Update on Functional Movement Disorders

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Disclosures

• No conflicts of interest to disclose
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Goals

• A whirlwind 30-minute tour of:
  • What a functional movement disorder (FMD) is, and is not
  • Advances in our understanding of FMD pathophysiology
  • FMD etiology: Predisposing, Precipitating, & Perpetuating factors
  • How FMD pathophysiology informs diagnosis and treatment
  • A transdisciplinary treatment approach to FMD
A Clinical Lesson at the Salpêtrière
(Une leçon clinique à la Salpêtrière, André Brouillet, 1887)

Fahn S, Olanow CW. “Psychogenic movement disorders”: they are what they are. Mov Disord 2014;29:853-856.
What is an FMD?

• “A movement disorder that is:
  • Significantly altered by distraction or non-physiological maneuvers (including dramatic placebo response)
  • Clinically incongruent with movement disorders known to be caused by neurological disease”

• “Functional motor disorder (FMD) can be defined as neurological symptoms affecting movement that are caused by loss of control or agency over movement, rather than a structural disease process.”

• DSM 5 criteria for Conversion Disorder (Functional Neurological Symptom Disorder) no longer requires temporal relationship between psychological factors and the onset of neurological symptoms
Examples of positive “rule-in” signs of FMD/functional limb weakness

- **General signs**
  Distractibility
  Variability (e.g., difference in symptom severity between history taking and examination)
  Suggestibility

- **Gait**
  Dragging monoplegic gait
  Knee buckling
  Noneconomic posture

- **Tremor**
  Variability
  Distractibility
  Entrainment
  Spread of tremor to another body part if the tremor is restrained (“Whack a Mole” sign)

- **Jerks**
  Predominantly axial
  Distractibility
  Variability

- **Parkinsonism**
  Excessive slowness without loss of amplitude
  Increased tone without cogwheel rigidity
  Concurrent functional tremor

- **Dystonia**
  Fixed posture (typically hand flexion with sparing of digits 1 and 2 or fixed ankle inversion)
  Lack of sensory trick/geste antagoniste

- **Tics**
  No voluntary suppression
  No or atypical/incomplete premonitory urge
  Movements not stereotypical

- **Weakness**
  Hoover sign/hip abductor sign
  Spinal Injuries Center sign
  Asymmetry of head rotation
  Arm drift without pronation
  Giveaway/collapsing and/or global pattern of weakness

What FMD is not…

“What Functional Neurological Disorder is REAL…and NOT imagined.”

Professor Jon Stone, Edinburgh.
www.neurosymptoms.org (patient education website)

So WHY do some people develop FMDs and others do not?

HOW do those with FMD experience movements that appear voluntary as involuntary?

WHAT should we say and do to help patients with FMD?
How?
Abnormalities of several constructs (and their associated neural circuits) can interact in different ways to produce symptoms and observable signs of FND.

Display of brain circuits (and related constructs) that are emerging as important in the pathophysiology of FND

Emotion Processing

Psychosocial adversity
- Adverse life events (e.g., abuse, other trauma)
- Chronic stress
- Relationship dysfunction
- Maladaptive learning

Biological vulnerability
- Genetics
- Physical adversity (i.e., illness, injury)
- HPA-axis dysfunction
- Aberrant developmental neuroplasticity (e.g., PFC, AMG)

Altered emotional processing
- Attentional bias to affective stimuli (AMG hyperactivity)
- Inaccurate interoception of affect (AMG-INS/ACC pathways)
- Disrupted emotion regulation (PFC-limbic pathways)

Affective hyperarousal & heightened responsivity
- Limbic (AMG) hyperactivity
- Excess glucocorticoid release

Impaired awareness of behavioural / motor / sensory processes
- Insula / ACC / temporo-parietal pathways

Impaired cognitive control of behavioural / motor / sensory processes
- AMG – dIPFC/OFC/ACC & dIPFC/ACC-motor pathways

Automatic activation of behavioural / motor / sensory processes
- AMG – SMA/PMA, cerebellum, PAG, HYP pathways

Emotion Processing

FND shown to experience:
- Increased emotional reactivity
- Heightened arousal and avoidance
- Impaired top-down emotion regulation
- Amplification of FND sx during negatively valenced or psychologically-threatening mood states
- Deficits in emotional awareness/alexithymia
- Aberrant salience processing
- Errant activation of learned/innate defensive responses


Self Agency

Ability to exert and perceive control over one’s own actions

When a movement is generated:

- The rest of the brain is notified by a feedforward signal.
- When movements happen, there is feedback through various sensory experiences about the movement.
- If the feedback matches the feedforward, then there is a sense of causality and self-agency.
- Impaired in FMD

Attention to self in psychogenic tremor

Mean percentage of visual attention for patients with psychogenic tremor and organic tremor

Interoception

• “the process by which the nervous system senses, interprets, and integrates signals originating from within the body, providing a moment-by-moment mapping of the body’s internal landscape across conscious and unconscious levels.”

• Shown to be impaired in FND

• Impaired interoception related to dissociation in FND

Perceptual Inference & Predictive Processing

![Graph showing number of draws to decision for patients and controls.]

Isabel Pareés et al. *J Neurol Neurosurg Psychiatry* 2012;83:460-463
Schematic illustration of the psychodynamic conversion model

A putative neural signal of a “conversion” process in functional neurological disorders

FMD Etiology: Why?

Predisposing
- Genetics
- Personality
- Adverse Childhood Experiences
- Symptom modeling
- Female gender?

Precipitating
- Physical injury
- Psychological trauma
- Life stressor

Perpetuating
- Plastic CNS changes
- Deconditioning
- Psychiatric disorders
- Illness beliefs
- Social benefits

- Stress vs Stressor
Why?
A stress-diathesis model of FND


Figure 1: Summary of meta-analysis of stressors in childhood and adulthood in conversion (functional neurological) disorder including subgroup analyses.

Figure 2: Summary of meta-analysis of adult stressful life events in conversion (functional neurological) disorder including sensitivity analysis by nature and duration of life event period assessed.
Diagnosis

• Take the patient seriously
• Give the problem a diagnostic label
• Explaining the rationale for the “rule-in” diagnosis
  • Demonstrate positive exam signs
• Some discussion of HOW symptoms arise
  • i.e. hardware versus software analogy, pathophysiological mechanisms may be useful
• Emphasis on reversibility and effective triage for treatment; Retraining
“Disorder of Communication”

- Aberrant communication at many levels:
  - Disordered messaging between brain, mind and body that results in functional movement symptoms
  - FMD symptoms as communication of embodied distress
  - Difficulty recognizing maladaptive thoughts and communicating emotion (alexithymia)
  - Often a breakdown of healthy communication in interpersonal (and clinical/therapeutic) relationships
  - Tx process of guiding patient in acquiring healthy communication (language/thoughts/retraining of brain & body) skills to improve agency, emotional regulation, and function
CBT Formulation

Environment/Relationships

Thoughts

Physical Reactions

Moods

Behaviors
(A) Box-whisker plots visually summarize the distribution of responses before and after CBT.

(B) Distribution of response categories based on change in Rating Scale for Psychogenic Movement Disorders (PMDRS) score after CBT.

Figure 2: Differences in fMRI activation for the basic-emotion task

(A) Differences between participants with functional tremor (FT) and healthy controls (HCs). Regions in red showed greater activation in FT.

(B) Region over which small volume correction was implemented.

(C) Changes from before CBT to after CBT in patients with FT.

Regions in red showed greater activation before CBT that decreased after CBT. ROI = region of interest.

A strong correlation was found between Hamilton Depression Scale (HAMD) scores and changes in activation, before cognitive behavioral therapy to after CBT, in the anterior cingulate/paracingulate region ($r^2 = 0.56$, $p = 0.008$) among those patients with FT who responded to CBT therapy.
Physiotherapy Tx- Czarnecki et al., 2012 (Mayo Clinic)

- 60 consecutive pts with FMD vs 60 historical matched FMD controls w/o PT
- Outpatients PT twice daily for 5 consecutive days
- Focused on relearning normal motor programs
- At one week, 69% reported markedly improved or remission
- At two years, 60% in intervention group better or in remission vs. 22% of controls
MOtor REtraining (MORE) for FMD

• One-week, multidisciplinary inpatient treatment program with
• 32 consecutive FMD patients admitted to program
• Daily physical, occupational, speech therapy, and psychotherapy interventions
• At discharge, 86.7% of patients reported symptom improvement on the CGI
• Self-reported improvement was maintained in 69.2% at the 6-month follow-up.
• PMDRS scores improved by 59.1% from baseline to discharge.

Also see:
(+ five day randomized inpatient feasibility study now with ongoing RCT in UK- www.physio4fmd.org)
Physiotherapy principles in 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 (e.g. walking) rather than the impairment (e.g. weakness) and controlled (“attention-full”) movement (e.g. 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 et al., 2014 (expert consensus)
OPTIMAL Theory: Restoring Self Agency to Movement

Focus on movement GOALS rather than Internal bodily focus

Vicarious Experiences
Social Comparison
Positive Normative Feedback

Giving the Learner choices!
“Let’s” and “Us”

(Slide adopted from Carly Lochala PT, DPT @OHSU)
Integrated Therapy for FMD

Resources

• Functional Neurological Disorder Society (FNDS): www.fndsoociety.org

• www.neurosymptoms.org
  • Self Help website for patients with functional neurological disorder/symptoms

• www.fndhope.org
  • Patient-run “charitable organization promoting awareness and support for individuals and carers affected by Functional Neurological Disorder”

• Feel free to e-mail me directly at mack@ohsu.edu