.043, 0.382–0.476)	0.12 (0.05, 0.07–0.17)

Laboratory-Supported Diagnosis

Proposed Revision of Classification of Degrees of Certainty in Diagnosis

Gupta & Lang, 2009

1. **Documented** (as in original Fahn & Williams)

2a. **Clinically established *plus* Other features** (as in original)

2b. **Clinically established *minus* Other features**

- Unequivocal clinical features incompatible with organic disease with no features suggesting another underlying neurological or psychiatric problem

1 + 2a + 2b = **Clinically Definite**

3. **Laboratory Supported Definite**

- Electrophysiological evidence proving a psychogenic movement disorder (primarily in cases of psychogenic tremor and psychogenic myoclonus)

4. **Possible**

- movement disorder demonstrates clinical features (or electrophysiology) that are strongly suggestive but not diagnostic of a psychogenic cause

Potential other categories:

- FMD (as above) + Organic MD (consistent/congruent)
- Organic MD (consistent/congruent) + “Functional / Psychogenic features” (false neurological signs, multiple somatizations, apparent embellishment/exaggeration of MD)

Proposed Revision of Classification of Degrees of Certainty in Diagnosis

Gupta & Lang, 2009

1. **Documented** (as in original Fahn & Williams)

2a. Clinically established w/o Other Explanation After Investigation

2b. Clinically established w/ Other Features

– Unequivocal clinical features incompatible with organic disease with no features suggesting another underlying neurological or psychiatric problem

1 + 2a + 2b = Clinically Definite

3. **Laboratory Supported Definite**

– Electrophysiological evidence proving a psychogenic movement disorder (primarily in cases of psychogenic tremor and psychogenic myoclonus)

4. Possible

Potential other categories:

– FMD (as above) + Organic MD (consistent/congruent)

– Organic MD (consistent/congruent) + "Functional / Psychogenic features" (false neurological signs, multiple somatizations, apparent embellishment/exaggeration of MD)

Laboratory Evaluation of F/PMDs

	Peripheral Electro-physiology	Central Electro-physiology	Imaging	Comments

– Not useful; + Possibly useful; ++ ? Diagnostic; +++ Diagnostic
All testing must be interpreted cautiously and in context of clinical features

Laboratory Evaluation of F/PMDs

	Peripheral Electro-physiology	Central Electro-physiology	Imaging	Comments
Tremor	+++	+	+	Combinations needed; Routine Dx

– Not useful; + Possibly useful; ++ ? Diagnostic; +++ Diagnostic
All testing must be interpreted cautiously and in context of clinical features

Movement Disorders, Vol. 26, No. 14, 2011

Moving Toward "Laboratory-Supported" Criteria for Psychogenic Tremor

Petra Schwingenschuh, MD,[1,2] Petra Katschnig, MD,[1,2] Stephan Seiler, MD,[2] Tabish A. Saifee, MBBS,[1] Maria Aguirregomozcorta, MD,[1] Carla Cordivari, MD,[3] Reinhold Schmidt, MD,[2] John C. Rothwell, PhD,[1] Kailash P. Bhatia, MD,[1] and Mark J. Edwards, PhD[1]*

TABLE 4. Results of the Test Battery in 13 Patients With Psychogenic Tremor

	Incorrect Tapping	Response to Tapping	Response to Ballistic Movements	Tonic Coactivation	Coherence	Response to Loading	Total Score (Maximum 10)
P1	2	3	NA	0	0	0	5
P2	0	3	1	0	0	0	4
P3	1	1	1	0	1	0	4
P4							
P5							
P6							
P7							
P8	2	0	1	0	0	0	3
P9	2	2	0	NA	0	0	4
P10	1	0	0	1	1	1	4
P11	0	1	0	1	1	1	4
P12	0	0	1	1	NA	1	3
P13	0	1	1	1	NA	0	3

No single test with adequate sensitivity (33-77%) or specificity (84-100%)
However: Combination of tests → Excellent sensitivity and specificity

RESEARCH ARTICLE

Movement Disorders, Vol. 31, No. 4, 2016

Validation of "Laboratory-Supported" Criteria for Functional (Psychogenic) Tremor

Petra Schwingenschuh, MD,[1,2*] Tabish A. Saifee, MRCP,[3] Petra Katschnig-Winter, MD, MSc,[1] Antonella Macerollo, MD,[3] Mariella Koegl-Wallner, MD,[1] Valeriu Culea, MD,[1] Christine Ghadery, MD, PhD,[1] Edith Hofer, PhD,[1,4] Tamara Pendl, MD,[1] Stephan Seiler, MD,[1] Ulrike Werner, PhD,[1] Sebastian Franthal, MD,[1] Natasha M. Maurits, PhD,[5] Marina A. Tijssen, MD, PhD,[5] Reinhold Schmidt, MD,[1] John C. Rothwell, PhD,[3] Kailash P. Bhatia, MD, FRCP,[3] and Mark J. Edwards, FRCP, PhD[3,6]

ABSTRACT: Background: In a small group of patients, we have previously shown that a combination of electrophysiological tests was able to distinguish functional (psychogenic) tremor and organic tremor with excellent sensitivity and specificity.

Objectives: This study aims to validate an electrophysiological test battery as a tool to diagnose patients with functional tremor with a "laboratory-supported" level of certainty.

Methods: For this prospective data collection study, we recruited 38 new patients with functional tremor (mean age 37.9 ± 24.5 years; mean disease duration 5.9 ± 9.0 years) and 73 new patients with organic tremor (mean age 55.4 ± 25.4 years; mean disease duration 15.8 ± 17.7 years). Tremor was recorded at rest, posture (with and without loading), action, while performing tapping tasks (1, 3, and 5 Hz), and while performing ballistic movements with the less-affected hand. Electrophysiological tests were performed by raters blinded to the clinical diagnosis. We calculated a sum score for all performed tests (maximum of 10 points) and used a previously suggested cut-off score of 3 points for a diagnosis of laboratory-supported functional tremor.

Results: We demonstrated good interrater reliability and test-retest reliability. Patients with functional tremor had a higher average score on the test battery when compared with patients with organic tremor (3.6 ± 1.4 points vs 1.0 ± 0.8 points; $P < .001$), and the predefined cut-off score for laboratory-supported functional tremor yielded a test sensitivity of 89.5% and a specificity of 95.9%.

Conclusion: We now propose this test battery as the basis of laboratory-supported criteria for the diagnosis of functional tremor, and we encourage its use in clinical and research practice. © 2016 International Parkinson and Movement Disorder Society

Key Words: Psychogenic; functional; diagnostic criteria; electrophysiological criteria

RESEARCH ARTICLE

Movement Disorders, Vol. 31, No. 4, 2016

Validation of "Laboratory-Supported" Criteria for Functional (Psychogenic) Tremor

Petra Schwingenschuh, MD,[1,2*] Tabish A. Saifee, MRCP,[3] Petra Katschnig-Winter, MD, MSc,[1] Antonella Macerollo, MD,[3] Mariella Koegl-Wallner, MD,[1] Valeriu Culea, MD,[1] Christine Ghadery, MD, PhD,[1] Edith Hofer, PhD,[1,4] Tamara Pendl, MD,[1] Stephan Seiler, MD,[1] Ulrike Werner, PhD,[1] Sebastian Franthal, MD,[1] Natasha M. Maurits, PhD,[5] Marina A. Tijssen, MD, PhD,[5] Reinhold Schmidt, MD,[1] John C. Rothwell, PhD,[3] Kailash P. Bhatia, MD, FRCP,[3] and Mark J. Edwards, FRCP, PhD[3,6]

ABSTRACT

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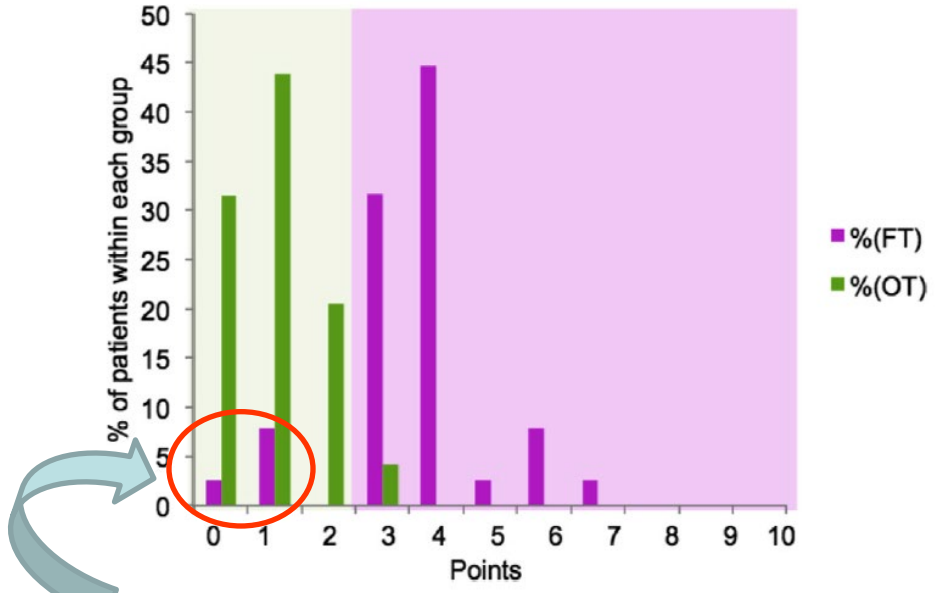
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Duration of symptoms / Score: < 10 yr: 4.1 ± 1.1; ≥ 10 yr: 2.9 ± 1.5



4 patients: 2 probable, 2 clinically established
3 (of the 5) lost to F/U
Duration of Sx: 10, 16, 23 and 38 yrs

Electrophysiology in Distinguishing Functional Tremor from Organic Tremor: A Systematic Review and Meta-Analysis of Diagnostic Accuracy

MOVEMENT DISORDERS CLINICAL PRACTICE 2026.

Surachet Rujirussawarawong, MD,[1,] Chawarat Ounmuang, MD,[1,2] Saharat Aungsumart, MD, PhD,[1] Chayut Kasemsuk, MD,[1] and Natlada Limotai, MD[1]*

TABLE 3 *Summary of pooled diagnostic accuracy of electrophysiological tests for functional tremor*

Tests[a]	Number of studies (number of test arms)	Total patients, N (FT/OT)[b]	Pooled sensitivity (95% CI)	Pooled specificity (95% CI)	Organic tremor diagnoses in comparator groups across studies
Frequency dissociation	1 (1)	2/19	1.00 (0.16–1.00)	0.68 (0.43–0.87)	PD, ET
Frequency peak width	1 (1)	19/40	0.95 (0.74–1.00)	0.85 (0.70–0.94)	PD, ET
Frequency shift by mental task	1 (1)	50/160	0.94 (0.83–0.99)	0.92 (0.87–0.96)	PD, ET, DT, EPT, CT, HT
Frequency peak width by mental task	1 (1)	19/40	1.00 (0.82–1.00)	0.98 (0.87–1.00)	PD, ET
Incorrect tapping	3 (7)	56/119	0.37 (0.27–0.48)	0.92 (0.81–0.99)	PD, ET, DT, NT, KF, FXTAS, MS, SCA12
Tapping response	5 (10)	111/290	0.56 (0.35–0.75)	0.94 (0.91–0.96)	PD, ET, DT, NT, EPT, CT, HT, KF, FXTAS, MS, SCA12
Ballistic movement response	3 (3)	56/110	0.74 (0.43–0.97)	0.96 (0.85–1.00)	PD, ET, DT, NT, KF, FXTAS, MS, SCA12
Tonic coactivation	2 (2)	36/65	0.56 (0.39–0.72)	0.97 (0.91–1.00)	PD, ET, DT, NT, KF, FXTAS, MS, SCA12
Weight loading	4 (4)	116/274	0.34 (0.17–0.54)	0.89 (0.71–0.99)	PD, ET, DT, NT, EPT, CT, HT, KF, FXTAS, MS, SCA12
Coherence analysis	2 (2)	39/75	0.30 (0.16–0.46)	0.94 (0.86–0.98)	PD, ET, DT, NT, KF, FXTAS, MS, SCA12
Coherence entrainment analysis	1 (1)	9/16	1.00 (0.66–1.00)	1.00 (0.79–1.00)	ET, DT
Wavelet coherence analysis	1 (1)	26/72	0.77 (0.56–0.91)	0.86 (0.76–0.93)	PD, ET, EPT
Test battery A	2 (2)	51/98	0.94 (0.84–0.99)	0.98 (0.93–1.00)	PD, ET, DT, NT, KF, FXTAS, MS, SCA12
Test battery B	1 (1)	50/160	1.00 (0.93–1.00)	0.93 (0.88–0.97)	PD, ET, DT, EPT, CT, HT

Abbreviations: CI, confidence interval; CT, cerebellar tremor; DT, dystonic tremor; EPT, enhanced physiologic tremor; ET, essential tremor; FT, functional tremor; FXTAS, fragile X-associated tremor/ataxia syndrome; HT, Holmes tremor; KF, Klinefelter syndrome; MS, multiple sclerosis; NT, neuropathic tremor; OT, organic tremor; PD, Parkinson's disease; SCA12, spinocerebellar ataxia type 12.

[a]See text for detailed descriptions of each electrophysiological test.

[b]The total number of patients was not double counted for electrophysiological tests (ie, incorrect tapping and tapping response) in which multiple test arms were derived from the same study.

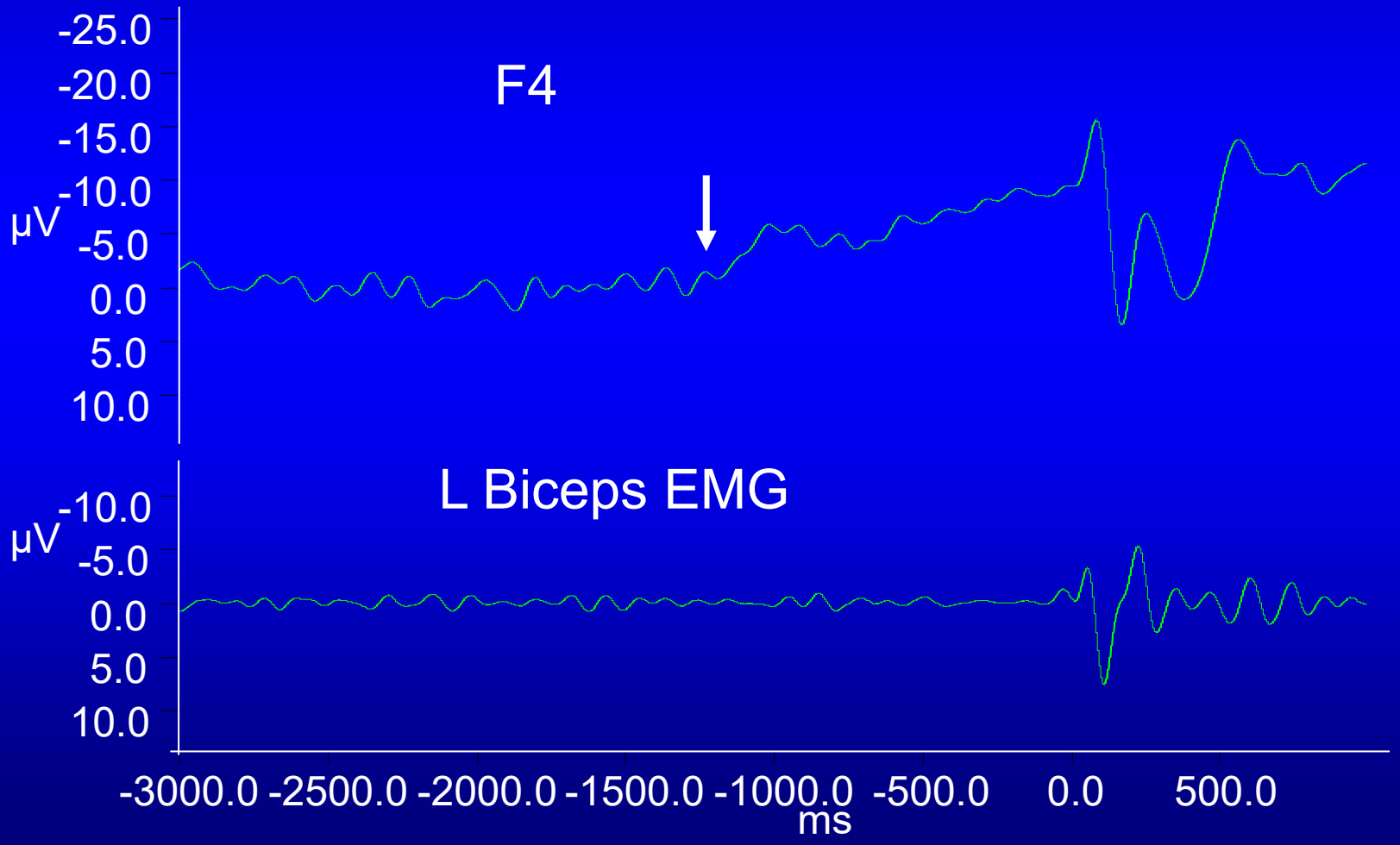
Overall pooled:
Sensitivity = 0.63
(95% CI 0.51-0.75)
Range 30%-100%)
Specificity = 0.93
(95% CI: 0.91-0.95)
Range 68%-100%
Significant heterogeneity for both

Laboratory Evaluation of F/PMDs

	Peripheral Electro-physiology	Central Electro-physiology	Imaging	Comments
Tremor	+++	+	+	Combinations needed; Routine Dx
Myoclonus	+++	+++	–	Combinations Routine Dx

– Not useful; + Possibly useful; ++ ? Diagnostic; +++ Diagnostic
All testing must be interpreted cautiously and in context of clinical features

Psychogenic muscle jerks – cortical premovement potentials



Idiopathic Spinal Myoclonus: A Clinical and Neurophysiological Assessment of a Movement Disorder of Uncertain Origin

Movement Disorders
Vol. 24, No. 16, 2009, pp. 2344–2349
© 2009 Movement Disorder Society

Marcello Esposito, MD,[1] Mark J. Edwards, PhD,[2] Kailash P. Bhatia, MD,[2]
Peter Brown, MD,[2] and Carla Cordivari, MD[1]*

TABLE 2. *BP detection in OM, PM, and NK patients*

Group	Definite BP	Possible BP	Absent BP
OM	4	1	0
PM	1	6	3
NK	1	2	2

OM, organic myoclonus; PM, psychogenic myoclonus; NK, not known.

All patients Dx'd as Organic by both raters:
BP Definite or Possible

Laboratory Evaluation of F/PMDs

	Peripheral Electro-physiology	Central Electro-physiology	Imaging	Comments
Tremor	+++	+	+	Combinations needed; Routine Dx
Myoclonus	+++	+++	–	Combinations Routine Dx
Parkinson-ism	+	–	++	Routine; Caution

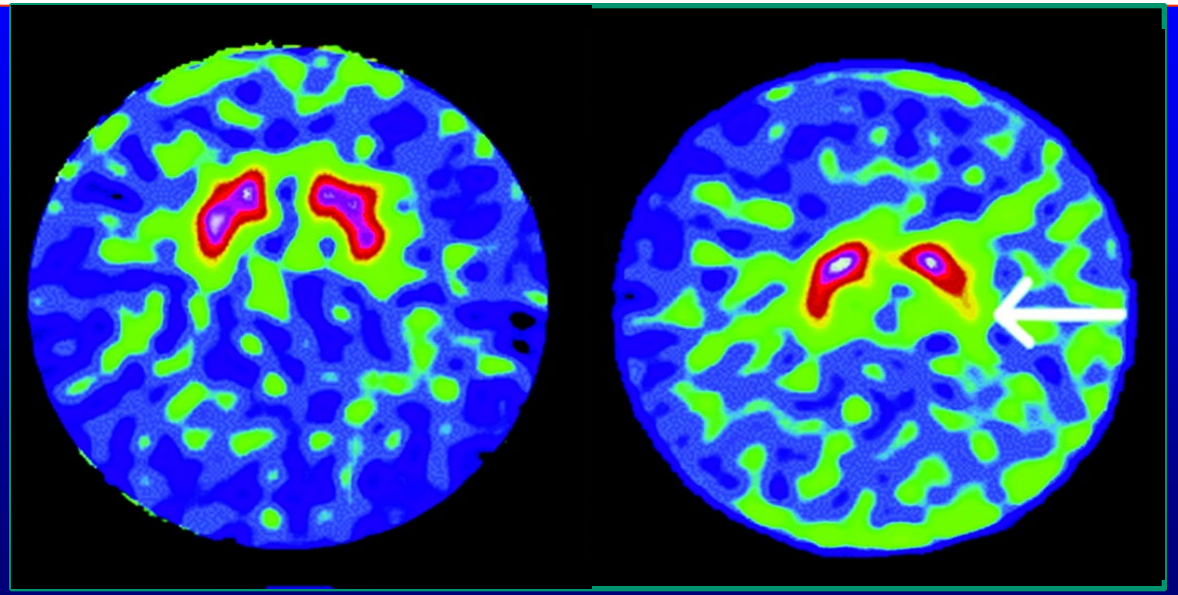
– Not useful; + Possibly useful; ++ ? Diagnostic; +++ Diagnostic
All testing must be interpreted cautiously and in context of clinical features

Movement Disorders
Vol. 21, No. 3, 2006, pp. 310–317
© 2005 Movement Disorder Society

Psychogenic Parkinsonism: A Combination of Clinical, Electrophysiological, and [^{123}I]-FP-CIT SPECT Scan Explorations Improves Diagnostic Accuracy

Sandrine Benaderette, MD,[1,2] Paolo Zanotti Fregonara, MD,[3] Emmanuelle Apartis, MD, PhD,[4,5] Charles Nguyen, MD,[3] Jean-Marc Trocello, MD,[1] Philippe Remy, MD, PhD,[6,7] Jean-Yves Devaux, MD,[3] Serge Askienazy, MD,[3] and Marie Vidailhet, MD[1,8]*

Clinical diagnosis	PP	PP + PD	PP + PD	PP + PD	PP + PD	PP + PD	PP	PP	PP + PD
EMG conclusions	PP	PP	PP + PD	PP	PP + PD	PD	NA	NA	PD
SPECT results	Normal	Abnormal	Abnormal	Normal[f]	Abnormal	Abnormal	Normal	Normal	Abnormal



Cohort study on somatoform disorders in Parkinson disease and dementia with Lewy bodies

Neurology® 2010;74:1598-1606

Marco Onofrj, MD
Laura Bonanni, MD, PhD
Lamberto Manzoli, MD
Astrid Thomas, MD, PhD

Table 2 SFMD phenomenology in PD[a]

	No. of patients		Coincident with diagnosis		In follow-up		Prior to diagnosis	
SFMD symptoms	PD	DLB	PD	DLB	PD	DLB	PD	DLB
Total	29	15	29	15	22	15	29	15
Hypochondriasis, %	90	87	90	87	90	87	90	87
Motor conversion, %								
Paresis	76	60	28	33	48	7	31	40
Abnormal postures	38	47	24	20	21	27	0	7
Globus pharyngis	52	47	0	7	52	47	7	7
Psychogenic parkinsonism	3	0	0	0	0	0	3	0
Catatonic signs	31	53	3	7	31	53	0	13
Sensory conversion, %								
Anesthesia	17	53	10	7	7	27	7	27
Body deformation delusions	45	20	17	7	10	7	42	7
Multilocalized pain with gastrointestinal symptoms	100	73	17	27	69	27	93	53

Movement disorders

RESEARCH PAPER

J Neurol Neurosurg Psychiatry 2018;**89**:566–571.

Functional neurological disorders in Parkinson disease

Benjamin D Wissel,[1] Alok K Dwivedi,[2] Aristide Merola,[1] Danielle Chin,[1] Cara Jacob,[1] Andrew P Duker,[1] Jennifer E Vaughan,[1] Lilia Lovera,[1] Kathrin LaFaver,[3] Ariel Levy,[4,5] Anthony E Lang,[4,5] Francesca Morgante,[6,7] Melissa Jill Nirenberg,[8] Christopher Stephen,[9] Nutan Sharma,[9] Alberto Romagnolo,[10] Leonardo Lopiano,[10] Bettina Balint,[11,12,13] Xin X Yu,[14] Kailash P Bhatia,[11] Alberto J Espay[1]

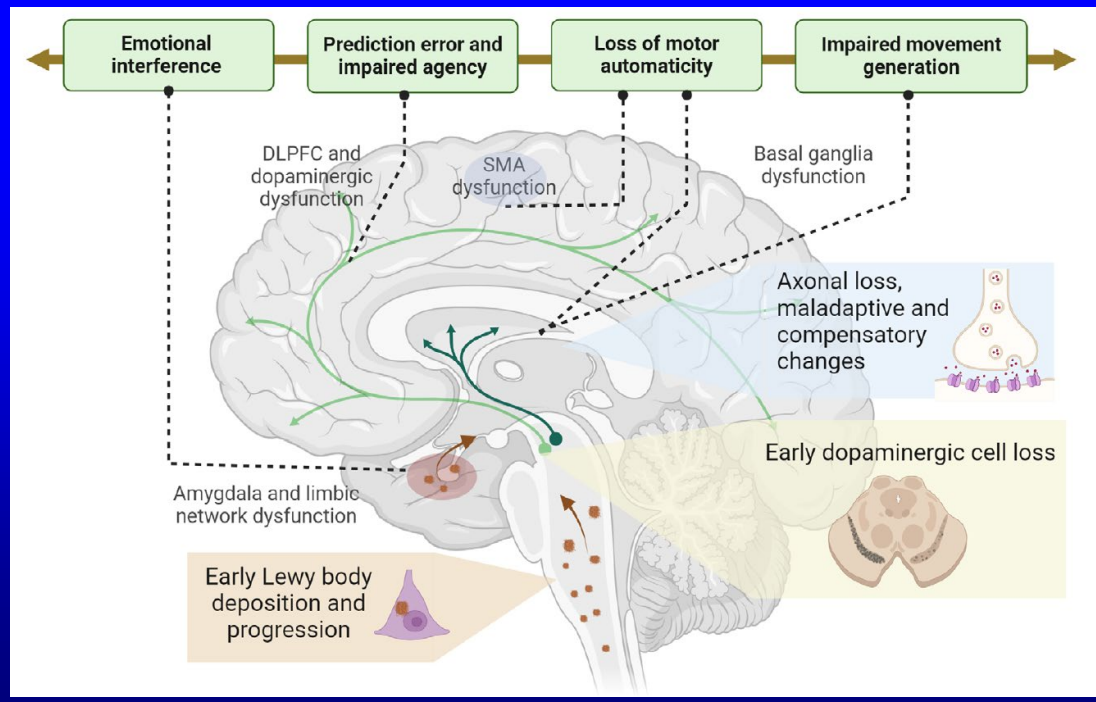
53 patients:
Functional symptoms preceded or co-occurred with PD onset in 34% of cases, nearly always in the most affected body side.

VIEWPOINT

Movement Disorders, Vol. 39, No. 11, 2024

Functional Movement Disorder as a Prodromal Symptom of Parkinson's Disease—Clinical and Pathophysiological Insights

Elie Matar, MD, PhD,[1,2,3*] Michele Tinazzi, MD, PhD,[4] Mark J. Edwards, MD, PhD,[5,6] and Kailash P. Bhatia, MD, DM, FRCP[1*]

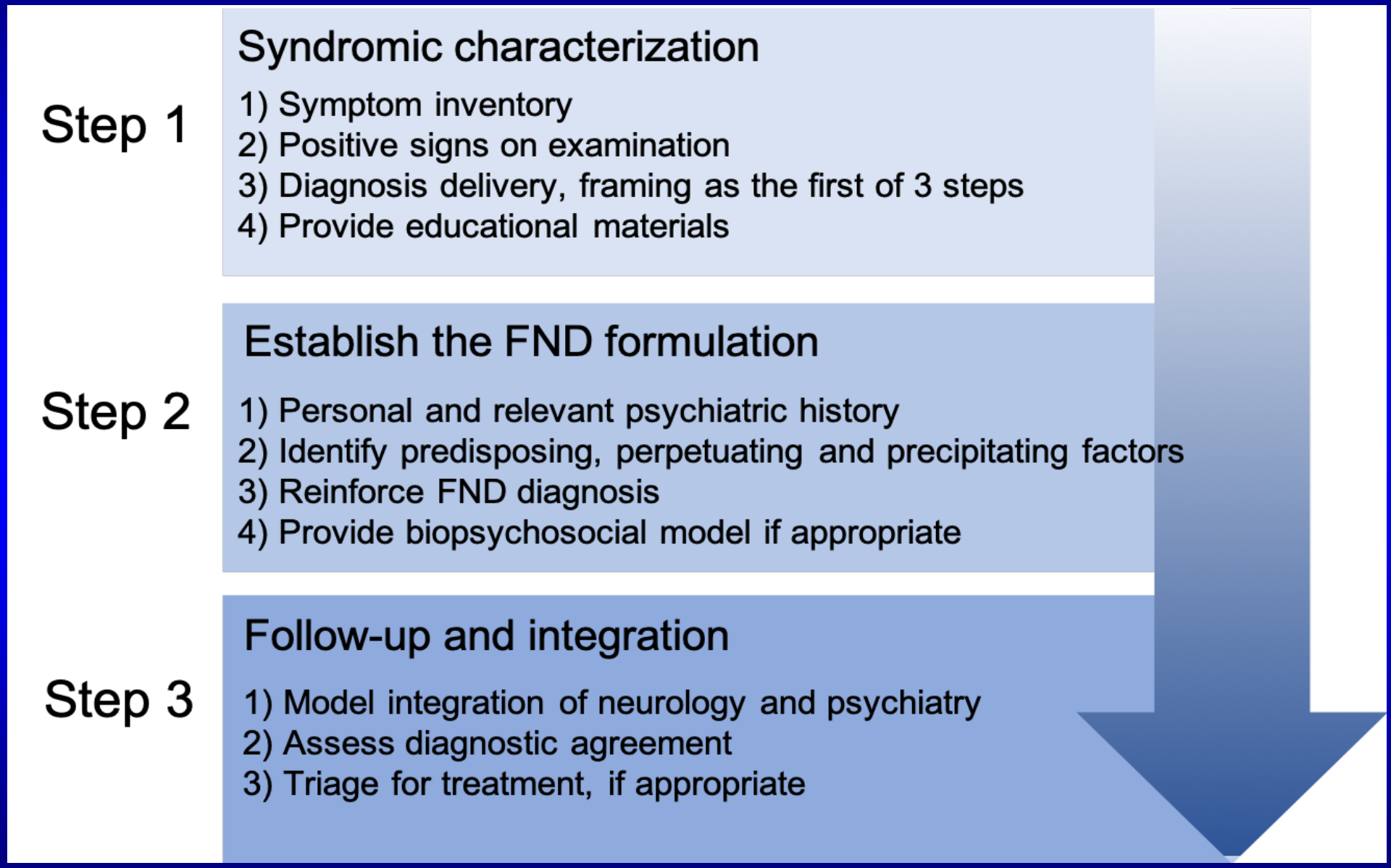


Laboratory Evaluation of F/PMDs

	Peripheral Electro-physiology	Central Electro-physiology	Imaging	Comments
Tremor	+++	+	+	Combinations needed; Routine Dx
Myoclonus	+++	+++	–	Combinations Routine Dx
Parkinson-ism	–	–	++	Routine; Caution
Dystonia	–	? -	+	? Diagnostic utility

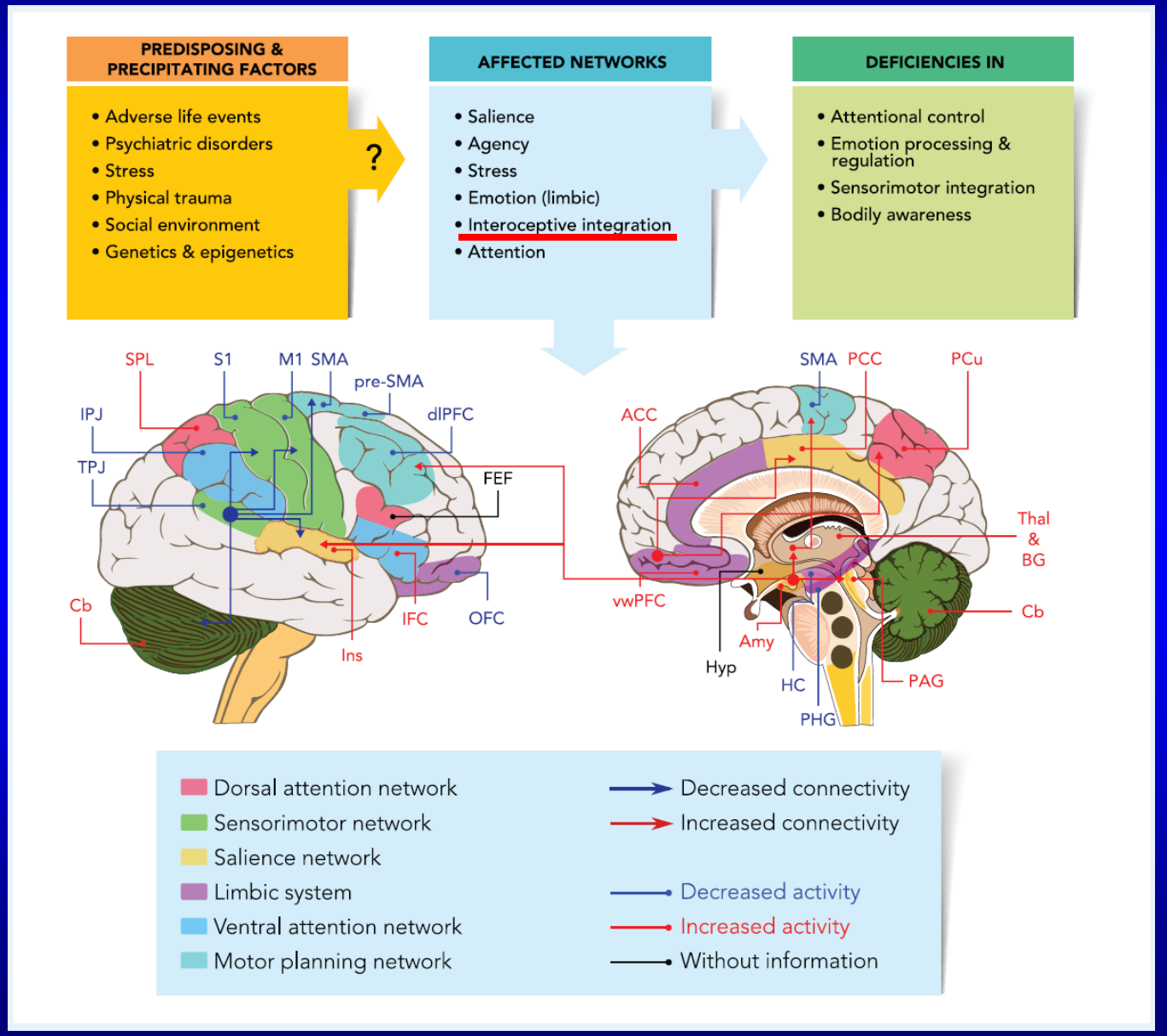
– Not useful; + Possibly useful; ++ ? Diagnostic; +++ Diagnostic
All testing must be interpreted cautiously and in context of clinical features

Diagnostic Triad of FND



Lidstone et al, 2020

FMD Pathogenesis: A Neurobiological Model



Ortega-Robles et al, 2025

Prognosis and Management

Impact of FND/FS

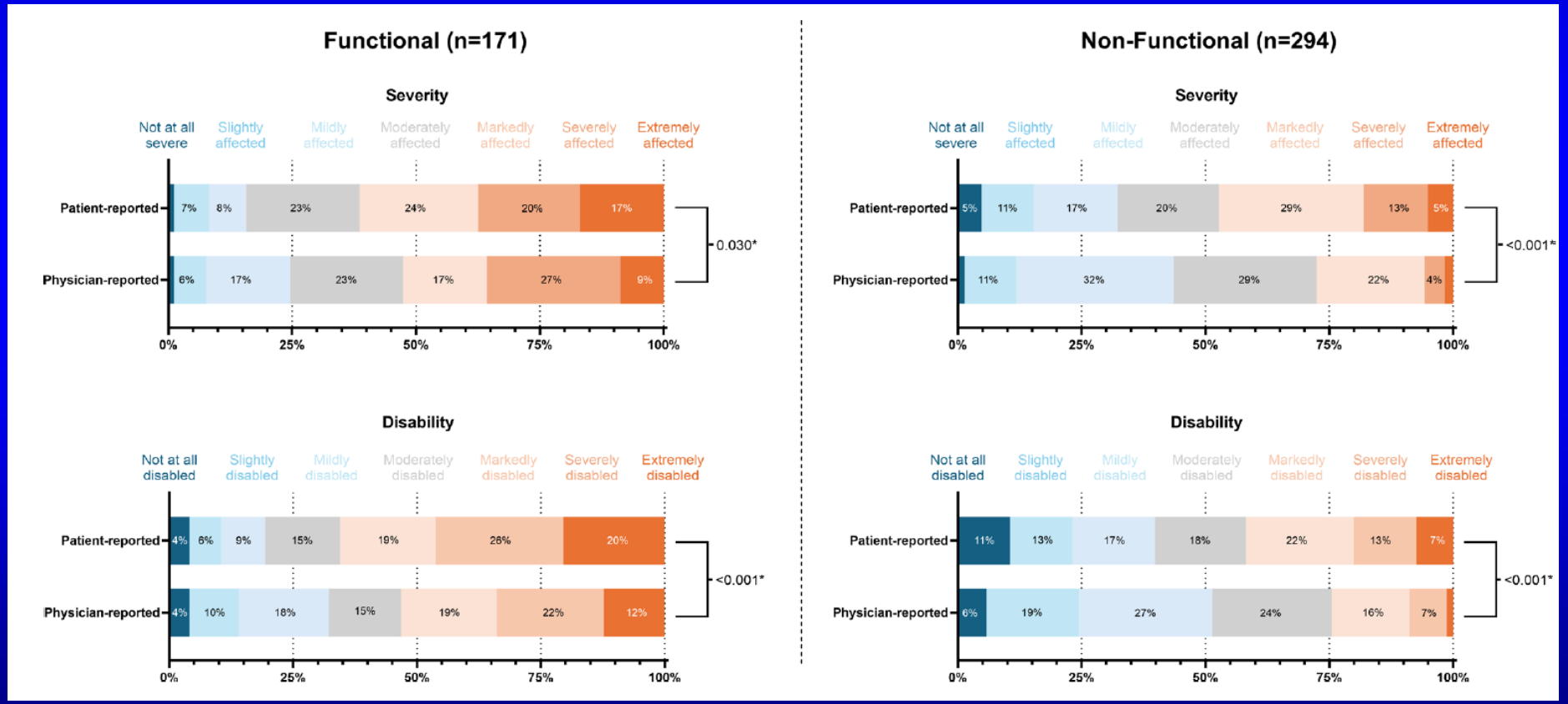
- FND Health Care Utilization (HCU) is costly (eds tests, amb visits, ICU, ED, hosp.) ~ $1.2 bill(adults); $88 mill (peds)
- Lower employment, greater socioeconomic deprivation
- ↓ QOL - same or worse than other neurological disorders
- Stigma worse
- ↑ suicide attempts (152%) w/hospitalization w/comorbid epilepsy (FS)
- Increased risk of injury, death (SMR 2.5 x gen pop)

Courtesy B. Dworetzky

Discrepancies between patient-reported and physician-reported severity and disability in functional and non-functional movement disorders

J Neurol Neurosurg Psychiatry 2026

Olof CB Vermeulen [1], Tjerk J Lagrand [2,3], Jeannette Gelauff [4], Marjolein Brusse-Keizer [5,6], Alexander Lehn [7,8], Marina A J Tijssen [1,2]



https://doi.org/10.1093/brain/awae283 BRAIN 2025: 148; 27–38 | 27

BRAIN
REVIEW ARTICLE

Iatrogenic harm in functional neurological disorder

Caoimhe Mcloughlin, Wei Hao Lee, Alan Carson and Jon Stone

Functional neurological disorder (FND) is continuing to gain increasing recognition globally as a valid and potentially treatable disorder. Iatrogenic harm towards patients with FND is significant, however, and has been around for centuries. Despite advances in our understanding around the aetiology, pathophysiology and treatment of FND, many aspects of such harm continue to persist. Avoidance of iatrogenic harm has been highlighted by clinicians as one of the most important therapeutic considerations in FND; however, the sources and range of potential harms, or indeed ways to mitigate them, have not previously been summarized.

Using a combination of clinical and research experience and scoping review methodology, this review aims to describe the main sources of iatrogenic harm towards patients with FND, including harm from misdiagnosis, delayed diagnosis and treatment, direct harm from professional interactions, other stigma-related harms, harm related to diagnostic overshadowing and over-diagnosis of FND. We also describe some potential ways to address and prevent such harms, such as ways to reduce misdiagnosis with a focus on rule in signs, optimizing teaching and communication, ensuring parity of FND with other medical conditions and continued integration of patient and professional organizations.

Who gets better?

Good prognostic factors:

- Duration of symptoms: < 3 mo
- Sudden onset
- Depression or anxiety
- Change in marital status

Poor prognostic factors:

- Duration of symptoms: > 3 mo - 1 y
- Number of Axis I comorbidities
- Personality disorder
- Comorbid somatoform disorder
- Financial benefits
- Pending litigation

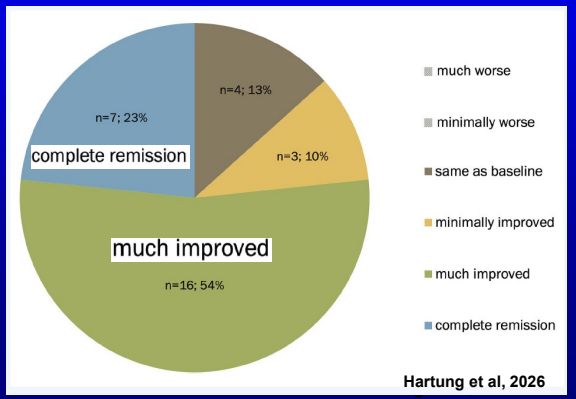
(Mace, 1996; Crimlisk, 1998;
Binzer, 1998; Feinstein, 2001)

Functional Neurological Disorders
Outcome

Greatly depends on underlying psychopathology

- Somatoform disorders
  - Can respond to treatment - relapses
- Factitious Disorders/Malingering
  - Respond poorly
- Litigation / Compensation
  - Often hamper recovery

- Functional tic-like movements: →
  - Generally good prognosis



Approach to Delivering the Diagnosis

1. Emphasize symptoms are real rather than feigned
   - They aren't "doing it on purpose"; Not "crazy"
2. Explain the clinical features and physical signs that are inconsistent with neurologic disease
   - "Trick or Treat" – use signs to explain; brain's need to "focus" to maintain the movement (e.g., distractability, entrainment)
3. Functional (software) not structural (hardware) problem; *Motor programs*
4. State the diagnosis confidently and also tell what they don't have (Stroke, MS etc)
5. Common and potentially fully reversible
   - www.Neurosymptoms.com
6. Avoid unnecessary tests
   - Diagnostic uncertainty? → keep an open mind; repeated examinations
7. Communicate diagnosis to other care providers
   - Emphasize definitive nature of the diagnosis
   - Avoid uncertainty and negative diagnostic terminology

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

neurosymptoms.org

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



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)
- caused by 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

Update December 2018

I have carried out an interim update of the site in December - to obtain a security certificate and move off the Adobe Flash platform. The site now runs in html5. Hope you like it it! Jon Stone

Symptoms ...

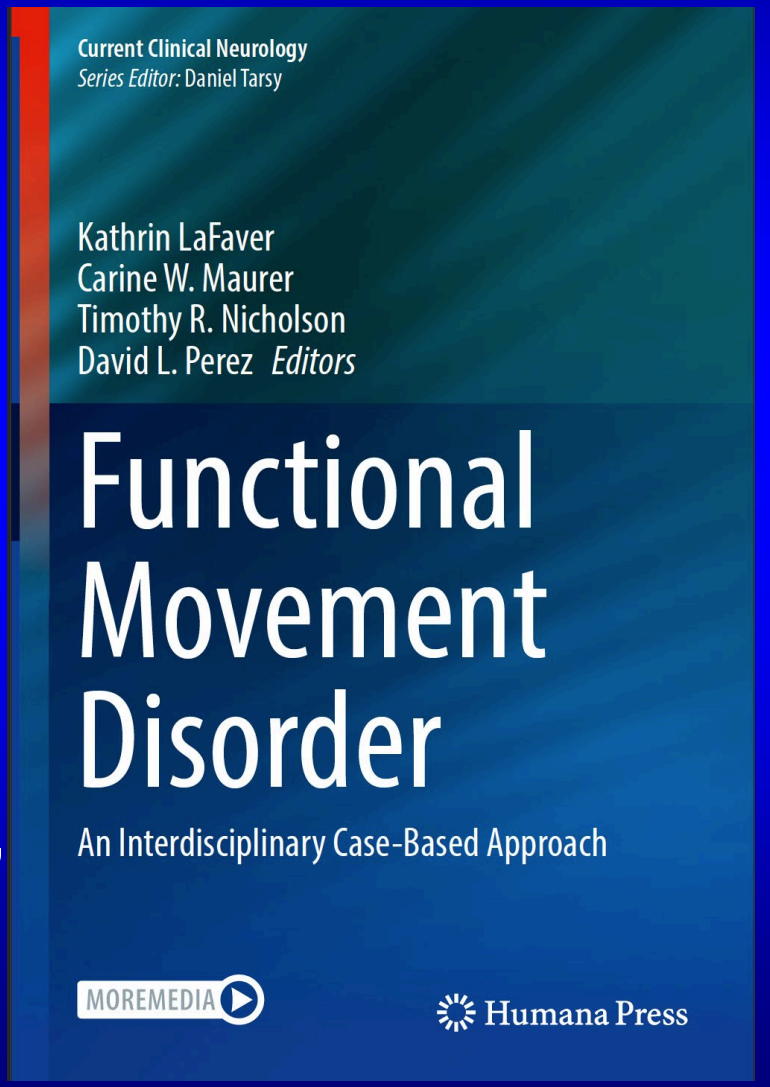
- Functional Limb Weakness
- Functional Tremor
- Blackouts / Attacks
- Functional Dystonia/Spasm
- Sensory Symptoms
- Functional Walking Problems
- Pain
- Word Finding Difficulty
- Tiredness / Fatigue
- Slurred Speech
- Sleep Problems
- Bladder Symptoms
- Poor Memory / Concentration
- Bowel Symptoms
- Dissociation
- Drop Attacks
- Worry / Panic
- Swallowing Problems
- Dizziness
- Complex Regional Pain
- Headache
- Health Anxiety
- Low Mood
- Post-Concussion Syndrome
- Facial Spasm
- Functional Jerks and Twitches
- Visual Symptoms
- Other Symptoms

Treatment of FMDs

- Begins with Delivering Dx and using signs to present Dx and initiate Rx
- Very few adequate randomized controlled trials
- Best outcomes with short interval between onset, diagnosis and treatment
- Best administered in multimodal fashion → markedly variable outcomes

FMD Treatment Options

- Diagnosis and education
- Mind-body therapies
- Lifestyle strategies
- Motor retraining physiotherapy
- Psychotherapy
- Multidisciplinary rehabilitation
- Treat comorbid conditions (anxiety, chronic pain, trauma therapy, etc.)
- Others reported: Activity, Antidepressants, Hypnosis, Acupuncture, rTMS, TENS, BoNT (dystonia, palatal tremor), others



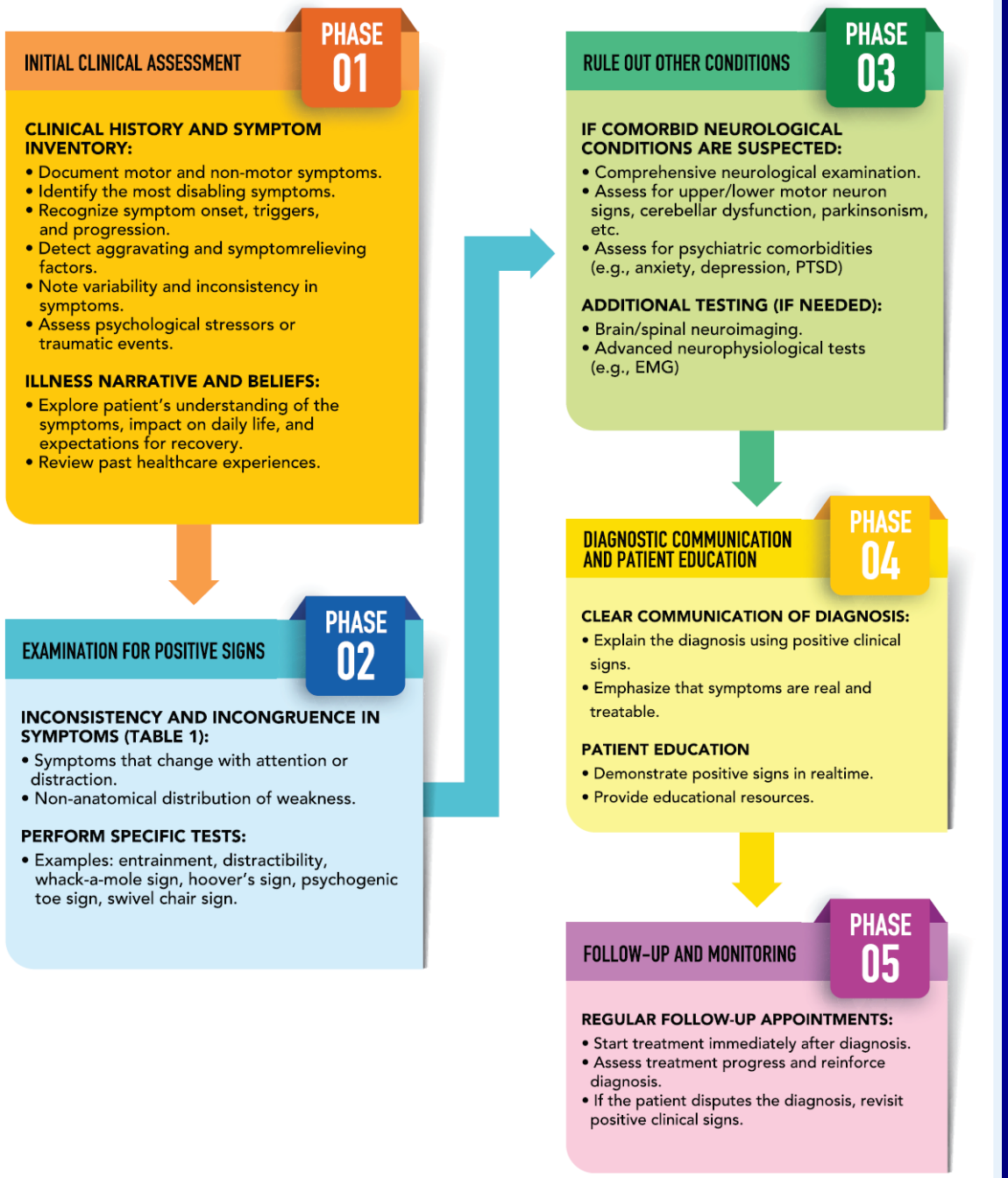
Principles of FMD Treatment

- First step = diagnosis and education
  - Diagnostic agreement is a prognostic factor
- Treatment is individualized
  - Triaging patients is important
- FMD can improve with physical therapy/motor retraining, psychological therapies (e.g. CBT) or both
- Pain and fatigue can limit therapy engagement
- Improvement of the functional movement may not result in improvement of the FND syndrome (fatigue, pain, cognitive fog, disability)

Movement Disorders
MOVEMENT DISORDERS CLINICAL PRACTICE 2025.
REVIEW
CLINICAL PRACTICE

Functional Movement Disorder: Evolving Mechanisms, Diagnostic Precision, and Personalized Multidisciplinary Care

Emmanuel Ortega-Robles, PhD,[1] Ali Shalash, MD, PhD,[2] Jesús Ramírez-Bermúdez, MD, PhD,[3] and Oscar Arias-Carrión, MD, PhD[1,4,]*



Principles of FMD Treatment for the Neurologist

1. Select candidates who are ready to commit and engage in therapy
2. Develop a shared illness model
3. Focus on automatic movements
4. Positive signs are the therapy tools
5. Recovery is self-management
6. Know when to stop, and know it’s ok

DISABILITY AND REHABILITATION
2025, VOL. 47, NO. 6, 1433–1441
https://doi.org/10.1080/09638288.2024.2373775

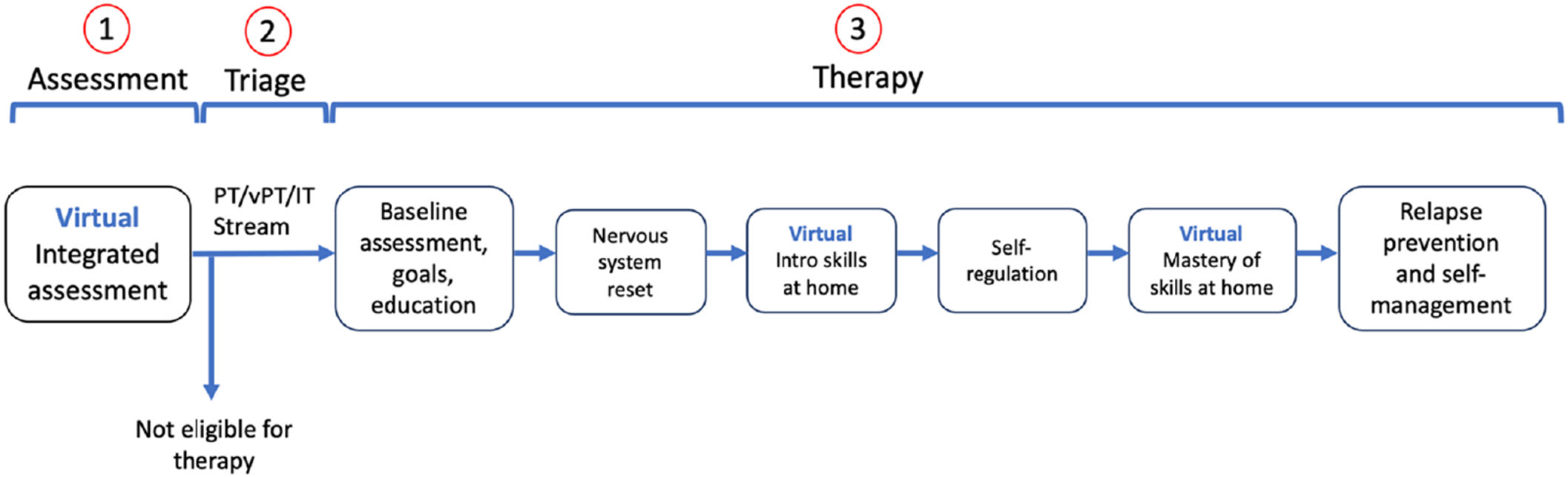
Taylor & Francis
Taylor & Francis Group

Check for updates

RESEARCH ARTICLE

Integrated model of care for functional movement disorder: targeting brain, mind and body

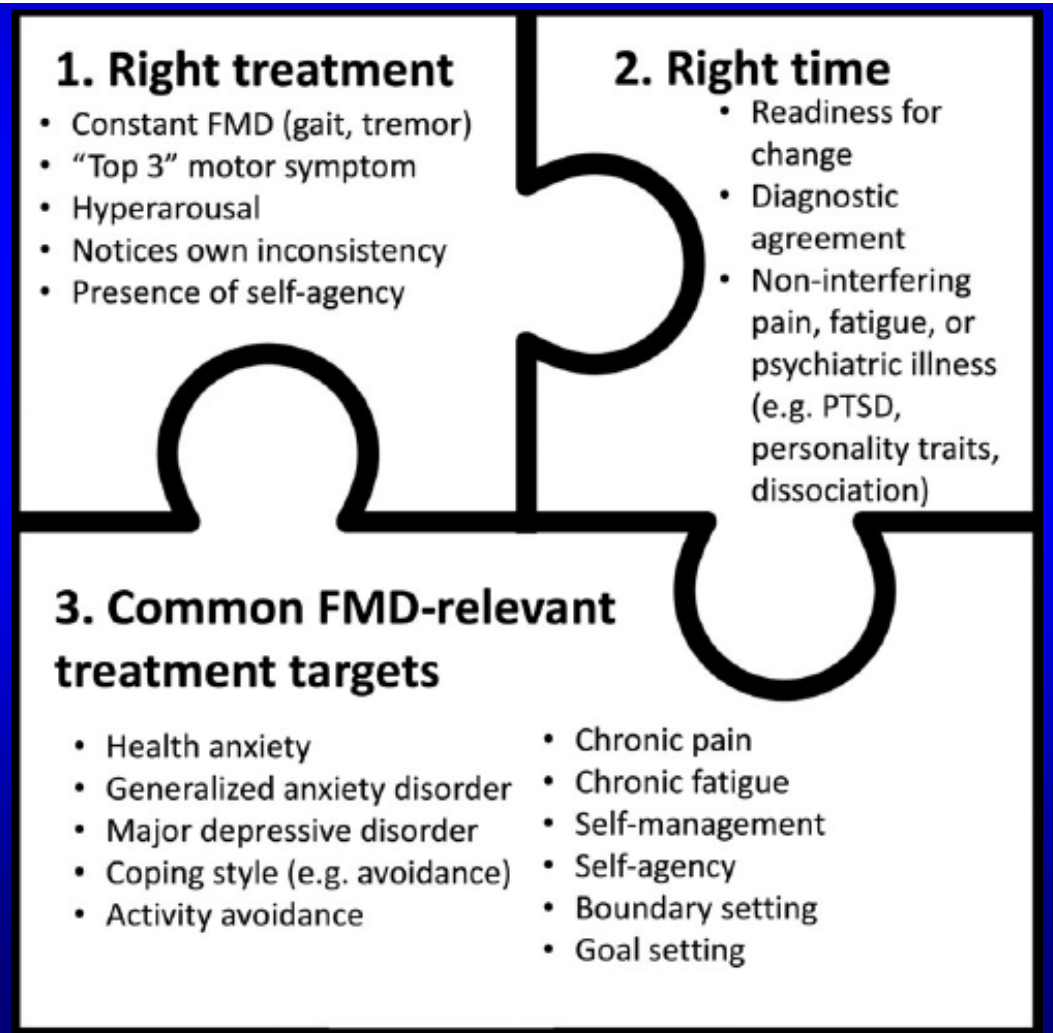
Haseel Bhatt[a,b], Lindsey MacGillivray[a,b,c], Gabriela S. Gilmour[a,d], Keschey Marcelle[a,b], Laura Langer[e] and Sarah C. Lidstone[a,b]



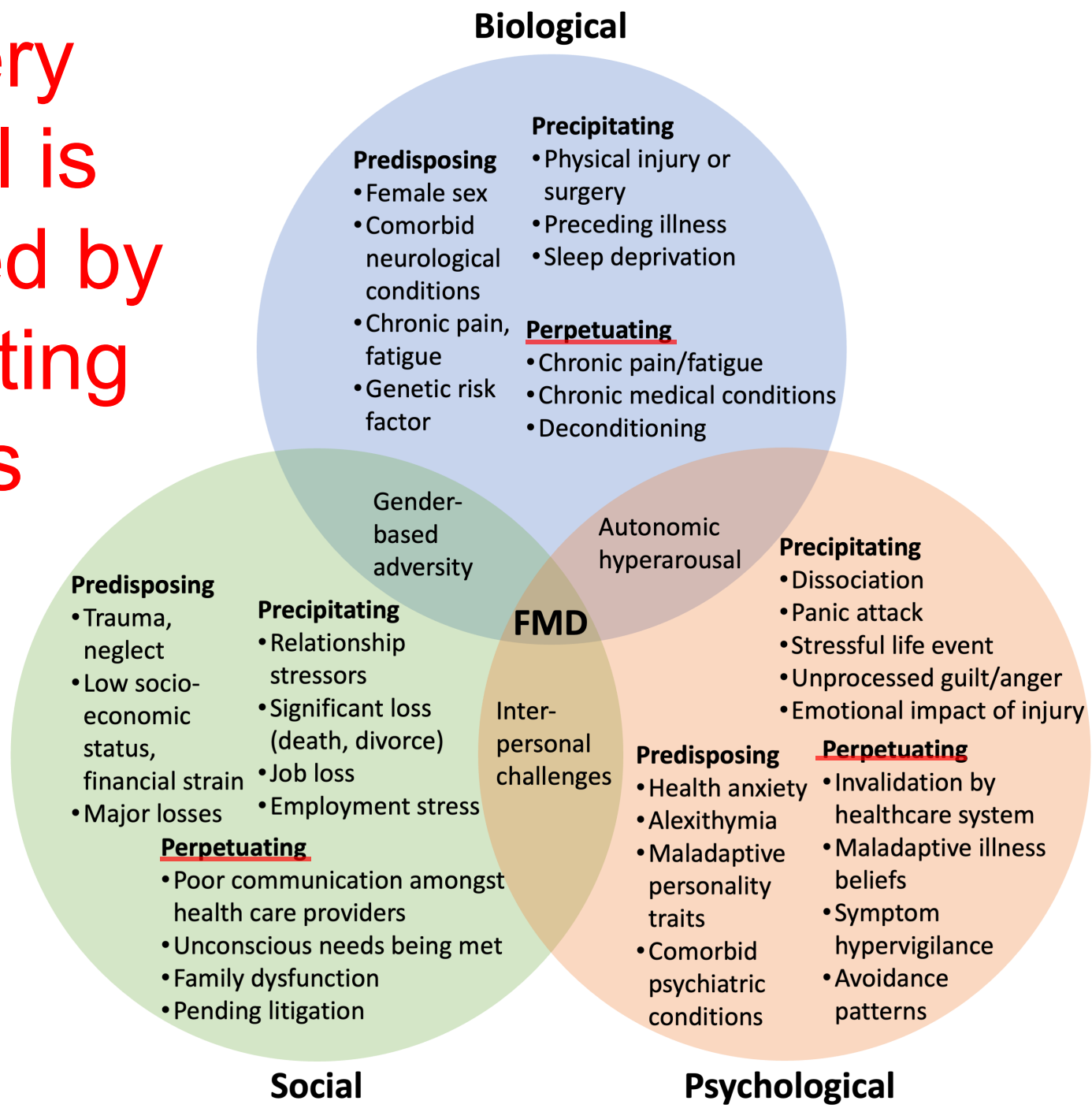
Factors Influencing Triage to Rehabilitation in Functional Movement Disorder

Gabriela S. Gilmour, MD,[1,2,3] Laura K. Langer, MSc(biostats.),[4] Haseel Bhatt, MSc, MScPT,[1,4,5] Lindsey MacGillivray, MD, PhD,[5,6] and Sarah C. Lidstone, MD, PhD[1,2,4,5,]*

MOVEMENT DISORDERS CLINICAL PRACTICE 2024;



Recovery potential is determined by perpetuating factors



Gilmour and Lidstone 2023

Chronic FMD

- 40% of patients with FMD remain with similar or worse symptoms in the long-term
- Numerous reasons patients become “stuck”
  - Maladaptive personality style/coping mechanisms
  - Low/no agency, external locus of control, victimized stance
  - High resistance e.g. persistent unexpressed anger, profound self-stigma
  - Implicit needs are being met through illness (disability claims, legal cases etc)
- With earlier diagnosis, better diagnostic explanation and rapid access to appropriate evidence-based treatments, most patients can achieve long-lasting improvement

Functional Movement Disorders: Summary

- Common, Disabling
- Challenging to diagnose – use of ancillary laboratory testing
- Pathogenesis poorly understood
- Terminology:
  - "Psychogenic": often misleading or counterproductive (stigmatizing)

  → Functional
- Treatment often unsatisfactory; need for new approaches and properly designed clinical trials

Functional Neurological Disorder Society
FNDSociety.org

- Improve the diagnosis and treatment of patients with FND;
- Operate exclusively for scientific, scholarly and educational purposes;
- Encourage and advance scientific research pertaining to FND;
- Provide forums / education; Increase awareness; Share ideas; Advance the related clinical and scientific disciplines; Encourage interest and participation; Collaborate with other organizations

Membership

Founding Member
Active Member
Allied Health Member
Trainee Member



FUNCTIONAL NEUROLOGICAL DISORDER SOCIETY

Thank you!



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UHN Krembil Brain Institute