



Functional Neurological Disorder

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UPDATE ON NEUROLOGY AND PSYCHIATRY OF WOMEN

May 23, 2024

Disclosures

Dr. Dworetzky

- No relevant financial disclosures
- Founding member, BOD, President-Elect: FNDS
- Epilepsy Foundation New England, PAB
- Royalties from Oxford University Press

Dr. Baslet

- No relevant financial disclosures
- Founding member, FNDS
- Royalties from Oxford University Press

Dr. Polich

- No relevant financial disclosures
- Founding member, FNDS
- Research funding, Foundation for PMR

Objectives

- Learn a best-practice model of care for patients with FND.
- Formulate an updated biopsychosocial understanding of FND.
- Acknowledge current state of evidence-based treatment for FND.

Functional Symptoms are Ubiquitous

- Gastroenterology: IBS
- Urology: overactive bladder syndrome
- Rheumatology: FBM
- Infectious disease: CFS
- Immunology: multiple chemical sensitivities
- *Cardiology: Atypical CP, syncope
- *Pulmonary: Chronic cough, SOB
- *ENT: Globus
- Gynecology: pelvic pain
- Ophthalmology: functional blindness
- Neurology: functional szs (aka PNES), attacks/syncope, sensory, weakness, speech, movement, or cognitive disorder, and Persistent Postural-Perceptual dizziness (PPPD)**



FND

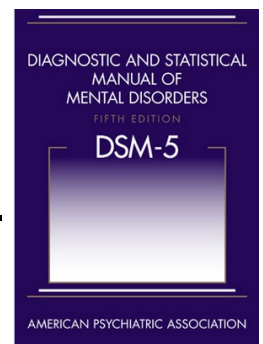
Everyone experiences functional symptoms...

Terminology

- **FND is a type of Somatic Symptom Disorder (SSD)**
- 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 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
- Specifier: with **weakness or paralysis**, with **abnormal movement**, with **swallowing symptoms**, with **speech symptom**, with **attacks or seizures**, with **anesthesia or sensory loss**, with special sensory symptom, **dizziness**, with mixed symptoms.
- Specifier: acute episode (< 6 months), persistent (> 6 months).
- Specifier: with psychological stressor, **or without** psychological stressor.

American Psychiatric Association, 2013

FS: Functional Seizures; FMD: Functional Movement Disorder



Epidemiology and Impact of FND

- Incidence: 4-12/ 100,000/yr¹ Prevalence 50/100,000²
- Female preponderance (3:1 F:M)³
- Adolescence → midlife onset; *children/elderly F=M*^{4,5}
- >20% comorbid neurological disorder⁶
- Health Care Utilization (HCU) is costly ^{7,8} ~**1.2 bill. (adults)⁹; 88 mill.(peds)¹⁰**
- ↓QOL (<= other neuro disorders)¹¹
- Stigma¹² and Caregiver burden¹³ same or worse than ES
- **Increased risk of death (SMR 2.5x gen. pop)¹⁴⁻¹⁶**
- A "*Crisis for Neurology*"¹⁷

1. Stone et al, Brain 2009 ; 2. Akagi and House, Contemp. App OUP, 2001; 3. Lesser, Neurology, 1996 4. Duncan et al, Neurology, 2006; 5. Huang et al, J Chin Med Assoc, 2009. 6. Stone et al, J. Neurol 2012; 7. Martin et al, Seizure 1998; 8. Seneviratne et al, Epilepsia 2019; .9. Barsky et al, Arch Gen Psych, 2005; 10. Stephen et al, JAMA 2021; 11. Szaflarski and Szaflarski, Epilepsy and Beh 2004; 12. Robson et al, Seizure 2018; 13. Karakis et al, Seizure 2014; 14. Jennum et al, E and B, 2019; 15. Nightscales et al, Neurology 2020; 16. LeZhang et al, JNNP, 2022; 17. Hallett, Curr Neurolog Neurosci Rep, 2006.

Functional neurological disorder is a feminist issue 

Caoimhe McLoughlin¹, Ingrid Hoeritzauer¹,  Verónica Cabreira^{1, 2}, Selma Aybek^{3, 4}, Caitlin Adams^{5, 6},  Jane Alty^{7, 8},  Harriet A Ball^{9, 10}, Janet Baker^{11, 12}, Kim Bullock¹³, Chrissie Burness¹⁴, Barbara A Dworetzky¹⁵, Sara Finkelstein^{6, 16}, Béatrice Garcin¹⁷, Jeannette Gelauff¹⁸,  Laura H Goldstein¹⁹, Anika Jordbru²⁰, Anne-Catherine ML Huys²¹, Aoife Laffan²²,  Sarah C Lidstone²³,  Stefanie Caroline Linden²⁴, Lea Ludwig²⁵, Julie Maggio^{16, 26}, Francesca Morgante^{27, 28}, Elizabeth Mallam²⁹,  Clare Nicholson³⁰, Mary O'Neal¹⁵, Suzanne O'Sullivan³¹, Isabel Pareés^{32, 33},  Panayiota Petrochilos³⁴,  Susannah Pick³⁵, Wendy Phillips²¹, Karin Roelofs^{36, 37}, Rachel Newby³⁸, Biba Stanton³⁹, Cordelia Gray⁴⁰, Eileen M Joyce⁴¹,  Marina AJ Tijssen⁴²,  Trudie Chalder⁴³, Maxanne McCormick⁴⁴, Paula Gardiner^{45, 46}, Indrit Bègue⁴⁷, Margaret C Tuttle^{6, 48}, Isobel Williams⁴⁹, Sarah McRae⁵⁰, Valerie Voon^{51, 52}, 

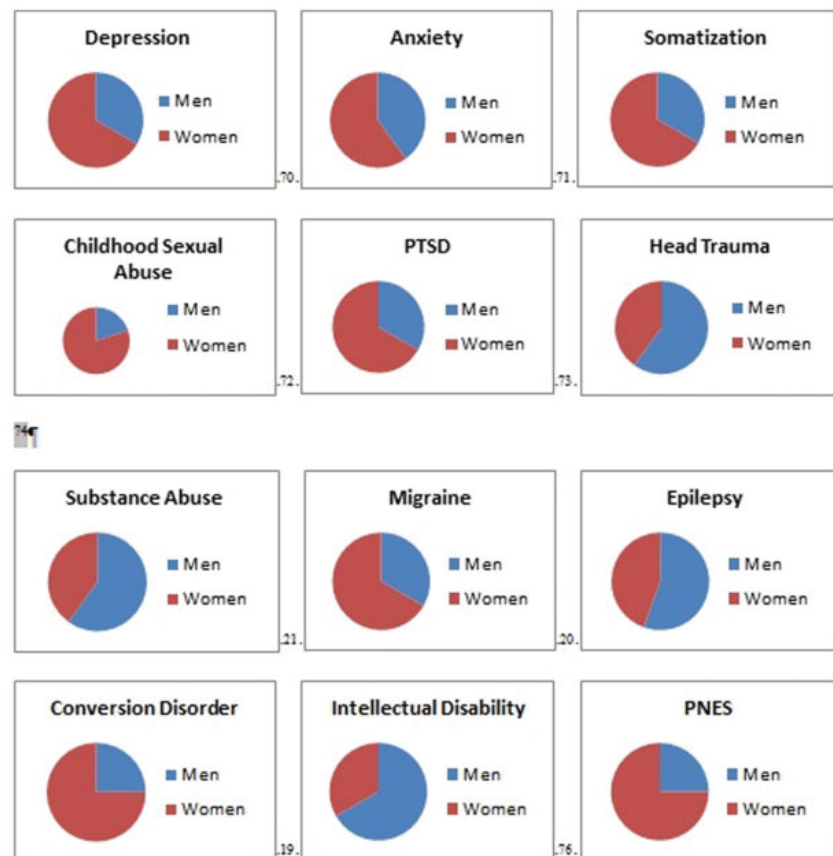
Laura McWhirter¹

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laura.mcwhirter@ed.ac.uk

- predominantly affects women
- disproportionate health effects of violence, poverty, social exclusion in women
- risk factors for FND greater in women
- disorders perceived as mostly affecting women have been neglected in medical research and health care

Why women?



> [Prog Neuropsychopharmacol Biol Psychiatry](#). 2023 Mar 21;125:110756.

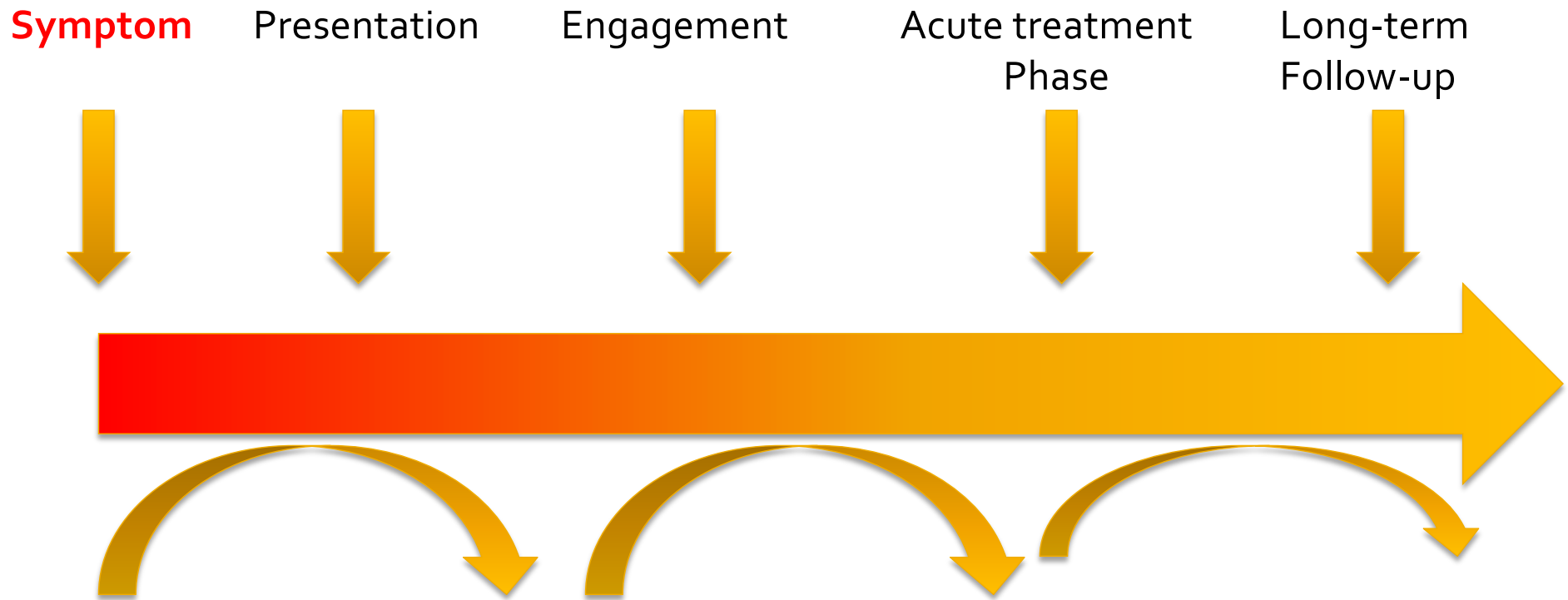
doi: 10.1016/j.pnpb.2023.110756. Online ahead of print.

Methylome changes associated with functional movement/conversion disorder: Influence of biological sex and childhood abuse exposure

Primavera A Spagnolo¹, Kory Johnson², Colin Hodgkinson³, David Goldman³, Mark Hallett⁴

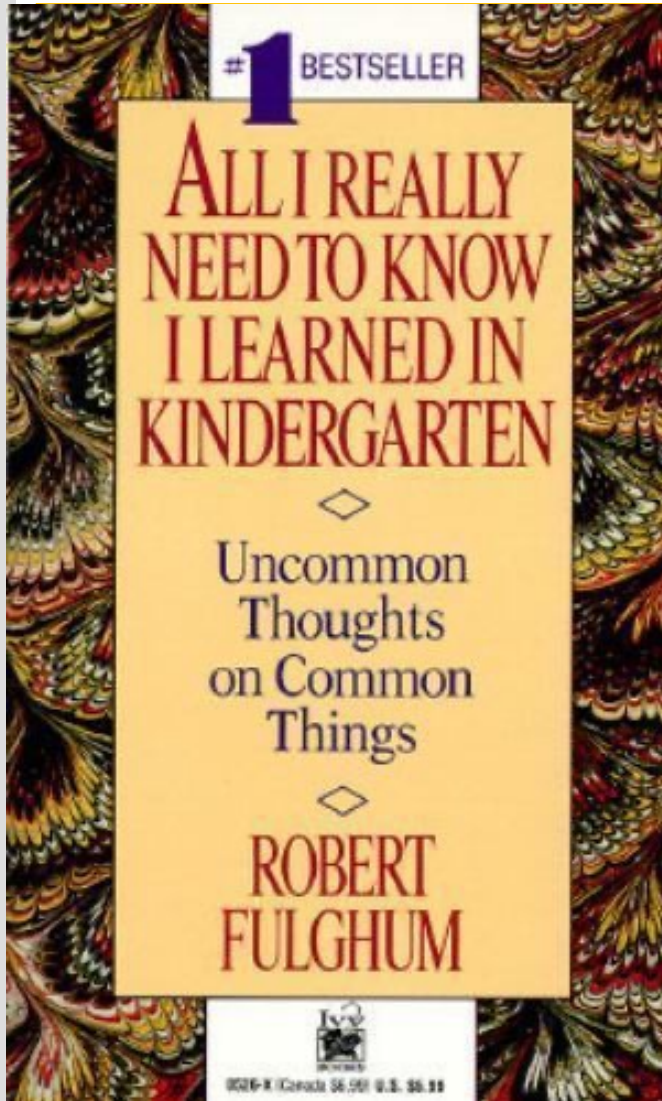
Immune response-related pathways significantly enriched in FMD. The direction of these changes appear to be affected by childhood trauma exposure and sex (n=57 FMD; 47 HV)

Course of treatment in FND



Taking the History

"Listen to your patient; he/she is telling you the diagnosis." Sir William Osler

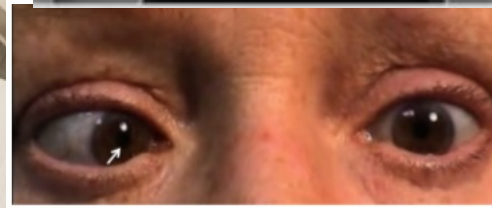


- Listen >> talk
- Obtain all the symptoms: "what else?"
- Building rapport takes time *(be curious: what did other doctors think? What does the patient believe?)*
- Do not assume psychiatric disorder
- Consider FND early; be transparent

Trick or treat?

Showing patients with functional (psychogenic) motor symptoms their physical signs

- Inconsistency
- Variability
- **Positive signs**
- Give away weakness
- Pattern



Diagnosis



'Keep your left heel on the ground – don't let me lift it up'

LEFT hip extension is weak



'Lift up your right leg. Don't let me push it down'

LEFT hip extension returns to NORMAL



Adapted from: Stone and Edwards, Neurology 2012

Reliability of Positive Signs for diagnosis

Adapted from Popkirov et al, Stroke, 2020; Syed et al, Ann Neurol, 2011; Avbersek and Sisodiya, JNNP 2010;

Clinical Sign	Sensitivity %	Specificity %	Comments
Hoover's	60-100	86-100	In unilateral leg weakness; not SMA, parietal
Hip adductor sign	-	100	Unilateral leg weakness
"Give way" weakness	20-90	95-100	Absence of joint pain
Dragging leg gait	20-100	100	
Drift w/o pronation	47-93	100	Palms up, wait 10 seconds; mild-mod UE weakness
Ictal eye closure	34-88	74-100	Geotropic gaze w/ forced eye opening; blinking after rubbing eyelashes
Ictal weeping	3.7-37	100	Not postictal
Pelvic thrusting	1-44	92-100	Exclude FLS
Side to side head/body	25-63	96-100	Convulsive events only
Asynchronous movements	44-96	93-96	Exclude FLS
Fluctuating course/long dur.	47-88	96-100	
Sensory loss- midline split			Not reliable, seen with thalamic stroke

Avoid painful stimuli!

Predisposing, precipitating and perpetuating factors

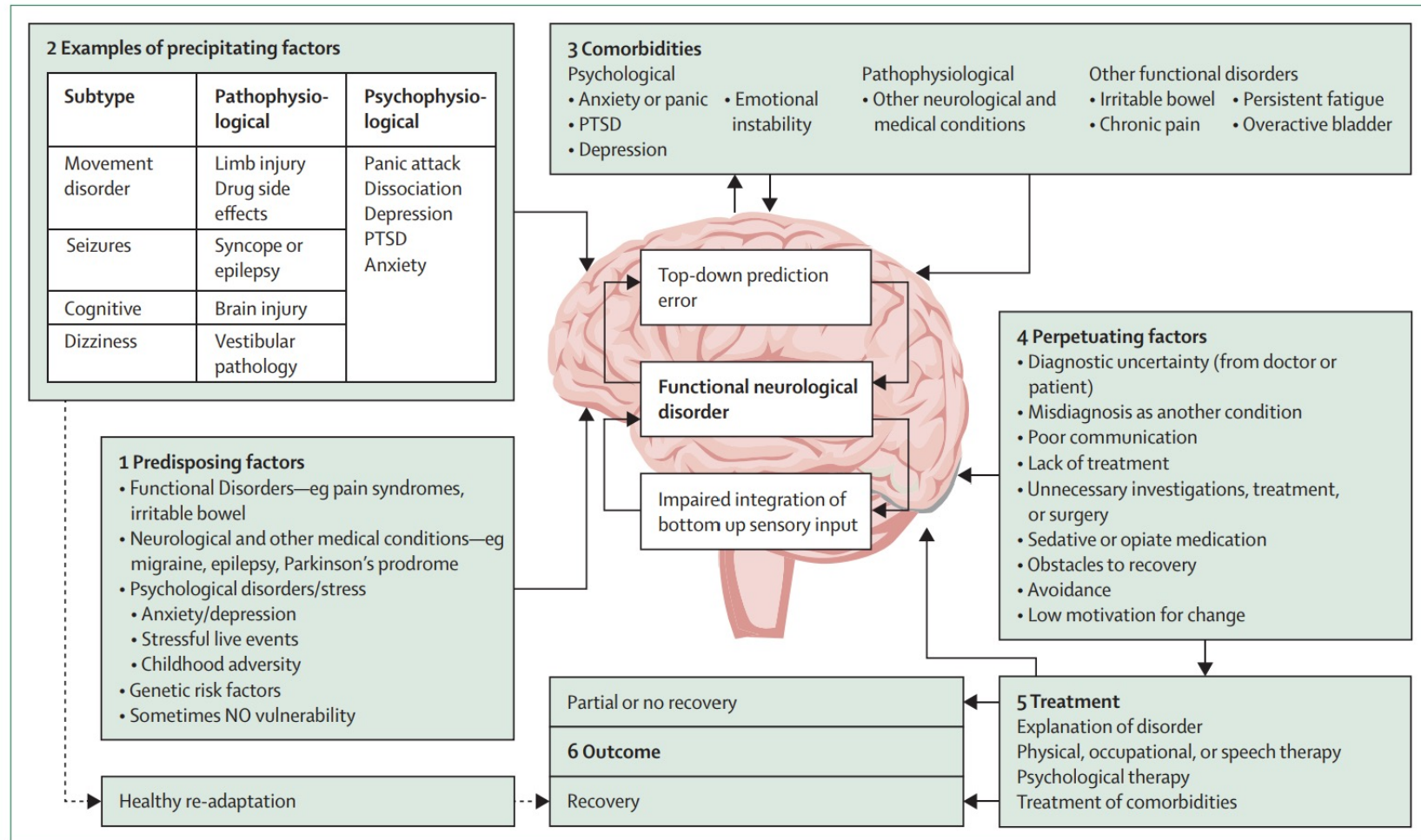


Figure 1: Pathophysiological and psychophysiological events that might trigger functional neurological disorder

The aetiology of functional neurological disorder depends on predisposing, precipitating, and perpetuating factors that affect the neural mechanisms of the disorder. The dotted line indicates that in most individuals the presence of these factors does not lead to functional neurological disorder. PTSD=post-traumatic stress disorder.

Hallett, Aybek, Dworetzky, McWhirter, Staab, Stone, *Functional Neurological Disorder: New Subtypes and Shared Mechanisms*, *The Lancet Neurology*, April 2022

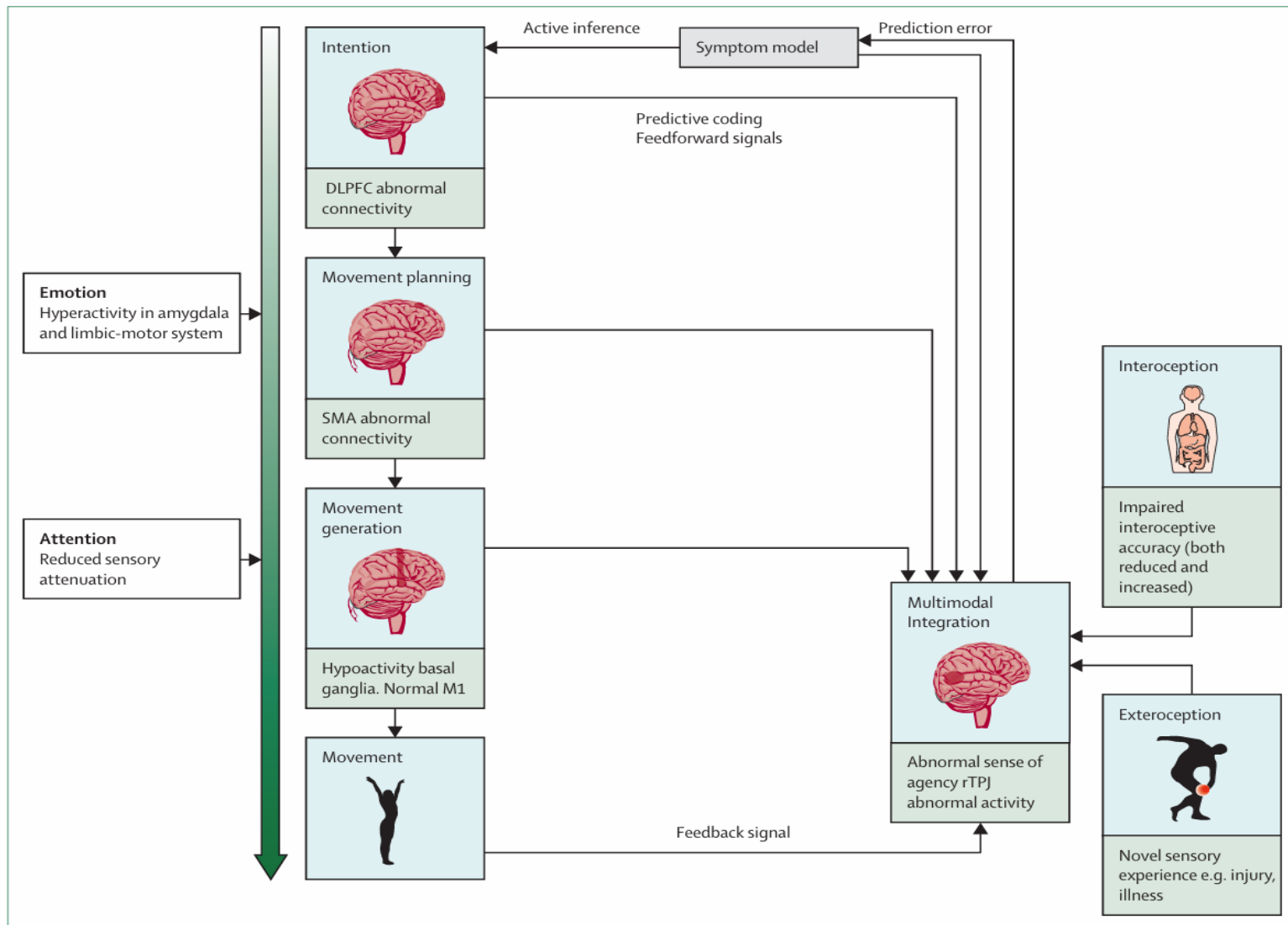
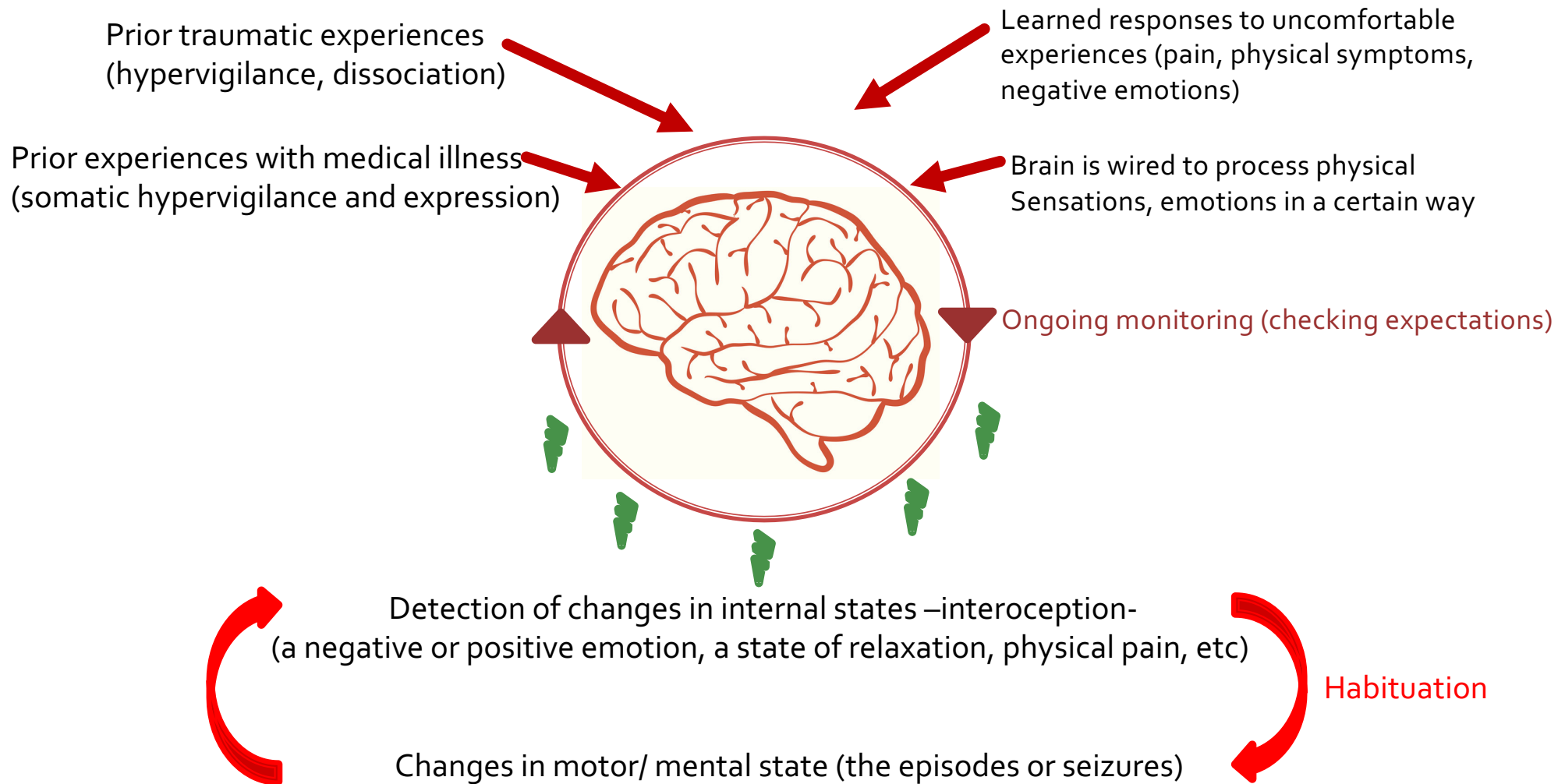


Figure 2: Neural mechanisms of functional neurological disorder

This scheme relates to functional movement disorder, but its principles are applicable to all functional neurological disorder entities. Movements are generated by the motor cortex after planning and preparation in the SMA. Planning and preparation of movement produce feedforward signals to be compared with feedback from interoceptive and external signals after action. If the signals do not match, movement will not be appreciated as voluntary. The brain has a model of the body and world that adds predictive coding to this multimodal integration. Feedback signals that do not match predictive coding create prediction error, which modifies the model so that predictive coding matches subsequent feedback. In functional neurological disorder, it is hypothesised that prediction error is not accurately updated, perpetuating dysfunction. The green arrow shows that there are multiple general influences on motor generation, including emotion and attention. DLPFC=dorsolateral prefrontal cortex. SMA=supplementary motor area. M1=primary motor area. rTPJ=right temporoparietal junction.

Hallett, Aybek, Dworetzky, McWhirter, Staab, Stone, Lancet, 2022

How does FND happen?



Course of treatment in FND

Symptom

Presentation

Engagement

Acute treatment
Phase

Long-term
Follow-up



FNSD: Functional Neurological Symptom Disorder

Baslet et al, *Clin EEG Neurosci*, 2014

Presenting the diagnosis: Communication Protocol

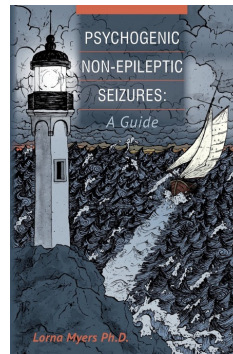
Item	Say to Patient
Validation	common, real, not faking
Label	Functional disorder
Diagnostic method	Positive features (Hoover's sign, vEEG capture)
Cause & Maintaining factors	Your brain's miscommunication to the body in the context of biopsychosocial risk factors; immediate trigger often not obvious
Treatment	Effective treatments, " retrain the brain " by learning new skills
Expectations	takes time, will improve, can resolve

Reuber, 2003; Hall-Patch, et al Epilepsia 2010

Educate everyone: you/clinicians/patients/public

- www.neurosymptoms.org (UK) (FND)
- www.fndhope.org (US, UK, Australia)(FND patient support website)
- www.nonepilepticseizures.com (US – includes info in Spanish)
- www.nonepilepticattacks.info (UK)

- Self-help book for patients:
Psychogenic non-epileptic seizures:
A guide (Lorna Myers, Ph.D.)



- 10 Myths about FND- Lidstone et al, 2020

- Documentary: **dis-sociated** (first feature documentary on PNES) – available free on YouTube

<https://youtu.be/MA1EYAg9y5k>

- Public awareness needed! *Popkirov et al, Hiding in Plain Sight: FND in the news Neuropsychiatr Clin Neurosci. 2019*

<http://www.fndsociety.org>; <https://www.fndsociety.org/fnd-education>

Functional and Dissociative Neurological Symptoms: a patient's guide

Welcome | Symptoms | Causes | In the mind? | Misdiagnosis? | Treatment | Feedback | Stories | Links/Downloads

This website is about symptoms which are:

- neurological (such as weakness, numbness or blackouts)
- REAL (and not imagined)
- and due to a PROBLEM with the FUNCTIONING of the nervous system, and NOT due to neurological disease.

These symptoms have many names (including dissociative symptoms and conversion symptoms) but are often described as "functional symptoms" or "functional disorders".

Symptoms like these are 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 to advertising and does not make any money for the author.

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)
- Click on 'Misdiagnosis' to find out how likely it is that your diagnosis is wrong
- Click on 'In the mind?' for some answers to this question
- Click on 'Treatment' for discussion of what treatments may help
- Click on 'Stories' for some real patient stories

Downloads and Links ...

Click on [Links and Downloads tab](#) on the menu above to access it.

Functional Limb Weakness | Functional Tremor | Blackouts / Attacks | Functional Dystonia/Spasm | Sensory Symptoms | Functional Walking Problems | Pain | Word Finding Difficulty | Tiredness / Fatigue | Shimmer / Shakes | Sleep Problems | Blinker Symptoms | Poor Memory / Concentration | Bowel Symptoms | Dissociation | Drop Attacks | Worry / Panic | Swallowing Problems | Dizziness | Complex Regional Pain | Headache | Health Anxiety | Low Mood | Post-Convulsion Syndrome | Facial Spasm | Functional Jerks and Tics/Twitches

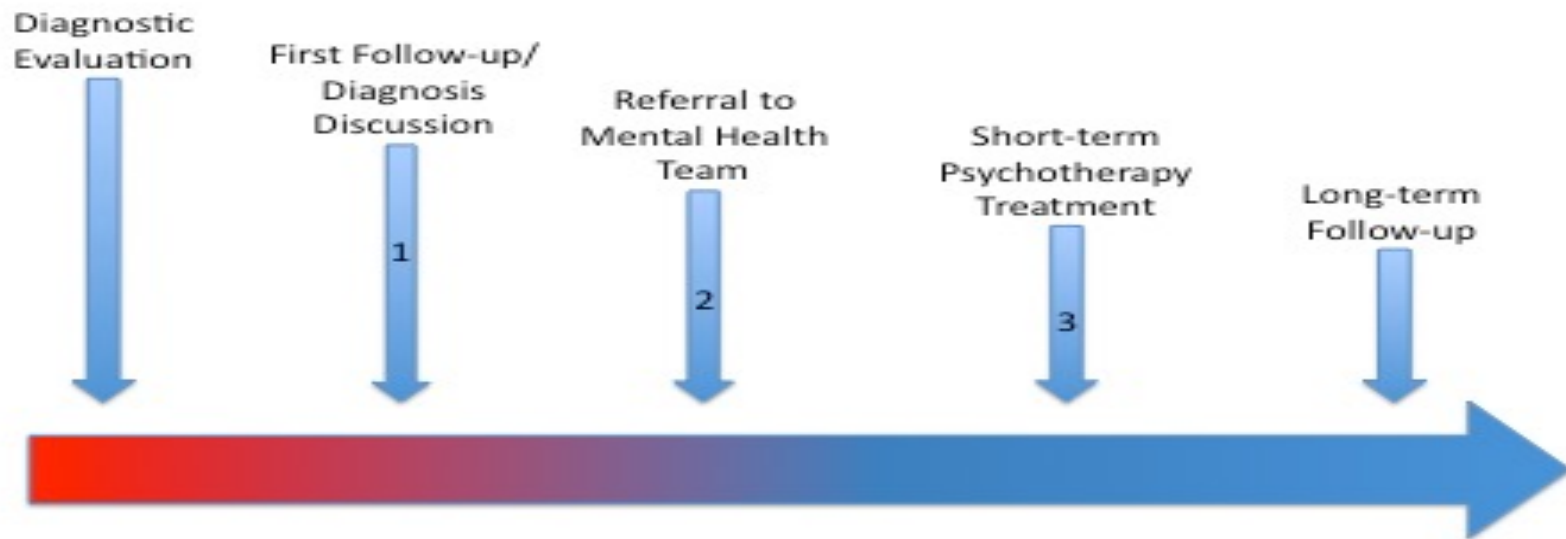
PNES
Psychogenic Non Epileptic Seizures
Illuminating, Helping, Empowering.

Home | Editorial Board | Reading materials on PNES | **PNES Information** | PNES Events and News | Ask us your question | Blog

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PNES publications
Psychogenic non-epileptic seizures: Toward the Integration of Care.
Click here to look inside.

Treatment engagement: At-risk time points in FND

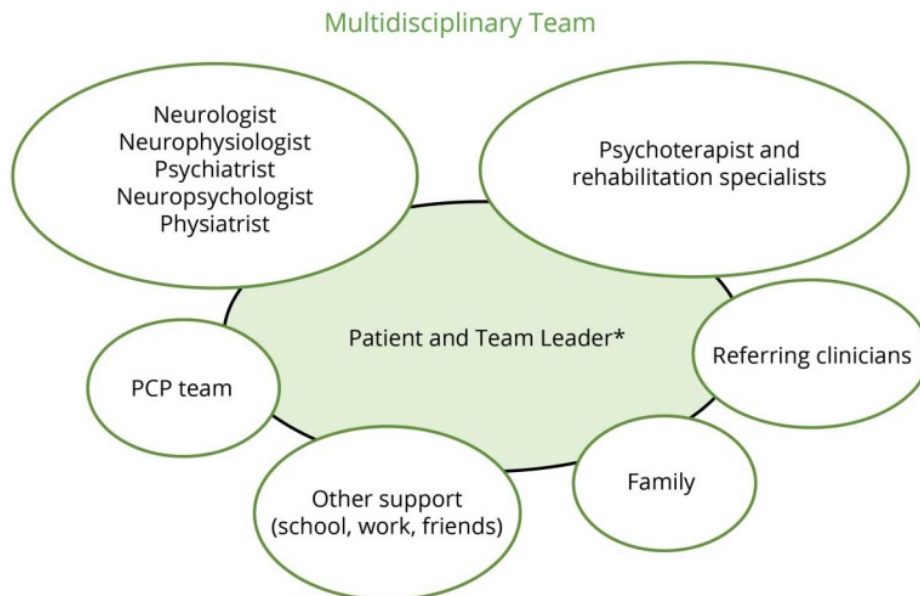


	Time Point	Rate of Adherence
1	Immediate follow-up with neurologic team following NES diagnosis	71-72% ^{1,2}
2	Initial referral to behavioral health team	66% ³
3	Completion of psychotherapy	31-54% ^{4,5}
1-3	Composite Adherence Rate (time points 1-3 considered in series)	15-26%

Tolchin and Baslet, Treatment Adherence and Obstacles to Treatment, in Dworetzky and Baslet (Eds) "Psychogenic Non-Epileptic Seizures: Towards the Integration of Care", OUP, 2017 -- 1. Duncan et al, Epilepsy & Beh, 2014; 2. McKenzie et al, Neurology, 2010; 3. Kanner et al, Neurology, 1999; 4. LaFrance et al, JAMA Psych, 2014; 5. Baslet et al, JNCN, 2013

Multidisciplinary team

Figure The Ideal Multidisciplinary Care Team for a Patient With FND



Members of the team interact in a fluid nature as determined by the patient's needs.
A neurologist may be the referring clinician or part of the multidisciplinary team.

*The Team Leader is the individual most engaged with the patient. This could be the PCP, neurologist, or one of the mental health providers.

FND = functional neurologic disorder; PCP = primary care provider.

Adapted from O'Neal, Baslet, Polich, Raynor, Dworetzky, Functional Neurological Disorder: The Need for a Model of Care, Neurology Clin Practice, April 2021

Course of treatment in FND

Symptom

Presentation

Engagement

**Acute treatment
Phase**

**Long-term
Follow-up**



FNSD: Functional Neurological Symptom Disorder

Baslet et al, *Clin EEG Neurosci*, 2014

Treatment in FND is multidisciplinary



ELSEVIER

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 

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 Edwards¹

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 

Review

Systematic review of psychotherapy for adults with functional neurological disorder

Myles Gutkin ^{1,2} Loyola McLean ^{3,4} Richard Brown ^{5,6}
Richard A Kanaan ¹

19 studies were included

- 12 skills-based, CBT-like approaches vs 7 psychodynamic approaches
- 11 pre-post studies vs. 8 RCTs
- Most studies (except 4) included only one FND phenotype
- Effect sizes showed medium-sized benefits for physical (FND) symptoms, mental health, well-being, function and resource use for both kinds of therapies.
- Outcomes comparable across both types of therapy.
- Lack of controlled trials for psychodynamic psychotherapy.
- Lack of follow-up data in majority of CBT trials

Common psychotherapy principles in FND

Validate and emphasize with the impact of FND on the patient's life.

Assess understanding and acceptance of diagnosis.

Review hypothetical model of the disease – consider influence of predisposing, precipitating and perpetuating factors over time.

Assess motivation to create change: reducing avoidance, developing new ways of relating to one's thoughts and internal processes and increasing values-based activities.

Clarify role of family: help promote therapeutic change versus assuming responsibilities for the patient.

Collaborative working relationship.

Types of psychotherapy studied in FND

- ▶ Skills-based:

CBT (CODES, other versions including ReACT)

CBT-informed psychotherapy/ Neurobehavior Therapy

Prolonged exposure (FS + comorbid PTSD)

Mindfulness-based psychotherapy

DBT skills training group

Hypnotherapy

Body-centered approaches

EMDR (study underway)

- ▶ Psychodynamic:

Psychoanalytic psychotherapy

Short-term psychodynamic psychotherapy

Psychodynamic interpersonal psychotherapy

Individual, group, self-help

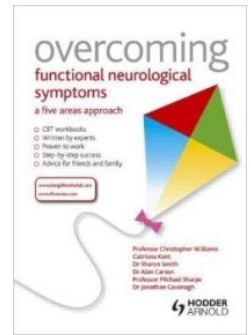
Common tools across psychotherapies for FND

Therapeutic tools, treatment modalities, and the disorders that are treated using these tools.

Tools	Treatment modalities that make use of these tools	Disorder targeted with these tools
Seizure/somatic symptom record/log	CBT, MBT, PIT, psychoeducational and therapeutic groups, DBT skills group, and PE	FS, FMD, FND
Workbooks	CBT and PE	FS, FND
Thought record	CBT	FS, FND
Relaxation training	CBT, MBT, PIT, psychoeducational approaches, DBT, and PE	FS, FND, epilepsy + FS
Support person	CBT	FS
Distraction techniques	CBT, MBT	FS, FMD
Handouts	CBT, psychoeducational modalities	FS, FND
Physical exercise prescription	CBT, psychoeducational groups, body-centered psychotherapy	FS, FMD
Values identification exercises	MBT	FS
Mindfulness	MBT, DBT	FS
Emotion recognition logs	PIT, MBT	FS
Sensory grounding	CBT, MBT, PE, PIT	FS, FS + PTSD
Life charts	PIT	FS, FND
Exposure	PIT, PE	FS, FS + PTSD
Self-hypnosis	Psychodynamic group therapy	FS
Coping strategies	CBT, MBT, PIT, Psychodynamic/psychoeducational groups	FS, FND, FMD
Assertiveness training	Psychodynamic/psychoeducational groups	FS
Prescribed adjunctive support group/therapy	Psychodynamic/psychoeducational groups	FS
“Punishers” used to increase treatment compliance (if necessary)	ReACT	Pediatric FS
Biofeedback	Body-centered psychotherapy	Pediatric FS
Body map	Body-centered psychotherapy	Pediatric FS

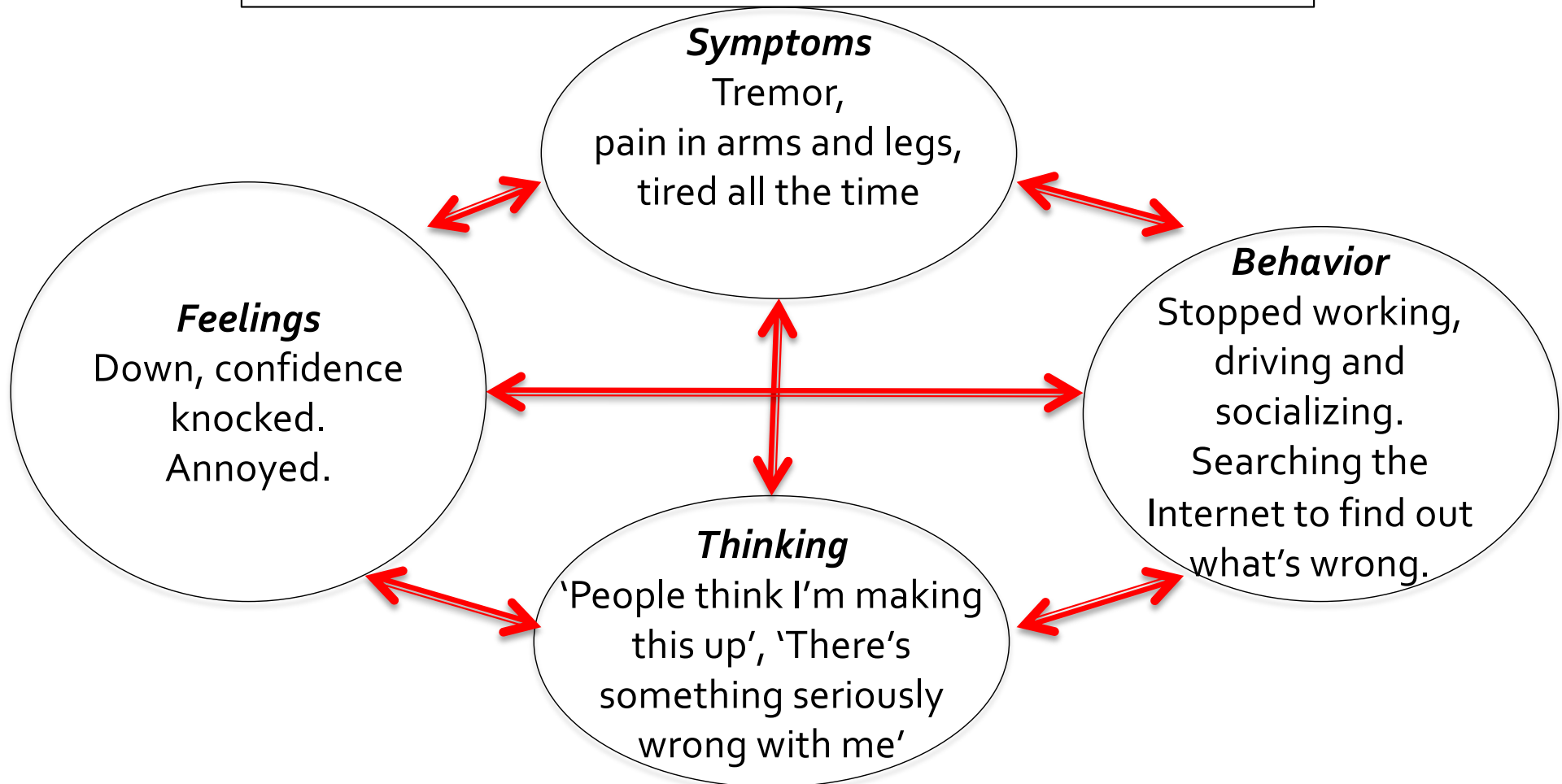
CBT: cognitive behavioral therapy; DBT: dialectical behavioral therapy; PIT: Psychodynamic interpersonal therapy; EMDR: eye movement desensitization and reprocessing; MBT: Mindfulness-based therapy; PE: prolonged exposure; QOL = Quality of life; ReACT: retraining and control therapy; FS: functional seizures; FND: functional neurological disorders; FMD: functional movement disorders.

Cognitive Behavioral Principles in FND



Situation, relationship, resources and practical problems

Good marriage; husband, mother and father supportive; income currently reduced

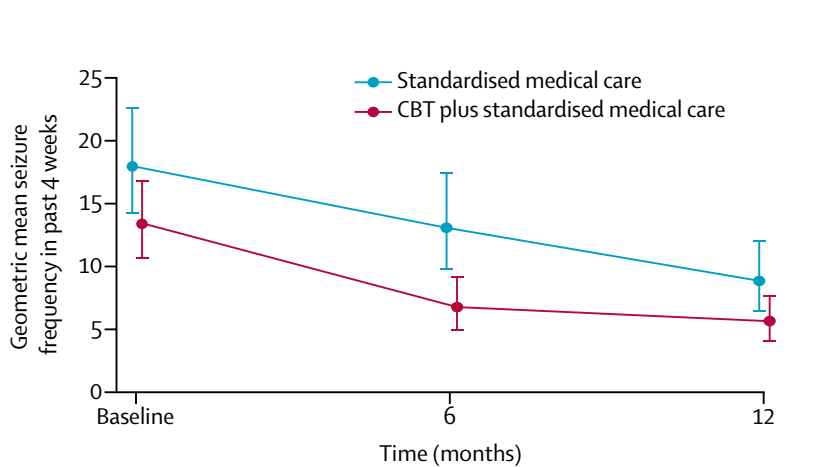




Cognitive Behavioral Therapy for Functional Seizures

- Multicenter, randomized controlled trial across the UK (27 sites).
- 368 adults with FS randomized to receive CBT + standardized medical care or SMC alone (2 neuro + 4 psych appts)

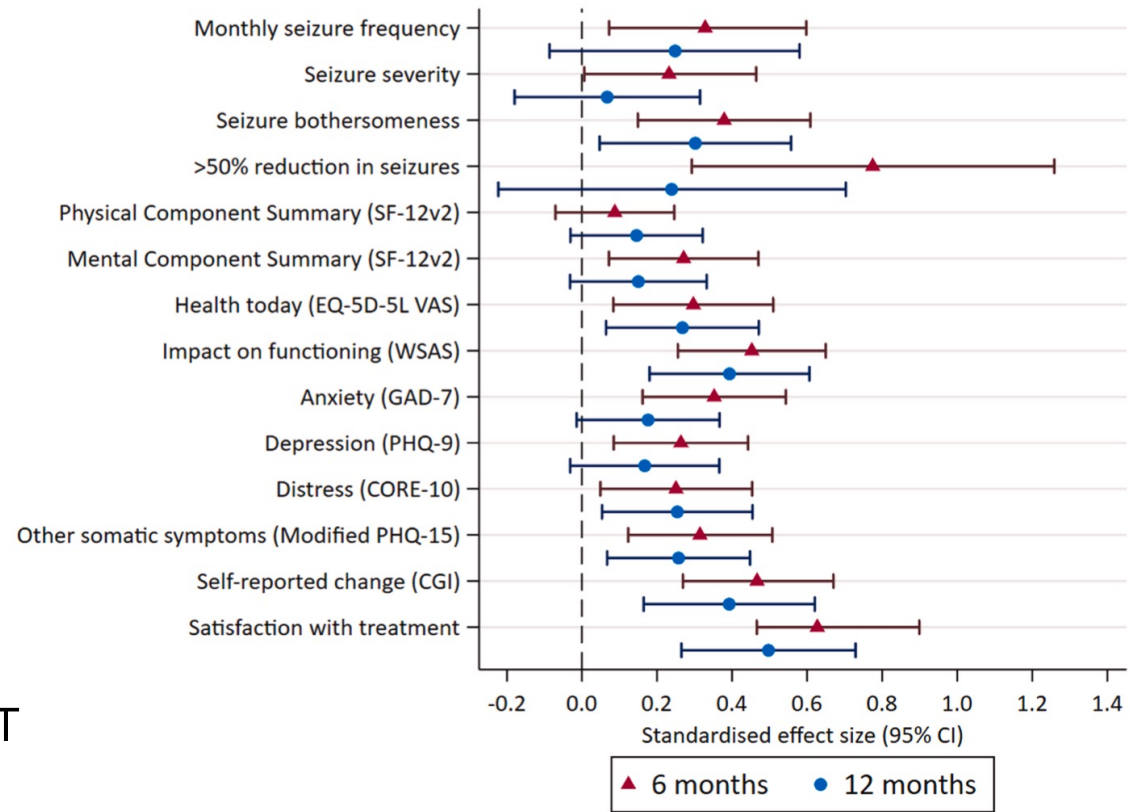
Changes in mean sz frequency over time



-20% in CBT vs 12% in SMC in remission
-68% reduction in sz freq at 12 mo in CBT
vs 63% reduction in SMC

Goldstein et al, *Lancet Psychiatry*, 2020

Standardized effects sizes at 6 and 12 months (between arm differences)



Goldstein et al, *Seizure*, 2022

Manualized mindfulness-based psychotherapy for FS

MODULE I: UNDERSTANDING YOUR DISEASE AND YOUR TREATMENT

- Session 1: Understanding Your Illness
- Session 2: Identifying the function of the symptom
- Session 3: Identifying values

MODULE II: STRESS MANAGEMENT STRATEGIES

- Session 4: Understanding the stress cycle
- Session 5: Mastering a stress management skill

MODULE III: MINDFULNESS

- Session 6: Introduction to mindfulness
- Session 7: Incorporating mindfulness into everyday life

MODULE IV: EMOTION MANAGEMENT

- Session 8: Emotion Recognition
- Session 9: Emotion Acceptance
- Session 10: Regulation of emotion-driven behavior

MODULE V: REWORKING COGNITIONS & RELAPSE PREVENTION

- Session 11: Reworking cognitions
- Session 12: Relapse Prevention

ASSESS COMMITMENT TO CHANGE



LOWER BASELINE HYPERAROUSAL

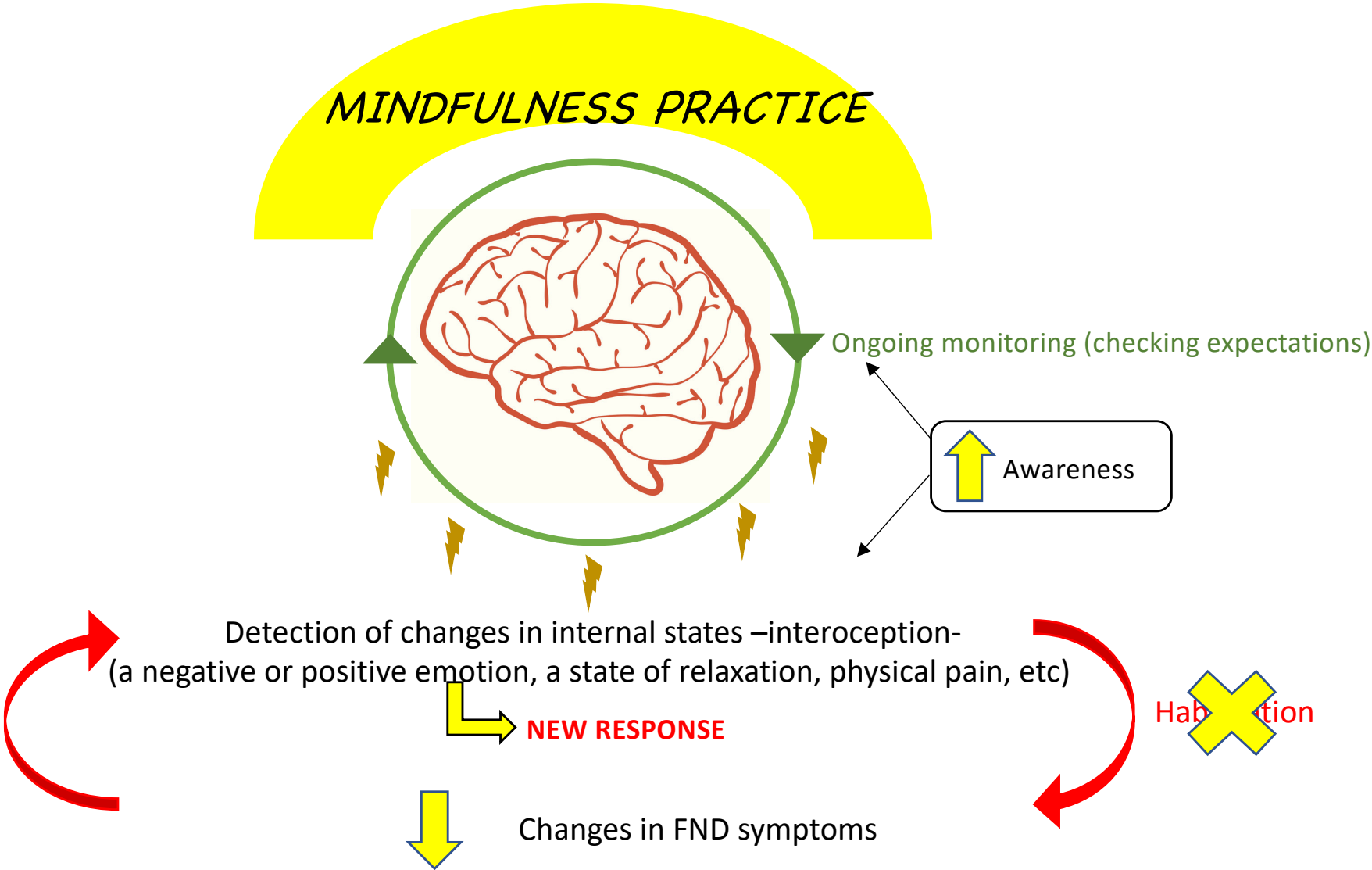


TRAIN THE 'PRESENT MOMENT AWARENESS' MUSCLE



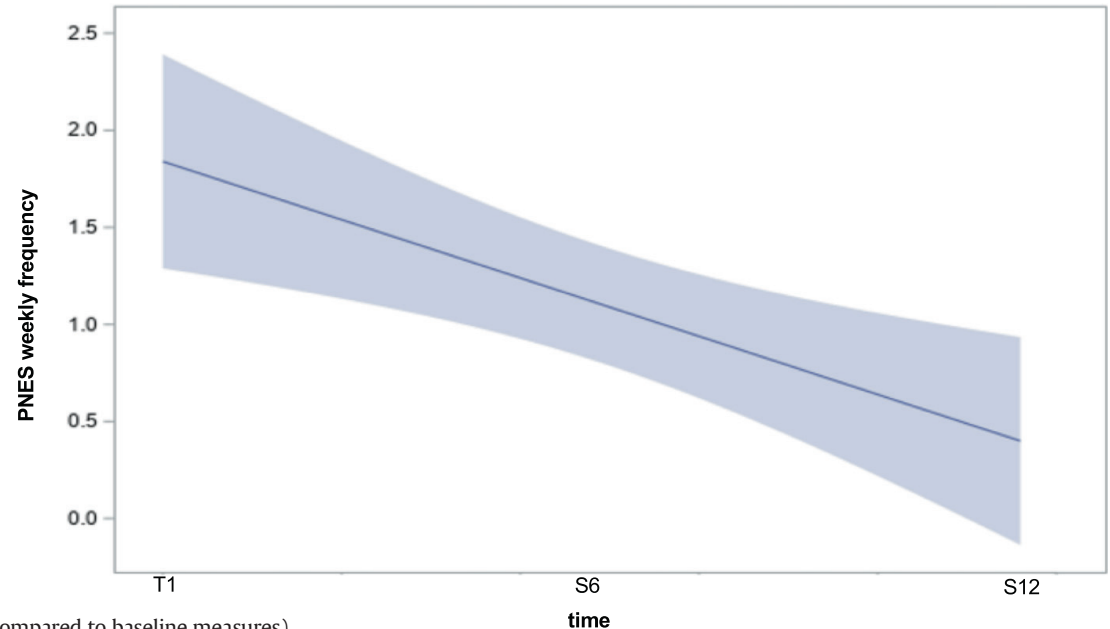
USE AWARENESS TO RELATE MORE EFFECTIVELY TO THOUGHTS AND FEELINGS

How (do we think that) mindfulness practice change FND symptoms?



Mindfulness-based psychotherapy for FS

- N= 26
- 70% with 50% reduction in frequency at treatment end
- 50% with no events in last session at treatment end
- At 3- to 6-month post-tx follow-up (n=14), 93% still had lower frequency than at baseline (and 50% further improved from end of treatment).



Changes in PNES intensity and duration and in quality of life (end of treatment compared to baseline measures).

	T1 mean (SD)	T2 mean (SD)	T3 mean (SD)
PNES intensity	5.56 (2.14)	3.92 (2.69)*	3.74 (2.65)#
QOLIE-10	2.59 (0.73)	2.40 (0.76)	2.14 (0.77)*

Statistical significant reductions from baseline scores are indicated with * for p < 0.01 and # for p < 0.05. QOLIE-10: Quality of Life in Epilepsy-10.

Baslet et al, *Epilepsy and Behavior*, 2020

	T1 median (min-max)	T3 median (min-max)	T3 vs. T1 diff (min-max)	T4 median (min-max)	T4 vs. T1 diff (min-max)
Weekly frequency	1.75 (0-66.5)	0.16 (0-57.6)	-1.02 (-24.5, 10.7)*	0.29 (0-56.0)	-1.25 (-17.5, 0.5)*

	T0	T1 mean (sd)	T3 mean (sd)	T3 vs. T0 diff (95%CI)	T3 vs. T1 diff (95%CI)	T4 mean (sd)	T4 vs. T0 diff (95%CI)	T4 vs. T1 diff (95%CI)
Number of days per week ^a		1.38 (0.85)	1.01 (0.84)		-0.37 (-0.69, -0.05)*	0.70 (0.68)		0.75 (-1.15, -0.35)*
PNES intensity		5.96 (1.99)	3.74 (2.65)		-2.21 (-3.44, -0.99)*	2.92 (2.81)		-2.94 (-4.42, -1.46)*

Baslet et al, *Epilepsy and Behavior*, 2021

Long-term outcomes: FS

Study	n	Method	Follow up period	Cont events in last year*	On ASM	Unemployed/ disabled	Psych morbid	Other functiona l sx's
Meierkord et al., 1991	110	Face to face	Mean 5 years	60%	n/a	20%	n/a	n/a
Selwa et al., 2000	57	Phone	19 months – 4 years	59.6%	32%, PNES only	n/a	39%	n/a
Lancman et al., 1993	63	Face to face	Mean 5 years	74.6%	n/a	n/a	n/a	n/a
Reuber et al., 2003	148	Postal	1-10 years	71.2%	40.7%, PNES only (79% cont events)	53.8%	n/a	n/a
Jones et al., 2010	61	Postal	<10 years	83%*	39%, all patients (8% with epilepsy)	n/a	52.6%	72.9%
Duncan et al., 2014	75	Postal	5-10 years	61%*	n/a	29.3% in paid employment	26.5%	n/a
Walther et al, 2019	52	Face to face	1-16 years	63%*	n/a	n/a	n/a	n/a
Asadi Pooya et al, 2018	86	Phone	4-9 years	45%*	n/a	n/a	n/a	n/a

FS: Functional Seizures
 ED: Emergency Department
 ASM: Anti-seizure medication

Long-term effects of psychotherapy at 24 months - Denmark

	Inclusion	End of treatment	Follow-up	
			12 months	24 months
Number of participants	42	42	42	32
Number of seizures/month	4 (1.25–11.5)	0.75 (0–2.75)*	0 (0–1)*	0.04 (0–2.75)*
Number of patients without seizures	0	19	22	16
>50% reduction in number of seizures	–	15	13	10
<50% reduction in number of seizures or unchanged	–	5	4	4
Number of patients with increased number of seizures	–	3	3	2

Data (seizure frequency) are expressed as median with interquartile range.

* Indicates levels of significance compared with number of seizures at inclusion ($p < 0.0001$).

Table 4
HCU before and after treatment.

	Before 24–13	Before 12–0	After 0–12	After 13–24
All visits	3.9	7.9	6.26	2.97
Median (IQR)	2 (1–6)	5 (4–9)	2 (1–8)	1 (0–3)
ED All causes	0.41 ± 0.79	01.51 ± 1.8	0.44 ± 0.64	0.36 ± 0.67
ED Seizures	0.15 ± 0.49	1.1 ± 1.64	0.05 ± 0.22	0.05 ± 0.32
ED Pain	0.18 ± 0.51	0.26 ± 0.55	0.28 ± 0.51	0.28 ± 0.56
ED Other	0.08 ± 0.35	0.15 ± 0.49	0.1 ± 0.31	0.08 ± 0.35
Department of Neurology	1.85 ± 2.77	3.9 ± 4.24	1.05 ± 1.73	0.54 ± 1.12
Department of Psychiatry	0.05 ± 0.22	1.18 ± 6.08	2.77 ± 10.4	0.79 ± 3.78
Other departments	1.67 ± 2.85	1.51 ± 2.27	2.54 ± 4.65	1.26 ± 2.07
Total hospital admission days (range)	60 (0–24)	119 (0–36)	97 (0–88)	28 (0–14)

Number of healthcare contacts expressed as mean ± SD, in parentheses, before and after psychotherapeutic intervention. All visits shown with mean and median IQR = interquartile range, 25th and 75th percentile. Healthcare utilization of all patients was acquired from the regional medical record system.

ED = Emergency Department

The 24-month pretreatment costs compared with the 24-month posttreatment costs directly associated with seizures dropped by 95.8%, and total healthcare costs were reduced by 63%.

Deleuran et al, *Epilepsy Beh*, 2019

Physiotherapy in motor FND: Principles

- ▶ **Limited 'hands-on' treatment.** When handling the patient, **facilitate rather than support.**
- ▶ **Encourage early weight bearing.** 'On the bed strength' will not usually correlate with ability to stand in functional weakness.
- ▶ **Foster independence and self-management.**
- ▶ Goal directed rehabilitation **focusing on function and automatic movement** (eg, walking) **rather than the impairment** (eg, weakness) and controlled ('attention-full') movement (eg, strengthening exercises).
- ▶ **Avoid use of adaptive equipment and mobility aids** (though these are not always contra-indicated).
- ▶ **Avoid use of splints and devices that immobilize joints.**
- ▶ **Recognize and challenge unhelpful thoughts and behaviors.**

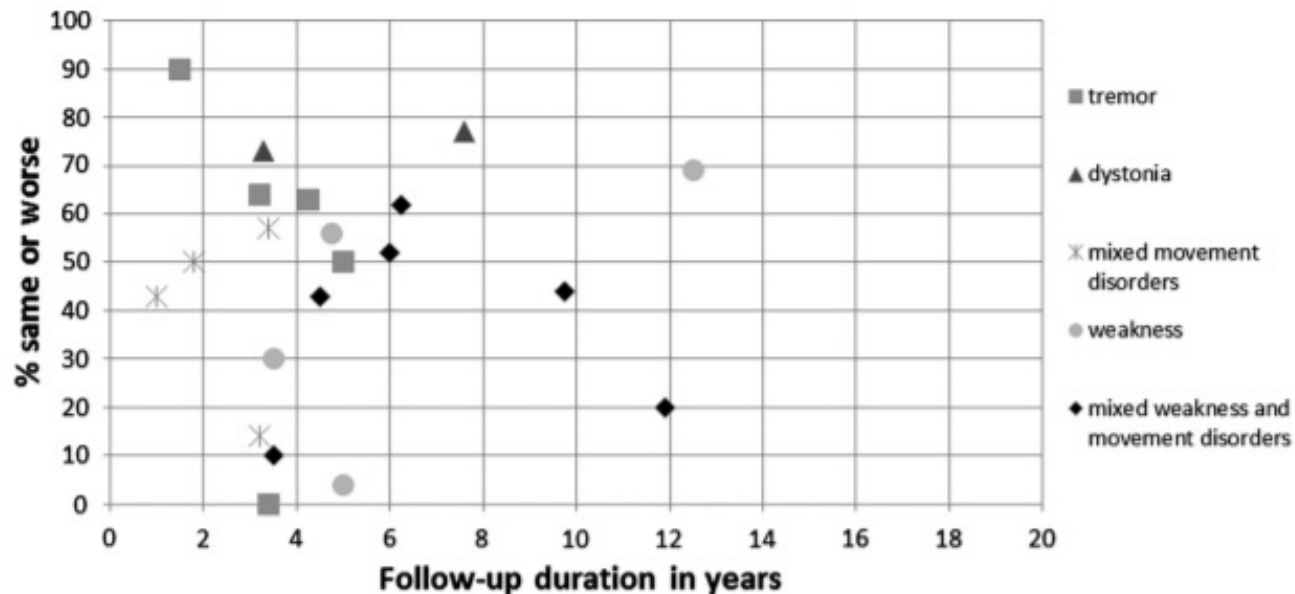
Physiotherapy: RCT of 5-day program outcomes at 6mo

Table 2 Continuous outcome measure scores at baseline and 6-month follow-up

	Intervention group Mean (SD)		Control group Mean (SD)		Regression coefficient for group, baseline as covariate (95% CI)	Cohen's d
	Baseline	Follow-up	Baseline	Follow-up		
SF36 domains						
Physical function	34.8 (23.7)	51.9 (27.2)	23.7 (19.0)	23.2 (21.3)	19.8 (10.2 to 29.5), p<0.001	0.70
Physical role	31.7 (28.9)	47.0 (30.3)	19.4 (21.7)	26.8 (22.5)	13.0 (0.8 to 25.2), p=0.037	0.46
Bodily pain	45.6 (33.5)	47.4 (33.1)	32.1 (25.3)	33.9 (27.4)	3.6 (−8.0 to 15.3)	0.12
General health	47.3 (23.9)	54.1 (28.3)	40.7 (23.4)	39.6 (22.6)	9.0 (−0.1 to 18.2)	0.34
Vitality	32.3 (21.4)	39.2 (27.3)	26.6 (17.6)	28.3 (20.2)	6.2 (−3.6 to 15.9)	0.25
Social function	39.7 (33.2)	56.9 (30.2)	34.4 (29.8)	37.0 (25.1)	17.1 (5.0 to 29.2), p=0.007	0.58
Role emotional	70.1 (29.5)	68.7 (34.5)	61.0 (32.6)	62.5 (35.4)	0.1 (−15.1 to 15.4)	0.00
Mental health	65.5 (21.1)	67.9 (23.8)	58.4 (23.8)	59.3 (25.2)	3.4 (−6.4 to 13.2)	0.14
Physical Summary score	33.1 (11.1)	38.7 (10.8)	28.7 (7.9)	29.5 (9.2)	5.9 (2.1 to 9.7), p=0.003	0.54
Mental Summary score	45.2 (13.0)	45.9 (13.6)	42.6 (13.3)	43.3 (14.2)	0.9 (−4.9 to 6.8)	0.06
HADS anxiety	6.5 (3.8)	6.9 (4.8)	7.7 (4.9)	7.9 (5.6)	−0.1 (−2.1 to 2.0)	−0.02
HADS depression	5.4 (4.0)	5.2 (3.9)	8.0 (4.5)	8.4 (5.0)	−1.4 (−3.2 to 0.5)	−0.30
WSAS	24.7 (7.9)	20.2 (10.5)	27.6 (7.5)	26.9 (10.2)	−4.2 (−8.4 to 0.1)	−0.39
Berg Balance Scale	39.0 (13.8)	47.7 (13.8)	35.7 (13.2)	37.0 (14.7)	8.0 (2.9 to 13.1), p=0.003	0.53
10 m walk time*	16.8 (10.0)	9.6 (3.8)	24.6 (17.3)	19.0 (10.6)	−6.7 (−10.7 to −2.8), p=0.001	−0.72
Functional Mobility Scale	11.7 (4.1)	14.5 (3.5)	10.0 (3.6)	10.0 (3.9)	3.4 (1.9 to 5.0), p<0.001	0.79
DASH	51.8 (19.6)	39.6 (25.6)	51.2 (15.0)	48.1 (21.4)	−9.1 (−17.4 to −0.8), p=0.031	−0.38
B-IPQ composite score	50.0 (10.8)	39.4 (16.1)	54.6 (10.6)	51.0 (13.0)	−8.0 (−14.4 to −1.6), p=0.015	0.51

*Two outliers removed from the intervention group (baseline times of 197 and 182 s). Removing these outliers decreased the treatment effect by 1.4 s. Higher scores represent better health in the SF36, Berg Balance and Functional Mobility Scale. Higher scores represent worse health for HADS, Work and Social Adjustment, 10 m timed walk and DASH. DASH, Disabilities of Arm Shoulder and Hand; HADS, Hospital Anxiety and Depression Scale; WSAS, Work and Social Adjustment Scale.

FMD prognosis in the outpatient setting



- 24 studies, average f/u 7.4 years, 40% same or worse (range 10-90%), 20% complete remission
- Positive predictive factors: short symptom duration, early dx, positive health care exp

FMD prognosis in the inpatient setting

- Functional stroke mimics most common motor FND (Gargalas 2017; Cock 2018)
 - ~8% of acute presentations of stroke
 - >young and F, +weakness, speech
- Outcomes for functional stroke mimics (Simhan 2020):
 - 30% → 63% good mRS or NIHSS \leq 1 at hosp dc or f/u
 - Acute presentation, more prompt dx, may lead to better outcomes



Contents lists available at [ScienceDirect](#)

Journal of Psychosomatic Research



Review

Physiotherapy for functional (psychogenic) motor symptoms: A systematic review



Glenn Nielsen ^{a,*}, Jon Stone ^b, Mark J Edwards ^c

- 1 controlled intervention + 28 case series (n=373)
- Typically PT in the context of MDT, included inpt, outpatient, intensive multidisciplinary.
- Improvements in 60-70% of cases including some studies with long-term follow-up

Outpatient rehab for FMD



MASSACHUSETTS
GENERAL HOSPITAL

- Retrospective cohort study (n=50)
- Outcomes analyzed over 4 months
 - Mean illness duration = 5.1 years
 - Weekly PT, # in 4 months = 6.5 sessions (4.3 SD)
 - 13 total discontinued treatment prior to discharge
 - 10 completely asymptomatic, 7 markedly improved
 - Positive correlation between # of sessions and clinical improvement

FMD outpatient day programs in the US



- 5 days (M-F)
- PMR screening; PT (2xdaily), OT (2xdaily), SLP (daily if needed), psychologist (once)

➔ 73.5% remission or near 60% at 2 yrs (Czarnecki 2012)



- 5 days (M-F)
- PT (daily), OT (daily), SLP (daily if needed), psychologist (daily)

➔ 86.7% at discharge
69.2% at 6 month follow-up (Jacob 2018)



- 8-12 sessions over 3wks
- PMR (beginning and end), rehab psych (6x), PT (4x/wk), OT (3x/wk), SLP (2x/wk), patient care coordinator

Inpatient Treatment of Functional Neurological Disorder: A Scoping Review

Gabriela S. Gilmour , *Jessica D. Jenkins*

- 34 articles met inclusion criteria, 11 acute presentations, 16 chronic presentations
- Rehabilitation + psychotherapy in most cases
- Most reported partial or complete resolution of symptom, mostly persisting in f/u
- Those with shorter duration of symptoms had better outcomes
- LOS mean 24.4 days

Treatment in FND is multidisciplinary



ELSEVIER

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 

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 Edwards¹

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 



OPEN ACCESS

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 Edwards¹

Key features:

- 1) Education
- 2) Demonstration that normal movement can occur
- 3) Retraining movement w/ diverted attention
- 4) Changing maladaptive behaviors related to symptoms

Box 1 General treatment principles for physiotherapy for functional motor disorder (FMD)

- ▶ Build trust before challenging/pushing the patient.
- ▶ Project confidence making it clear that the physiotherapist knows about FMD.
- ▶ Create an expectation of improvement.
- ▶ Open and consistent communication between the multidisciplinary team and patient.
- ▶ Involve family and carers in treatment.
- ▶ Limited 'hands-on' treatment. When handling the patient, facilitate rather than support.
- ▶ Encourage early weight bearing. 'On the bed strength' will not usually correlate with ability to stand in functional weakness.
- ▶ Foster independence and self-management.
- ▶ Goal directed rehabilitation focusing on function and automatic movement (eg, walking) rather than the impairment (eg, weakness) and controlled ('attention-full') movement (eg, strengthening exercises).
- ▶ Minimise reinforcement of maladaptive movement patterns and postures.
- ▶ Avoid use of adaptive equipment and mobility aids (though these are not always contra-indicated).
- ▶ Avoid use of splints and devices that immobilise joints.
- ▶ Recognise and challenge unhelpful thoughts and behaviours.
- ▶ Develop a self-management and relapse prevention plan.

(Nielsen 2015)

PT Interventions

Neuropsychiatry



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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 Edwards¹

Table 3 Examples of techniques for specific symptoms to normalise movement

Symptom	Movement Strategy
Gait disturbance	<p>Speed up walking (in some cases, this may worsen the walking pattern)</p> <p>Slow down walking speed</p> <p>Walk by sliding feet forward, keeping plantar surface of foot in contact with the ground (ie, like wearing skis). Progress towards normal walking in graded steps</p> <p>Build up a normal gait pattern from simple achievable components that progressively approximate normal walking. For example—side to side weight shift, continue weight shift allowing feet to 'automatically' advance forward by small amounts; progressively increase this step length with the focus on maintaining rhythmical weight shift rather than the action of stepping</p> <p>Walk carrying small weights/dumbbells in each hand</p> <p>Walking backwards or sideways</p> <p>Walk to a set rhythm (eg, in time to music, counting: 1, 2, 1, 2...)</p> <p>Exaggerated movement (eg, walking with high steps)</p> <p>Walking up or down the stairs (this is often easier than walking on flat ground)</p>

OT Interventions

Occasional essay

Occupational Therapy Consensus Recommendations for Functional Neurological Disorder (Long Version)

Clare Nicholson,¹ Mark J Edwards,² Alan 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 McGregor,¹¹ Glenn Nielsen,² Louise Oakley,¹² Jason Price,¹³ Jessica Ranford,⁹ Jasbir Ranu,¹ Ed Sum,¹⁴ Jon Stone³

Table 5 Examples of intervention strategies for functional movement symptoms

Symptom	Intervention Strategy
Functional Tremor	<ul style="list-style-type: none">- Superimpose alternative, voluntary, 'rhythms' on top of the existing tremor and gradually slowing all movement to a complete rest.- Unilateral tremor: use the unaffected limb to dictate a new rhythm (eg, tapping/opening and closing the hand), that is entrain the tremor to stillness.¹² Music can be introduced to dictate a rhythm to follow.- Assist the person to relax the muscles in the limb to prevent co-contraction.- Try to control a tremor with the person at rest, before moving on to activity.- Use of gross rather than fine movements (which take more concentration) eg, handwriting retraining; using a marker and large piece of paper or white board with big lettering or patterns / shapes rather than trying to focus on 'normal' handwriting.- Discourage co-contraction or tensing of muscles as a method to suppress a tremor, as this is unlikely to be a helpful long-term strategy.

SLP Interventions

General neurology

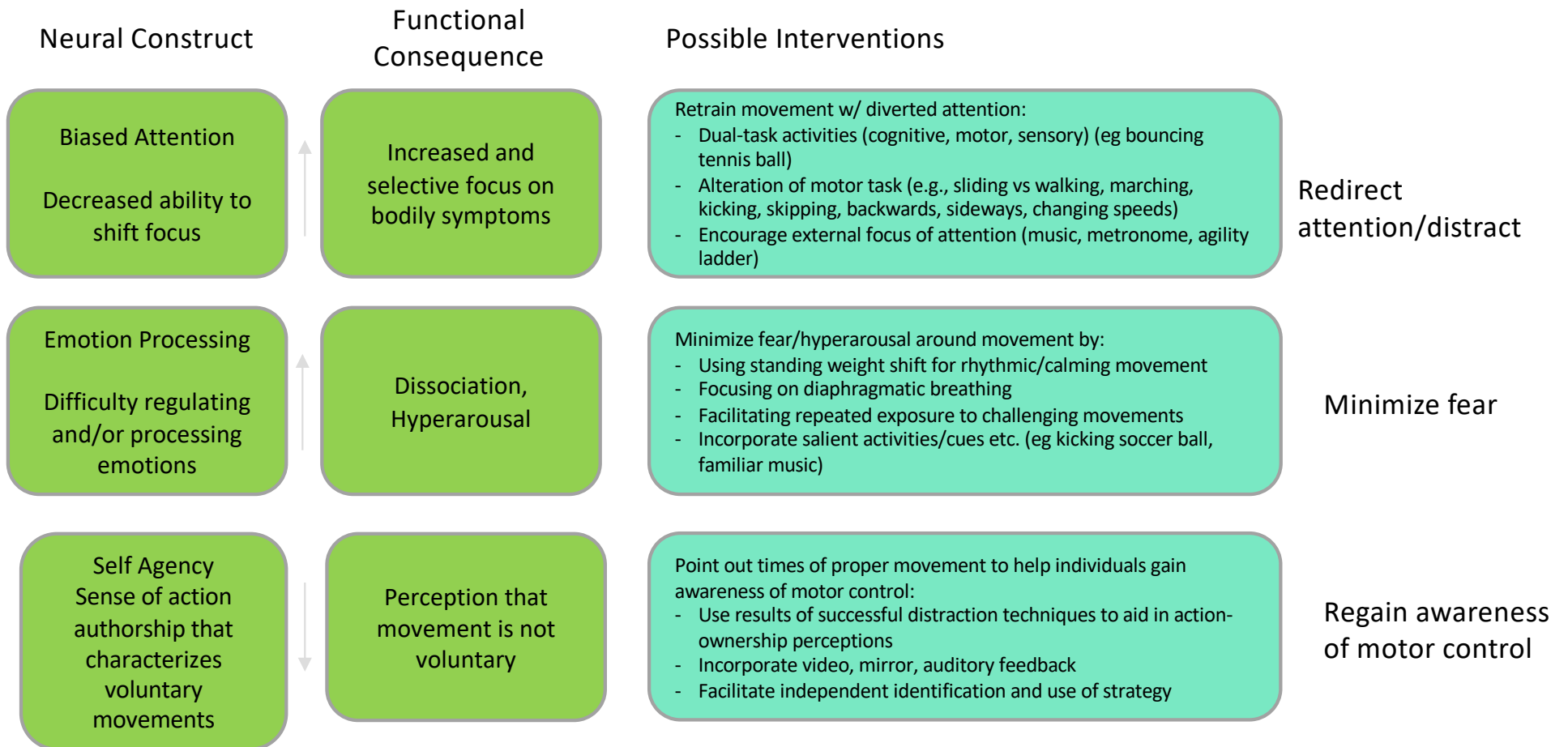
Review

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

Table 5 Treatment of functional articulation disorders

Domains of intervention	Examples of possible strategies
Education and explanatory	<ul style="list-style-type: none"> ▶ Reassurance regarding nature of symptoms and good prognosis for resolution. ▶ General principles already discussed as for functional voice and fluency including their understanding of diagnosis, the rationale for current diagnosis. ▶ Education about how we actually speak vs how we think we speak for example, we do not necessarily pronounce words according to spelling.
Symptomatic	<ul style="list-style-type: none"> ▶ Reduction of excessive musculoskeletal tension in speech and non-speech muscles often associated with articulation: in head, neck, shoulders, face and mouth. ▶ Where there is functional facial weakness, spasm, or trismus, collaborative treatment with physiotherapy or occupational therapy may be helpful. ▶ Eliminate secondary or accessory movements which may involve the patient doing something differently, which acts as a distraction, later to be faded out as speech normalises. ▶ Focusing on normal movements and sounds, distracting from abnormal sounds, etc. ▶ Dual tasking while speaking as form of distraction. ▶ Invite non-speech articulation such as singing. ▶ Introduce skills in 'mindfulness' during oromotor tasks as a way of maintaining focus on easy, smooth movements where possible. ▶ Slow speech down or elongate a sound rather than building tension around it, which can be explained as 'resetting the system'. ▶ Use nonsense words or syllable repetitions as way to demonstrate potential for 'normal' function. ▶ Advance communication with higher cognitive linguistic content in hierarchical fashion (similar to the strategies for functional voice and stuttering). ▶ Redirect patient focus on speech to other topics, monitoring if speech improves and in which contexts. ▶ If functional voice or fluency problems are also present the treatment of a single communication problem may result in resolution of all communication symptoms.

Understanding and Targeting the Underlying Mechanisms



Rehabilitative Strategies

Rhythmic stimulation applied to a functional gait disorder

Baseline

Rhythmic stimulation

Carryover

(Hebb 2022)

Take-home messages

- FND are common in neurological practice.
- Our understanding of FND has expanded in recent years with increasing identification of neurobiological and cognitive processing mechanisms.
- Evidence-based treatment for FND is limited but slowly growing.
- Ongoing communication between patient, clinicians, families, supports is an essential part of the treatment.



JOIN US
Because the FND picture needs you



Membership

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<https://www.fndsociety.org/membership>

First year free for trainees

Education/webinars available to members

Verona, Italy June 8-11, 2024 Next International FNDS Meeting