Functional Neurological Disorders: The Art and the Science

David L. Perez MD, MMSc
Departments of Neurology and Psychiatry at The Massachusetts General Hospital
Functional Neurological Disorders Clinic
Functional Neurology Research Group
Harvard Medical School
No Disclosures and No Conflicts of Interest
Physicians and Other Clinical Professionals are Uncomfortable Caring for Patients with FND

Neurologists in the psychiatrist’s chair:

Below a neurologist comments on his (her) understanding of Functional Neurological Symptoms:

“Well, I don’t really know....I suppose it may be their way of dealing with problems they can’t solve”

This discomfort in caring for patients with FND actually extends to include psychiatrists, internists, psychologists, social workers, physiatrists, physical and occupational therapists.......
Motor Functional Neurological Disorders

This Lecture Focuses on Motor Subtypes of Functional Neurological Disorder:

• Functional Movement Disorders
• Functional Weakness
• Psychogenic Non-epileptic Seizures
Conversion Disorder (Functional Neurological Symptom Disorder)

- One or more symptoms of altered voluntary motor or sensory function
- Clinical findings provide evidence of incompatibility between the symptom and recognized neurological or medical conditions
  - i.e. Hoover’s Sign, Tremor Entrainment Test
- The symptom or deficit is not better explained by another medical or mental disorder
- The symptom or deficit causes clinically significant distress or impairment in social, occupational, or other areas of functioning
- Modifiers:
  - With weakness or paralysis
  - With abnormal movements
  - With attacks or seizures
  - With anesthesia or sensory loss
- **Association with a psychological stressor and ruling out malinger no longer required**
# Functional Movement Disorder (FMD)

**Table 1 Clues suggesting psychogenic cause**

<table>
<thead>
<tr>
<th>Historical</th>
<th>General examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrupt onset (symptoms often maximal at that time)</td>
<td>Movement inconsistent</td>
</tr>
<tr>
<td>Static course</td>
<td>Variability over time (frequency, amplitude, direction/distribution of movement)</td>
</tr>
<tr>
<td>Spontaneous remissions/cures</td>
<td>Distractibility reduces or resolves, attention increases movement</td>
</tr>
<tr>
<td>Paroxysmal symptoms (generally nonkinesigenic) b</td>
<td>Selective disability</td>
</tr>
<tr>
<td>Psychiatric comorbidities c</td>
<td>Entrainment (especially with tremor)</td>
</tr>
<tr>
<td>Secondary gain (often not apparent)</td>
<td>Movement incongruous with organic movement disorders</td>
</tr>
<tr>
<td>Risk factors for conversion disorder d</td>
<td>Mixed (often bizarre) movement disorders</td>
</tr>
<tr>
<td>Psychological stressors e</td>
<td>Paroxysmal attacks (including pseudoseizures)</td>
</tr>
<tr>
<td>Multiple somatizations/undiagnosed conditions</td>
<td>Precipitated paroxysms (often suggestible/startle)</td>
</tr>
<tr>
<td>Employed in allied health professions (infrequent)</td>
<td>Suggestibility</td>
</tr>
<tr>
<td></td>
<td>Effortful production or deliberate slowness (without fatiguing) of movement</td>
</tr>
<tr>
<td></td>
<td>Self-inflicted injury (caution: tic disorders)</td>
</tr>
<tr>
<td></td>
<td>Delayed and excessive startle response to a stimulus</td>
</tr>
<tr>
<td></td>
<td>Burst of verbal gibberish or stuttering speech g</td>
</tr>
<tr>
<td></td>
<td>False (give-away) weakness</td>
</tr>
<tr>
<td></td>
<td>Nonanatomical sensory loss or spread of movement</td>
</tr>
<tr>
<td></td>
<td>Certain types of abnormal movements common in individuals with PMDs h</td>
</tr>
<tr>
<td></td>
<td>Functional disability out of proportion to examination findings</td>
</tr>
</tbody>
</table>

**Table 2 Diagnostic classification of psychogenic movement disorders**

<table>
<thead>
<tr>
<th>Classification of degrees of certainty in diagnosis a</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Documented b</td>
</tr>
<tr>
<td>Remittance with suggestion, physiotherapy, psychotherapy, placebos, 'while unobserved'</td>
</tr>
<tr>
<td>2. Clinically established b</td>
</tr>
<tr>
<td>Inconsistent over time/incongruent with clinical condition + other manifestations: other 'false' signs, multiple somatizations, obvious psychiatric disturbance</td>
</tr>
<tr>
<td>3. Probable</td>
</tr>
<tr>
<td>Inconsistent/incongruent — no other features</td>
</tr>
<tr>
<td>Consistent/congruent + 'false' neurological signs c</td>
</tr>
<tr>
<td>Consistent/congruent + multiple somatizations c</td>
</tr>
<tr>
<td>4. Possible d</td>
</tr>
<tr>
<td>Consistent/congruent + obvious emotional disturbance c</td>
</tr>
</tbody>
</table>

Gupta & Lang, 2009, Fahn & Williams 1998
Functional Weakness (Paralysis)

**Hoover Sign**:
- ask subject to perform right hip flexion (symptomatic leg) and look for contralateral hip extension in the strong left leg
- if you are able to lift up the left (healthy) leg, this is positive Hoover’s sign (a sign of poor effort)

---

<table>
<thead>
<tr>
<th>Weakness</th>
<th>Positive Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoover sign(^\text{18}) (Figure 15-2)</td>
<td>Hip extension weakness that returns to normal with contralateral hip flexion</td>
</tr>
<tr>
<td>(Supplemental Digital Content 15-3, links.lww.com/CONT/A144)</td>
<td>against resistance</td>
</tr>
<tr>
<td>Hip abductor sign(^\text{18})</td>
<td>Hip abduction weakness returns to normal with contralateral hip abduction</td>
</tr>
<tr>
<td>Other clear evidence of inconsistency</td>
<td>against resistance</td>
</tr>
<tr>
<td>Global pattern of weakness</td>
<td>Eg, weakness of ankle plantar flexion on the bed but patient able to walk on</td>
</tr>
<tr>
<td></td>
<td>tiptoes</td>
</tr>
<tr>
<td></td>
<td>Weakness that is global, affecting extensors and flexors equally</td>
</tr>
</tbody>
</table>

Stone and Carson 2015; Neurology Continuum
# Psychogenic Nonepileptic Seizure (PNES)

**TABLE 1. Semiologic features that support the diagnosis of psychogenic nonepileptic seizures (PNES) vs. epileptic seizures (ES).**

<table>
<thead>
<tr>
<th>Signs Favoring PNES</th>
<th>Signs Favoring ES</th>
<th>Indeterminate Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Duration</td>
<td>Occurrence From Physiologic Sleep</td>
<td>Gradual Onset</td>
</tr>
<tr>
<td>Fluctuating Course</td>
<td>Postictal Confusion</td>
<td>Non-Stereotyped Events</td>
</tr>
<tr>
<td>Asynchronous Movements*</td>
<td>Stertorous Breathing</td>
<td>Flailing or Thrashing Movements</td>
</tr>
<tr>
<td>Pelvic Thrusting*</td>
<td></td>
<td>Opisthotonus</td>
</tr>
<tr>
<td>Side-To-Side Head or Body Movements**</td>
<td></td>
<td>Tongue Biting</td>
</tr>
<tr>
<td>Forced Eye Closure</td>
<td></td>
<td>Urinary Incontinence</td>
</tr>
<tr>
<td>Ictal Crying</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory Recall</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Indicates that sign may not reliably differentiate between PNES and frontal lobe partial epileptic seizures.

** Indicates that sign may only be helpful in distinguishing convulsive PNES and ES.

Adopted from Avbersek and Sisodiya\(^{14}\) with permission.
# Psychogenic Nonepileptic Seizure (PNES)

## TABLE 2. Diagnostic levels of certainty for psychogenic nonepileptic seizures

<table>
<thead>
<tr>
<th>Diagnostic level</th>
<th>History</th>
<th>Witnessed event</th>
<th>EEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible</td>
<td>+</td>
<td>By witness or self-report/description</td>
<td>No epileptiform activity in routine or sleep-deprived inter-ictal EEG</td>
</tr>
<tr>
<td>Probable</td>
<td>+</td>
<td>By clinician who reviewed video recording or in person, showing semiology typical of PNES</td>
<td>No epileptiform activity in routine or sleep-deprived inter-ictal EEG</td>
</tr>
<tr>
<td>Clinically established</td>
<td>+</td>
<td>By clinician experienced in diagnosis of seizure disorders (on video or in person), showing semiology typical of PNES, while not on EEG</td>
<td>No epileptiform activity in routine EEG or ambulatory ictal EEG, capturing a typical ictus*</td>
</tr>
<tr>
<td>Documented</td>
<td>+</td>
<td>By clinician experienced in diagnosis of seizure disorders, showing semiology typical of PNES, while on video EEG</td>
<td>No epileptiform activity immediately before, during or after ictus captured on ictal video EEG with typical PNES semiology</td>
</tr>
</tbody>
</table>

+, history characteristics consistent with PNES; PNES, psychogenic nonepileptic seizures; ES, epileptic seizures; EEG, electroencephalogram.

*Captured ictus should not resemble types of ES whichthat may not show ictal epileptiform correlate on EEG (e.g., simple partial epileptic seizures).

Functional Tremor: A Video Guide
Tremor Entrainment

Functional Tremor: A Video Guide

Suggestibility

The value of ‘positive’ clinical signs for weakness, sensory and gait disorders in conversion disorder: a systematic and narrative review

Corinna Daum,² Monica Hubschmid,² Selma Aybek¹ Daum C, et al. J Neurol Neurosurg Psychiatry 2014;85:180–190

<table>
<thead>
<tr>
<th>Clinical sign</th>
<th>Estimated specificity (CI)</th>
<th>Estimated sensitivity (CI)</th>
<th>Positive predictive value (CI)</th>
<th>Negative predictive value (CI)</th>
<th>Description</th>
<th>Comment</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Validated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hoover sign</td>
<td>99% (95.7 to 99.9)</td>
<td>94% (85.8 to 97.3)</td>
<td>99% (92.8 to 99.9)</td>
<td>96% (91.3 to 98.4)</td>
<td>A:P supine, E hand under paretic leg (under heel): P exerts max force downward  B:Same but P exerts max force upward with contralateral leg (against E resistance)  Comparison of felt pressure in E hand under paretic side heel  Hoover—if strength in condition B &gt; A</td>
<td>Can only be applied when a significant proximal leg weakness is present. Caution when coexisting comprehension/attention deficit or cortical neglect or pain</td>
<td>Stone et al²¹, Sonoo ¹⁴, Tinazzi et al ¹⁵, McWhirter et al ¹³, Liv et al ⁹⁹</td>
</tr>
<tr>
<td>Abductor sign</td>
<td>100% (77.1 to 100)</td>
<td>100% (75.9 to 100)</td>
<td>100% (75.9 to 100)</td>
<td>100% (77.1 to 100)</td>
<td>A:P supine, E hands on both sides, P exerts full abduction with both legs (paretic legs stays on midline)  B:P exerts max strength on abducted leg (against E resistance)  Sign—if paretic leg moves in adduction  Sign—if paretic leg stays in position</td>
<td>Rather complex manoeuvre with no data on inter-rater reliability</td>
<td>Sonoo ¹⁴</td>
</tr>
<tr>
<td>Abductor finger sign</td>
<td>100% (67.9 to 100)</td>
<td>100% (65.5 to 100)</td>
<td>100% (65.5 to 100)</td>
<td>100% (67.8 to 100)</td>
<td>P abduction finger movement against resistance of E for 2 min with healthy hand. Synkinetic abduction finger movements of contralateral/‘paretic’ hand in functional paresis, no movement in ‘organic’ paresis</td>
<td>Can only be applied to patients with moderate paresis</td>
<td>Tinazzi et al ¹⁵</td>
</tr>
<tr>
<td>Collapsing/give-away weakness</td>
<td>97% (89.4 to 99.1)</td>
<td>63% (53.9 to 71.5)</td>
<td>96% (88.7 to 99)</td>
<td>65% (55.9 to 72.9)</td>
<td>Limb collapses from a normal position with a light touch or a normal strength is developed and then suddenly collapses (or gives-way)</td>
<td>Prone to error in patients with pain or who have difficulty following instructions</td>
<td>Stone et al ²¹, Chabrol et al ²², Gould et al ⁶</td>
</tr>
<tr>
<td>Motor inconsistency</td>
<td>98% (85.3 to 99.9)</td>
<td>13% (2.3 to 41.6)</td>
<td>67% (12.5 to 98.2)</td>
<td>75% (60.7 to 85.5)</td>
<td>Impossibility to do a movement while another movement using the same muscle is possible</td>
<td>Easy to detect but needs careful observation during the entire examination. Only formally evaluated in a single study  The differential diagnosis includes small thalamic lesions</td>
<td>Chabrol et al ²²</td>
</tr>
<tr>
<td>Midline splitting</td>
<td>93% (83.8 to 96.9)</td>
<td>20% (6.6 to 44.2)</td>
<td>40% (13.6 to 72.6)</td>
<td>82% (72.4 to 89.2)</td>
<td>Sign—if exact splitting of sensation in the midline</td>
<td></td>
<td>Rosak ¹⁶, Stone et al ²¹, Chabrol et al ²², Gould et al ⁶</td>
</tr>
</tbody>
</table>
FND Epidemiology: A Problem We Can No Longer Ignore

• In Neurology, 30% of outpatients are seen for medically unexplained illness

• **16-18% of patients with medically unexplained illness are diagnosed with FND** (Stone et al 2009)

• Up to 20% of patients in Movement Disorder Clinics are diagnosed with a Functional Movement Disorder (FMD) (Williams et al 1995)

• Functional Weakness (Paralysis) has an estimated incidence of 3.9/100,000 individuals (Similar to Multiple Sclerosis) (Stone et al 2010)

• Upwards of 20-50% of patients admitted to Epilepsy Monitoring Units are diagnosed with Psychogenic Non-Epileptic Seizures (PNES)
Controversies in Epilepsy and Behavior

When did neurologists and psychiatrists stop talking to each other?

Andres M. Kanner*

INVITED COMMENTARY

Psychogenic Movement Disorders: A Crisis for Neurology

Mark Hallett, MD

Editorial

Are psychogenic non-epileptic seizures and psychogenic movement disorders two different entities? When even neurologists stop talking to each other
Psychogenic seizures and psychogenic movement disorders: Are they the same patients?  
J.L. Hopp a,*, K.E. Anderson a,b, A. Krumholz a, A.L. Gruber-Baldini c, L.M. Shulman a

Table 1  
Selected measures used in comparison of psychogenic nonepileptic seizure (PNES) patients (n = 35) and psychogenic movement disorder (PMD) patients (n = 104).a

<table>
<thead>
<tr>
<th>Variable</th>
<th>PNES (n = 35)</th>
<th>PMD (n = 104)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Numbers (%) or mean[SD]</td>
<td>Numbers (%) or mean[SD]</td>
<td></td>
</tr>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (female)</td>
<td>30 (85.7%)</td>
<td>69 (67.0%)</td>
<td>0.034*</td>
</tr>
<tr>
<td>Age (years)</td>
<td>41.8 [SD = 14.8]</td>
<td>47.1 [SD = 12.5]</td>
<td>0.040*</td>
</tr>
<tr>
<td>Married</td>
<td>23 (65.7%)</td>
<td>72 (69.6%)</td>
<td>0.673</td>
</tr>
<tr>
<td>Employed</td>
<td>16 (45.7%)</td>
<td>44 (44.4%)</td>
<td>0.896</td>
</tr>
<tr>
<td>College educated (&gt;4 years)</td>
<td>15 (42.9%)</td>
<td>41 (41.4%)</td>
<td>0.879</td>
</tr>
<tr>
<td><strong>Clinical manifestations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Episodic (vs. continuous)</td>
<td>35 (100%)</td>
<td>68 (66.7%)</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Altered consciousness</td>
<td>30 (85.7%)</td>
<td>32 (31.4%)</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Convulsive</td>
<td>29 (62.9%)</td>
<td>32 (31.4%)</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Unilateral</td>
<td>0 (0%)</td>
<td>21 (20.6%)</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Duration of symptoms (years)</td>
<td>3.08 [SD = 6.51]</td>
<td>2.94 [SD = 6.51]</td>
<td>0.887</td>
</tr>
<tr>
<td><strong>Psychological and social measures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-12 Health Survey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF12 Physical Health score</td>
<td>38.47 [13.62]</td>
<td>34.82 [14.88]</td>
<td>0.218</td>
</tr>
<tr>
<td>SF12 Mental Health score</td>
<td>43.46 [13.63]</td>
<td>43.44 [11.74]</td>
<td>0.994</td>
</tr>
<tr>
<td>BSI-18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global Symptom Index (GSI)</td>
<td>59.00 [9.32]</td>
<td>60.34 [9.72]</td>
<td>0.588</td>
</tr>
<tr>
<td>BSI Somatization t-score</td>
<td>63.46 [9.33]</td>
<td>63.08 [9.73]</td>
<td>0.846</td>
</tr>
<tr>
<td>BSI Depression t-score</td>
<td>55.49 [13.58]</td>
<td>55.61 [12.72]</td>
<td>0.964</td>
</tr>
<tr>
<td>Self-efficacy measures (Lorig)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lorig Manage Disease</td>
<td>11.82 [2.55]</td>
<td>11.54 [2.31]</td>
<td>0.568</td>
</tr>
<tr>
<td>Lorig Manage Symptoms</td>
<td>10.19 [2.67]</td>
<td>9.43 [2.84]</td>
<td>0.194</td>
</tr>
<tr>
<td>Lorig Exercise</td>
<td>6.76 [1.95]</td>
<td>6.00 [2.22]</td>
<td>0.086</td>
</tr>
<tr>
<td>Lorig Social Activities</td>
<td>4.53 [1.44]</td>
<td>4.06 [1.34]</td>
<td>0.097</td>
</tr>
<tr>
<td></td>
<td>PNES n = 116 (%)</td>
<td>PMD n = 56 (%)</td>
<td>Total n = 172 (%)</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------------</td>
<td>----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>Hx of abuse</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>41 (35%)</td>
<td>12 (21%)</td>
<td>53 (31%)</td>
</tr>
<tr>
<td>Emotional</td>
<td>35 (51%)</td>
<td>7 (12.5%)</td>
<td>43 (25%)</td>
</tr>
<tr>
<td>Sexual</td>
<td>36 (31%)</td>
<td>9 (16%)</td>
<td>45 (26%)</td>
</tr>
<tr>
<td>Childhood abuse</td>
<td>51 (41%)</td>
<td>12 (21%)</td>
<td>63 (37%)</td>
</tr>
<tr>
<td>Precipitating stressor</td>
<td>73 (63%)</td>
<td>25 (45%)</td>
<td>98 (57%)</td>
</tr>
<tr>
<td>Medical</td>
<td>41 (35%)</td>
<td>16 (29%)</td>
<td>57 (33%)</td>
</tr>
<tr>
<td>Psychosocial</td>
<td>35 (30%)</td>
<td>17 (30%)</td>
<td>52 (30%)</td>
</tr>
<tr>
<td>Physical injury</td>
<td>14 (12%)</td>
<td>7 (13%)</td>
<td>21 (12%)</td>
</tr>
<tr>
<td>Abuse related</td>
<td>5 (4%)</td>
<td>2 (5%)</td>
<td>7 (4%)</td>
</tr>
<tr>
<td><strong>Chronic pain disorder:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pelvic</td>
<td>7 (6%)</td>
<td>1 (2%)</td>
<td>8 (5%)</td>
</tr>
<tr>
<td>GI/IBS</td>
<td>40 (35%)</td>
<td>2 (4%)</td>
<td>22 (12%)</td>
</tr>
<tr>
<td>Headache</td>
<td>40 (35%)</td>
<td>NR</td>
<td>40 (23%)</td>
</tr>
<tr>
<td>Fibromyalgia</td>
<td>21 (18%)</td>
<td>6 (16%)</td>
<td>27 (16%)</td>
</tr>
<tr>
<td>Other</td>
<td>40 (35%)</td>
<td>34 (61%)</td>
<td>74 (43%)</td>
</tr>
<tr>
<td>No. of pain Dx:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>38 (33%)</td>
<td>14 (25%)</td>
<td>52 (30%)</td>
</tr>
<tr>
<td>1</td>
<td>43 (37%)</td>
<td>41 (73%)</td>
<td>84 (49%)</td>
</tr>
<tr>
<td>2</td>
<td>23 (20%)</td>
<td>1 (2%)</td>
<td>24 (14%)</td>
</tr>
<tr>
<td>3</td>
<td>10 (9%)</td>
<td>0</td>
<td>10 (6%)</td>
</tr>
<tr>
<td>4</td>
<td>2 (2%)</td>
<td>0</td>
<td>2 (1%)</td>
</tr>
<tr>
<td><strong>Subjective fatigue</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep disorder</td>
<td>24 (21%)</td>
<td>19 (34%)</td>
<td>43 (25%)</td>
</tr>
<tr>
<td>Subjective cog sx</td>
<td>68/113 (60%)</td>
<td>25 (44.6%)</td>
<td>93 (55%)</td>
</tr>
<tr>
<td>ETOH abuse</td>
<td>6 (5%)</td>
<td>3 (5%)</td>
<td>9 (5%)</td>
</tr>
<tr>
<td>Drug abuse</td>
<td>10 (9%)</td>
<td>10 (18%)</td>
<td>20 (12%)</td>
</tr>
<tr>
<td><strong>Family Hx of:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seizure/movement d/o</td>
<td>22 (19%)</td>
<td>8 (14%)</td>
<td>30 (17%)</td>
</tr>
<tr>
<td>Substance abuse</td>
<td>38 (33%)</td>
<td>17 (30%)</td>
<td>55 (32%)</td>
</tr>
<tr>
<td>Alcoholism</td>
<td>30 (26%)</td>
<td>11 (20%)</td>
<td>41 (24%)</td>
</tr>
<tr>
<td>Axis I</td>
<td>38 (33%)</td>
<td>20 (36%)</td>
<td>58 (34%)</td>
</tr>
<tr>
<td><strong>Pre-existing psychiatric Dx:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>49 (42%)</td>
<td>23 (41%)</td>
<td>72 (42%)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>18 (16%)</td>
<td>27 (48%)</td>
<td>45 (26%)</td>
</tr>
<tr>
<td><strong>Mayo psychiatrist Dx:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somatoform</td>
<td>61 (100%)</td>
<td>32 (100%)</td>
<td>93 (100%)</td>
</tr>
<tr>
<td>Other Axis I</td>
<td>51 (85%)</td>
<td>19 (60%)</td>
<td>70 (80%)</td>
</tr>
<tr>
<td>Anxiety or PTSD</td>
<td>32 (52%)</td>
<td>29 (90%)</td>
<td>61 (70%)</td>
</tr>
<tr>
<td>Depression</td>
<td>35 (57%)</td>
<td>17 (53%)</td>
<td>52 (60%)</td>
</tr>
<tr>
<td>Bipolar</td>
<td>6 (10%)</td>
<td>2 (6%)</td>
<td>8 (10%)</td>
</tr>
<tr>
<td>Adjustment</td>
<td>2 (3%)</td>
<td>1 (3%)</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>Active substance use</td>
<td>3 (5%)</td>
<td>4 (12%)</td>
<td>7 (8%)</td>
</tr>
<tr>
<td>IED</td>
<td>1 (2%)</td>
<td>0</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Dissoc. disorder</td>
<td>2 (3%)</td>
<td>0</td>
<td>2 (3%)</td>
</tr>
</tbody>
</table>

Driver-Dunckley et al, 2011 Psychosomatics
### MGH FND Clinic Cohort

<table>
<thead>
<tr>
<th></th>
<th>Psychogenic Non-Epileptic Seizures (n = 24)</th>
<th>Functional Weakness (n = 19)</th>
<th>Functional Movement Disorders (n = 17)</th>
<th>Total (n = 49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at presentation (years)</td>
<td>34.8 ± 12.4</td>
<td>37.3 ± 12.7</td>
<td>41.9 ± 10</td>
<td>38.2 ± 12.4</td>
</tr>
<tr>
<td>Men/women</td>
<td>6/18</td>
<td>5/14</td>
<td>1/16</td>
<td>13/36</td>
</tr>
<tr>
<td>White/nonwhite</td>
<td>20/4</td>
<td>13/6</td>
<td>14/3</td>
<td>39/10</td>
</tr>
<tr>
<td>Education: college/professional degree (≥ 16 years)</td>
<td>10 (42)</td>
<td>6 (32)</td>
<td>8 (47)</td>
<td>20 (41)</td>
</tr>
<tr>
<td>Duration of FNS (≥ 1 year)</td>
<td>13 (54)</td>
<td>12 (63)</td>
<td>11 (65)</td>
<td>32 (65)</td>
</tr>
<tr>
<td>History of Depression</td>
<td>14 (58)</td>
<td>11 (58)</td>
<td>7 (41)</td>
<td>28 (57)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>17 (71)</td>
<td>12 (63)</td>
<td>10 (59)</td>
<td>30 (61)</td>
</tr>
<tr>
<td>Past post-traumatic stress disorder</td>
<td>9 (38)</td>
<td>6 (32)</td>
<td>4 (24)</td>
<td>16 (33)</td>
</tr>
<tr>
<td>Any abuse</td>
<td>11 (46)</td>
<td>9 (47)</td>
<td>8 (47)</td>
<td>23 (47)</td>
</tr>
<tr>
<td>Sexual abuse</td>
<td>5 (21)</td>
<td>6 (32)</td>
<td>4 (24)</td>
<td>12 (24)</td>
</tr>
<tr>
<td>Physical abuse</td>
<td>4 (17)</td>
<td>5 (26)</td>
<td>3 (18)</td>
<td>11 (22)</td>
</tr>
<tr>
<td>Prior suicidality or self-injurious behaviors</td>
<td>9 (38)</td>
<td>4 (21)</td>
<td>4 (24)</td>
<td>15 (31)</td>
</tr>
<tr>
<td>Past FNS-related emergency department visit</td>
<td>17 (71)</td>
<td>14 (74)</td>
<td>11 (65)</td>
<td>30 (61)</td>
</tr>
<tr>
<td>Past psychiatric hospitalization</td>
<td>10 (42)</td>
<td>3 (16)</td>
<td>3 (13)</td>
<td>13 (27)</td>
</tr>
<tr>
<td>Cognitive complaints</td>
<td>18 (75)</td>
<td>7 (37)</td>
<td>7 (41)</td>
<td>27 (55)</td>
</tr>
<tr>
<td>History of another functional medical syndrome</td>
<td>6 (25)</td>
<td>8 (42)</td>
<td>7 (41)</td>
<td>18 (37)</td>
</tr>
<tr>
<td>Chronic pain</td>
<td>5 (21)</td>
<td>5 (26)</td>
<td>5 (29)</td>
<td>15 (31)</td>
</tr>
<tr>
<td>Fibromyalgia</td>
<td>1 (4)</td>
<td>3 (16)</td>
<td>1 (6)</td>
<td>4 (8)</td>
</tr>
<tr>
<td>Chronic fatigue</td>
<td>1 (4)</td>
<td>2 (11)</td>
<td>2 (12)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Prior head trauma†</td>
<td>9 (38)</td>
<td>6 (32)</td>
<td>5 (29)</td>
<td>15 (31)</td>
</tr>
<tr>
<td>No. medication allergies at intake</td>
<td>1.1 ± 1.3</td>
<td>1.2 ± 1.5</td>
<td>1.1 ± 1.4</td>
<td>1.1 ± 1.4</td>
</tr>
<tr>
<td>Family history of psychiatric disease‡</td>
<td>18 (75)</td>
<td>15 (79)</td>
<td>11 (65)</td>
<td>35 (71)</td>
</tr>
<tr>
<td>Family history of neurological disease ‡</td>
<td>8 (33)</td>
<td>10 (53)</td>
<td>9 (53)</td>
<td>22 (45)</td>
</tr>
<tr>
<td>Employment status: employed or full-time student</td>
<td>12 (50)</td>
<td>9 (47)</td>
<td>6 (35)</td>
<td>23 (47)</td>
</tr>
<tr>
<td>Disability status: pursuing or receiving payments</td>
<td>10 (42)</td>
<td>5 (26)</td>
<td>7 (41)</td>
<td>20 (41)</td>
</tr>
<tr>
<td>Marital status: married</td>
<td>8 (33)</td>
<td>6 (32)</td>
<td>9 (53)</td>
<td>18 (37)</td>
</tr>
<tr>
<td>Patient-reported symptom burden§</td>
<td>4.5 ± 2</td>
<td>6.2 ± 2.2</td>
<td>6 ± 1.7</td>
<td>5.1 ± 2</td>
</tr>
<tr>
<td>Number of motor and sensory FNS examination findings∥</td>
<td>0.8 ± 1.2</td>
<td>2.1 ± 1.4</td>
<td>1.9 ± 1.4</td>
<td>1.2 ± 1.3</td>
</tr>
</tbody>
</table>

Perez et al, 2016 Cogn Behav Neurol
<table>
<thead>
<tr>
<th>FNS Subtype</th>
<th>Significant Variable Identified by Univariate Screening</th>
<th>Odds Ratio</th>
<th>95% Confidence Interval for Odds Ratio</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychogenic non-epileptic seizures (n = 24) vs. other FNS (n = 25)</td>
<td>Patient-reported symptom burden</td>
<td>0.8</td>
<td>0.5 to 1.1</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>Cognitive complaints</td>
<td><strong>10.7</strong></td>
<td><strong>2.0 to 57.2</strong></td>
<td><strong>0.006</strong></td>
</tr>
<tr>
<td></td>
<td>Past psychiatric hospitalization</td>
<td><strong>9.6</strong></td>
<td><strong>1.4 to 65.6</strong></td>
<td><strong>0.022</strong></td>
</tr>
<tr>
<td>Functional weakness (n = 17) vs. other FNS (n = 32)</td>
<td>Patient-reported symptom burden</td>
<td>1.6</td>
<td>1.1 to 2.4</td>
<td><strong>0.009</strong></td>
</tr>
<tr>
<td></td>
<td>Cognitive complaints</td>
<td>0.3</td>
<td>0.1 to 1.0</td>
<td>0.058</td>
</tr>
<tr>
<td>Functional movement disorders (n = 19) vs. other FNS (n = 30)</td>
<td>Patient-reported symptom burden</td>
<td>1.4</td>
<td>1.0 to 1.9</td>
<td>0.076</td>
</tr>
<tr>
<td></td>
<td>Marital status: married</td>
<td>2.9</td>
<td>0.8 to 10.7</td>
<td>0.11</td>
</tr>
<tr>
<td>( \geq 2 ) motor FNS (n = 13) vs. other FNS (n = 36)</td>
<td>Patient-reported symptom burden</td>
<td>1.4</td>
<td>1.0 to 2.0</td>
<td>0.089</td>
</tr>
<tr>
<td></td>
<td>Past FNS-related emergency department visit</td>
<td>3.3</td>
<td>0.6 to 18.4</td>
<td>0.18</td>
</tr>
</tbody>
</table>

**Bold type** indicates significance at < 0.05.
**Predisposing, Precipitating & Perpetuating Factors in FND**

Table 1. A range of potential mechanisms and aetiological factors in patients with functional motor disorders

<table>
<thead>
<tr>
<th>Factors</th>
<th>Biological</th>
<th>Psychological</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factors acting at all stages</td>
<td><em>‘Organic’ disease</em></td>
<td><em>Emotional disorder</em></td>
<td><em>Socio-economic/deprivation</em></td>
</tr>
<tr>
<td></td>
<td><em>History of previous functional symptoms</em></td>
<td><em>Personality disorder</em></td>
<td><em>Life events and difficulties</em></td>
</tr>
<tr>
<td></td>
<td><em>Genetic factors affecting personality</em></td>
<td><em>Perception of childhood experience as adverse</em></td>
<td><em>Childhood neglect/abuse</em></td>
</tr>
<tr>
<td></td>
<td><em>Biological vulnerabilities in the nervous system</em></td>
<td><em>Personality traits</em></td>
<td><em>Poor family functioning</em></td>
</tr>
<tr>
<td>Predisposing</td>
<td></td>
<td><em>Poor attachment/coping style</em></td>
<td><em>Symptom modelling of others</em></td>
</tr>
<tr>
<td>vulnerabilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precipitating mechanisms</td>
<td><em>Abnormal physiological event or state (eg, drug side effect hyperventilation, sleep deprivation, sleep paralysis)</em></td>
<td><em>Perception of life event as negative, unexpected</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Physical injury/pain</em></td>
<td><em>Acute dissociative episode/panic attack</em></td>
<td></td>
</tr>
<tr>
<td>Perpetuating factors</td>
<td><em>Plasticity in CNS motor and sensory (including pain) pathways leading to habitual abnormal movement</em></td>
<td><em>Illness beliefs (patient and family)</em></td>
<td><em>Social benefits of being ill</em></td>
</tr>
<tr>
<td></td>
<td><em>Deconditioning</em></td>
<td><em>Perception of symptoms as being irreversible</em></td>
<td><em>Availability of legal compensation</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Not feeling believed</em></td>
<td><em>Ongoing medical investigations and uncertainty</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Perception that movement causes damage</em></td>
<td><em>Excessive reliance on sources of information or group affiliations which reinforce beliefs that symptoms are irreversible and purely physical in nature</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Avoidance of symptom provocation</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Fear of falling</em></td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Stone and Carson.13
CNS, central nervous system.

Nielsen et al, 2014, JNPP
Treatment Begins with Delivery of the Diagnosis

Symptom -> Diagnosis Delivery -> Engagement -> Acute Treatment -> Long-term Follow-up

Baslet, Dworetzky, Perez & Oser. 2015 Clin EEG & Neurosci
Explaining functional disorders in the neurology clinic: a photo story


Alan Carson,1 Alexander Lehn,2,3 Lea Ludwig,1 Jon Stone1

An Unhelpful Approach: Delivery of a Negative Diagnosis

An Unhelpful Approach Continued: Imply that symptoms are “all psychiatric”
A More Helpful Approach:

Name the diagnosis: Functional Neurological Disorder

Integrate use of potential physical (PT) and psychological (CBT) therapies
Table 1. Strategies used for the communication of the diagnosis of psychogenic nonepileptic seizures

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Good news—the seizures are not caused by epilepsy, explain vEEG findings.</td>
<td>Cover reasons for concluding they do not have epilepsy.</td>
<td>Explain how vEEG works and how it has helped with the diagnosis.</td>
<td>Genuine symptoms.</td>
</tr>
<tr>
<td>Bad news—we do not know the precise cause of the seizures but: They are nonepileptic, antiepileptic drugs do not work.</td>
<td>Relay what they do have (explain “switching off”; describe dissociation).</td>
<td>Seizures are emotional/psychological, due to past/present issues, not a medical condition.</td>
<td>Real events—can be frightening or disabling.</td>
</tr>
<tr>
<td>Antiepileptic drugs may cause serious side effects.</td>
<td>Emphasize they are not suspected of “putting on” the events.</td>
<td>List possible predisposing factors as “specimen causes” not directly linked to the patient.</td>
<td>Label. Give a name for the condition. Give alternative names they may hear.</td>
</tr>
<tr>
<td>“We may never know what these seizures are but can work together on the problems.”</td>
<td>They are not “mad”; the problem is common, and seizures are disabling.</td>
<td>Seizures are not under conscious control but patients can learn to control them with help from a therapist.</td>
<td>Reassure that this is a common and recognized condition.</td>
</tr>
<tr>
<td>In most cases seizures are eventually related to upsetting emotions of which patients are unaware.</td>
<td>Events are stress related, but stresses may be difficult to identify.</td>
<td>Patients may have anxiety or low mood but are otherwise not mentally ill or “mad.”</td>
<td>Cause and maintaining factors:</td>
</tr>
<tr>
<td>This may be best addressed by psychiatrist, psychologist or counselor.</td>
<td>Triggering “stresses” may not be immediately apparent.</td>
<td>Drug treatment does not work, psychological treatment can work, no other treatment is available.</td>
<td>Not epilepsy, predisposing factors difficult to identify, precipitating factors can be related to stress/emotions, perpetuating factors (viscous cycle: worry or stress/events get worse/more worry).</td>
</tr>
<tr>
<td>You are not crazy, the seizures occur at a subconscious level.</td>
<td>Relevance of etiologic factors in their case.</td>
<td>Describe psychological intervention.</td>
<td>Provide a model for the events—e.g., brain becomes overloaded and shuts down.</td>
</tr>
<tr>
<td>Counseling may not control seizures immediately, but seizures can improve as treatment progresses.</td>
<td>Maintaining factors. Worry about seizures may make them worse/more frequent.</td>
<td>Ask whether patients want psychological intervention.</td>
<td>Treatment. Antiepileptic drugs are not effective.</td>
</tr>
<tr>
<td>Neurologic follow-up will continue.</td>
<td>Avoidant behavior may make seizures worse.</td>
<td></td>
<td>Evidence that psychological treatment is effective.</td>
</tr>
<tr>
<td>A history of sexual abuse is discovered in many cases.</td>
<td>May improve after correct diagnosis.</td>
<td></td>
<td>Talk about referral to a treatment specialist.</td>
</tr>
<tr>
<td>The seizures may stop spontaneously. Although they are subconscious, a conscious effort can sometimes stop them.</td>
<td>Caution that AED withdrawal should be gradual.</td>
<td></td>
<td>Expectations. Can resolve.</td>
</tr>
<tr>
<td>More seizures may occur before complete control is achieved.</td>
<td>Describe psychological treatment.</td>
<td></td>
<td>Can expect improvement.</td>
</tr>
</tbody>
</table>
Trick or treat?

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

1. Giving the symptoms one of the available names (rather than avoiding making a diagnosis at all⁸)
2. Indicating to patients that you believe their symptoms are genuine and not "made up" or "crazy"
3. Explaining that they have symptoms which are potentially reversible
4. Explaining that it is common and not "weird"
5. The use of metaphors: "This is like a software problem rather than a hardware problem"
6. Sharing with patients the clinical letter or directing to sources of self-help³
We know that in dealing with these illnesses it is important to think about the whole person and not just their arm or leg for example.

Sometimes everything would feel a lot simpler if you could just tell people you had suffered something like Parkinson’s disease, something that everyone understands and sympathises with. Its very important to know that unlike someone with Parkinson’s disease you have the potential to get better even after having the symptoms for a long time.

A good way of thinking about your symptoms is:

**What can I do to help myself get better?**

You didn’t bring the symptoms on but you can help to make them better

If you have had the symptoms for a long time you cannot get better quickly from them. These are some of the things that may help:

- **Feeling confident about the diagnosis.** If you have ongoing doubts that the diagnosis is wrong then it is unlikely that you will get better. Getting better requires dealing with symptoms that may change from day to day. There may be days when you feel ‘back to square one’. It is very hard to use any of the subsequent advice here without some confidence in the diagnosis.

- **Gradually increasing your level of activity**— this is hard to describe in a nutshell but it involves setting very small goals for yourself. (maybe going for a 50 or 100 yard walk) which you can gradually build on including other activities that you may have stopped doing. It is often helpful with functional movement disorders not to think too hard about the problem —you may have already found that functional tremor is often best when you’re distracted by something else. You are not ‘imagining’ the tremor, but paying attention to it can make it worse. You should expect ‘relapses’ of your symptoms as you try to improve, aiming for each relapse to be not quite as bad as the last one with slow gradual improvement in between. Symptoms usually vary a lot day to day and may be worse after exercise

- **Increasing activity (continued).** If you can start improving your recovery may look like this on a graph.

- **Physiotherapy**—this can be very helpful if you can find a physiotherapist who is happy dealing in this area. The physio is there to guide your self-help and rehabilitation not to do the treatment for you. You may find that your movements are worst when you are relaxed and best when you are distracted.

- **Hypnosis and Sedation**— sometimes hypnosis can improve functional movement disorders. For patients with functional dystonia, an examination under a light anaesthetic can also be therapeutic.

- **Drug treatment**—so-called antidepressants can be helpful in these illnesses, even for people who are not feeling depressed. They are not addictive, like Valium or painkillers, and will not harm you. They seem to work as a ‘nerve tonic’—putting right imbalances in chemicals in the brain and making the nervous system work better again. You can get better without them but they may well increase your chances of success.

- **Dealing with stress**— not everyone with functional movement disorders are under stress, but if you are it then talking to family, friends or a professional such as a psychologist or psychiatrist may help in trying to overcome the problem.

**Where can I go for more information?**

There is a lot more information on functional weakness, other functional neurological symptoms and common associated symptoms like pain and fatigue at:

[www.neurosymptoms.org](http://www.neurosymptoms.org)
We are beginning to understand why people are vulnerable to these symptoms and something about their mechanisms in the brain but there is still a lot we do not understand. We know that in dealing with these illnesses it is important to think about the whole person and not just their arm or leg for example.

Sometimes everything would feel a lot simpler if you could just tell people you had suffered something like a stroke, something that everyone understands and sympathises with. Its very important to know that unlike someone with a bad stroke you have the potential to get better even after having the symptoms for a long time.

A good way of thinking about your symptoms is:

**You didn’t bring the symptoms on but you can help to make them better**

**What can I do to help myself get better?**

If you have had the symptoms for a long time you cannot get better quickly from them.

These are some of the things that help:

- **Feeling confident about the diagnosis.** If you have ongoing doubts that the diagnosis is wrong then it is unlikely that you will get better. Getting better requires dealing with symptoms that may change from day to day. There may be days when you feel 'back to square one'. It is very hard to use any of the subsequent advice here without some confidence in the diagnosis.

- **Gradually increasing your level of activity**—this is hard to describe in a nutshell but it involves setting very small goals for yourself, (maybe going for a 50 or 100 yard walk) which you can gradually build on including other activities that you may have stopped doing. It is often helpful with functional weakness not to think too hard about the limb when you are using it—you may find this only makes it harder for the messages to reach it from your brain.

- **Increasing activity (continued)** You should expect ‘relapses’ of your symptoms as you try to improve, aiming for each relapse to be not quite as bad as the last one with slow gradual improvement in between. Symptoms usually vary a lot day to day and may be worse after exercise. If you can start improving your recovery may look like this on a graph.

- **Physiotherapy**—this can be very helpful if you can find a physiotherapist who is happy dealing in this area. The physio is there to guide your self-help and rehabilitation not to do the treatment for you. You may find that your weakness is worst when you are trying your hardest to move and improves when you are distracted.

- **Drug treatment**—so-called antidepressants can be helpful in these illnesses, even for people who are not feeling depressed. They are not addictive, like Valium or painkillers, and will not harm you. They seem to work as a 'nerve tonic' - putting right imbalances in chemicals in the brain and making the nervous system work better again. You can get better without them but they may well increase your chances of success.

- **Dealing with stress** — not everyone with functional weakness is under stress, but if you are it then talking to family, friends or a professional such as a psychologist or psychiatrist may help in trying to overcome the problem.

**Where can I go for more information?**

There is a lot more information on functional weakness, other functional neurological symptoms and common associated symptoms like pain and fatigue at:

[www.neurosymptoms.org](http://www.neurosymptoms.org)
Other symptoms like a hot feeling, tight chest, heart racing, nausea, sweating, flushing, shaking can all occur. All of these symptoms indicate that your nervous system is going into a state of red alert.

In many patients the attack can be understood as the brain’s way of getting rid of these horrible warning symptoms.

Sometimes everything would feel a lot simpler if you could just tell people that you had epilepsy, something that most people understand and sympathises with. Its very important to know that unlike many people with epilepsy you have the potential to get better without medication even after having the symptoms for a long time.

A good way of thinking about your symptoms is:

“You didn’t bring the attacks on but you can help yourself to get better”

What can I do to help myself get better?

These are some of the things that may help

• Feeling confident about the diagnosis. If you have ongoing doubts that the diagnosis of dissociative attacks is wrong then it is unlikely that you will get better. Getting better requires dealing with unpredictable symptoms which is hard to do if you are still worried that its epilepsy or another condition.

• Learning to prevent attacks — if, like most people with dissociative attacks, you find the attacks come on randomly then there are some things worth trying to avert the attack

1. Try to make the warning phase last longer. During the warning phase are you feeling frightened or worried about what is happening to your body? Remind yourself that you do not have epilepsy, you have dissociative attacks. Although you feel horrible and just want the feeling to be over, nothing serious is going to happen to you.

If you don’t experience warning symptoms then work on trying to remember them after the attack

“Dissociative Attacks can be overcome if you learn to understand them and how to avert them”

2. Use distraction techniques — if you are experiencing the warning symptoms try to distract yourself with something completely different: talk to someone, play a video game on your phone, do a puzzle or try to do some mental arithmetic. If you can distract your brain from the horrible feelings you may learn to get control of the situation again

3. Other people should stay calm — family or friends can be understandably frightened by these attacks. Try to reassure them that you are not going to die during one and you simply need to be placed in a comfortable position until the attack is over.

4. Dealing with situational dissociative attacks -If there is something which seems to bring on attacks, like certain situations (or sometimes even certain memories) then try to recognise this and talk about it. Sometimes attacks are more likely to happen when you’re worried about having one. Distraction techniques may be helpful here.

5. Expecting ‘relapses’ and giving yourself time to get better — it is not easy to overcome dissociative attacks. You may find that just when you thought you had the problem solved, another attack come unexpectedly.

If you have had attacks for a long time you cannot get better quickly from them, but you may be able to get better slowly.

There is more detailed guidance on treatment along with patient stories at:

www.neurosymptoms.org

You may also find the NEAD trust a useful source of information. www.neadtrust.co.uk
Functional Movement Disorders

This leaflet aims to explain a bit about functional movement disorders and how you can begin to overcome them.

Not all of it may apply to you and you should discuss it with the doctor who gave it to you.

Patients with functional movement disorders often end up not feeling believed by doctors.

What are functional movement disorders?

A functional movement disorder means that there is abnormal movement or positioning of part of the body due to the nervous system not working properly.

Patients with a functional movement disorder may experience a range of distressing and disabling symptoms. Some patients may experience too much movement of a body part, for example, tremor (shaking), jerking or twitching of a limb or the head. Other patients may experience too little movement of a body part, for example, "spasm" or clenching of an arm or leg which is then difficult to move.

Unlike other movement disorders (e.g., Parkinson’s disease), a functional movement disorder is not caused by damage or disease of the nervous system. It is however due to a reversible problem in the way that the nervous system is working. This means that a functional movement disorder has the potential to get better and even go away completely (although this is not easy).

<table>
<thead>
<tr>
<th>nummness or tingling</th>
<th>sleep disturbance</th>
<th>attacks that mimic epilepsy but are not</th>
</tr>
</thead>
<tbody>
<tr>
<td>fatigue</td>
<td>finding the right word</td>
<td>frustration and/or anger</td>
</tr>
<tr>
<td>arm or leg pain</td>
<td>slurred speech</td>
<td>low mood</td>
</tr>
<tr>
<td>back or neck pain</td>
<td>blurred vision</td>
<td>lack of enjoyment</td>
</tr>
<tr>
<td>headache</td>
<td>bladder or bowel problems</td>
<td>worry</td>
</tr>
<tr>
<td>poor concentration</td>
<td>a floaty, distant feeling that things around aren't quite real (dissociation)</td>
<td>panic</td>
</tr>
</tbody>
</table>

Dissociative (Non-Epileptic) Attacks

This leaflet aims to explain a bit about non-epileptic attacks and how you might try to overcome them.

Not all of it may apply to you and you should discuss it with your doctor.

Patients with dissociative attacks often end up not feeling believed by doctors.

What are dissociative attacks?

Dissociative (non-epileptic) attacks are disabling and frightening attacks that look very similar to epilepsy. They can be called Non-epileptic attacks or Non-epileptic seizures.

Unlike epilepsy, dissociative attacks are not due to abnormal electrical discharges in the brain or another nervous system disease. They are basically your brain going in to a ‘trance like’ state for a period of time. People can experience shaking attacks or attacks when they simply become unresponsive often for quite a long time.

Dissociative attacks are common. Nearly half of all people brought in to hospital with suspected serious epilepsy have them. Many patients with dissociative attacks are misdiagnosed with epilepsy and may have taken drugs for epilepsy.
Acute Phase Treatments

Three Parallel Treatment Approaches

“Physical Therapy for Physical Symptoms”
&
Consider OT & Speech Therapy

Medication Treatments for FND and other Psychiatric Symptoms (Limited Role)

Psychotherapy: Cognitive Behavioral Therapy For FND
Guided self-help for functional (psychogenic) symptoms
A randomized controlled efficacy trial

overcoming
functional neurological symptoms
a five areas approach

Professor Christopher Williams
Catriona Kent
Dr Sharon Smith
Dr Alan Carson
Professor Michael Sharpe
Dr Jonathan Cavanagh

Hodder Arnold

Copyrighted Material
Guided self-help for functional (psychogenic) symptoms
A randomized controlled efficacy trial

Table 2 Comparison of outcome measures between trial arms at 3 months

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>Usual care</th>
<th>Usual care + GSH</th>
<th>Treatment effect (95% CI)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in overall health (CGI)</td>
<td>63</td>
<td>17</td>
<td>24 (12 to 47)</td>
<td>0.016</td>
</tr>
<tr>
<td>Change in presenting symptoms (CPS)</td>
<td>63</td>
<td>29</td>
<td>23 (12 to 46)</td>
<td>0.014</td>
</tr>
<tr>
<td>Symptom burden (PHQ-13)</td>
<td>62</td>
<td>7.0 (3.0)</td>
<td>61</td>
<td>6.2 (3.3)</td>
</tr>
<tr>
<td>Depression (HADS)</td>
<td>61</td>
<td>7.3 (4.1)</td>
<td>61</td>
<td>6.0 (4.9)</td>
</tr>
<tr>
<td>Anxiety (HADS)</td>
<td>60</td>
<td>8.2 (4.9)</td>
<td>56</td>
<td>6.6 (3.9)</td>
</tr>
<tr>
<td>SF-12 Physical Function</td>
<td>62</td>
<td>50 (40)</td>
<td>60</td>
<td>60 (39)</td>
</tr>
<tr>
<td>Belief symptoms are permanent</td>
<td>61</td>
<td>3.4 (1.1)</td>
<td>61</td>
<td>3.2 (1.2)</td>
</tr>
<tr>
<td>Belief symptoms are a mystery</td>
<td>61</td>
<td>3.7 (1.1)</td>
<td>61</td>
<td>3.3 (1.4)</td>
</tr>
<tr>
<td>Health anxiety: is there something seriously wrong with your body?</td>
<td>60</td>
<td>55</td>
<td>61</td>
<td>75</td>
</tr>
<tr>
<td>Health anxiety: Do you worry a lot about your health?</td>
<td>61</td>
<td>44</td>
<td>61</td>
<td>64</td>
</tr>
<tr>
<td>Satisfaction: Overall quality of care</td>
<td>54</td>
<td>27</td>
<td>60</td>
<td>67</td>
</tr>
<tr>
<td>Satisfaction: Would recommend to a friend</td>
<td>55</td>
<td>46</td>
<td>60</td>
<td>88</td>
</tr>
</tbody>
</table>
Cognitive behavioral therapy for psychogenic nonepileptic seizures

W. Curt LaFrance Jr.\(^{a,b,*}\), Ivan W. Miller\(^{a}\), Christine E. Ryan\(^{a}\), Andrew S. Blum\(^{b}\), David A. Solomon\(^{a}\), Joan E. Kelley\(^{a}\), Gabor I. Keitner\(^{a}\)

**Original Investigation**

**Multicenter Pilot Treatment Trial for Psychogenic Nonepileptic Seizures**

**A Randomized Clinical Trial**

JAMA Psychiatry. 2014;71(9):997-1005

W. Curt LaFrance Jr, MD, MPH; Grayson L. Baird, MS; John J. Barry, MD; Andrew S. Blum, MD, PhD; Anne Frank Webb, MA; Gabor I. Keitner, MD; Jason T. Machan, PhD; Ivan Miller, PhD; Jerzy P. Szafarski, MD, PhD; for the NES Treatment Trial (NEST-T) Consortium
### TABLE 3. Summary of controlled clinical trials in the treatment of psychogenic nonepileptic seizures (PNES).

<table>
<thead>
<tr>
<th>Study</th>
<th>Subjects</th>
<th>Interventions</th>
<th>Primary end point</th>
<th>Significant findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goldstein et al. 63</td>
<td>66 PNES</td>
<td>CBT + SMC vs. SMC</td>
<td>Sz frequency</td>
<td>↓ Sz at study end but not at f/up</td>
</tr>
<tr>
<td>LaFrance et al. 64</td>
<td>38 PNES</td>
<td>Sertraline vs. placebo</td>
<td>Sz frequency</td>
<td>↓ Sz with sertraline</td>
</tr>
<tr>
<td>Oto et al. 69</td>
<td>25 PNES</td>
<td>Immediate vs. delayed AED withdrawal</td>
<td>Sz frequency</td>
<td>↓ Sz with immediate withdrawal</td>
</tr>
<tr>
<td>Chen et al. 68</td>
<td>64 PNES</td>
<td>Group psychoeducation vs. SMC</td>
<td>Sz frequency &amp; psychosocial function</td>
<td>Improved psychosocial function</td>
</tr>
<tr>
<td>LaFrance et al. 65</td>
<td>38 PNES</td>
<td>CBT-ip vs. CBT-ip + sertraline vs. sertraline vs. SMC</td>
<td>Sz frequency</td>
<td>↓ Sz with CBT-ip &amp; CBT-ip + sertraline</td>
</tr>
</tbody>
</table>

CBT, cognitive behavioral therapy; CBT-ip, cognitive behavioral therapy-informed psychotherapy; SMC, standard medical care; AED, anti-epileptic drug; Sz, seizures; f/up, follow-up; ↓ - reduction in.
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

Preliminary Neurobiological Research Findings
16 patients with motor conversion disorder & h/o anxiety & depression vs. 16 Healthy Controls (Age/Sex Matched)

fMRI, Affective Facial Viewing Task

Increased AMG activity to happy faces (decreased amygdala habituation to positive stimuli)

Increased AMG connectivity to Supplementary Motor Area in patient group

Voon et al, 2010 *Brain*
• 8 patients with positional psychogenic tremor
• fMRI comparison of volitional tremor vs. psychogenic positional tremor

• Reduced right temporo-parietal junction activity during psychogenic vs. volitional tremor

• Reduced functional connectivity between TPJ and motor/somatosensory regions, ventral ACC, medial PFC

• Dysfunction in R TPJ associated with impaired action authorship recognition in patients with psychogenic tremor
11 PNES patients vs. 12 Healthy Subjects

Resting-State Functional Connectivity Analysis

Seed Region: L Precentral Sulcus

ACC = anterior cingulate cortex
ICa = insular cortex, anterior
ACC & Insula: Multimodal Integration Areas

**Posterior Insula**
- provides an interoceptive representation of the physiological condition of the body

**Mid Insula**
- integrative zone for affective and motivation information from AMG, ACC and OFC to converge

**Anterior Insula**
- in conjunction with the ACC (also an integrative zone), the anterior insula is theorized to be involved in emotional awareness


Emerging Biology of FND

Neural Functional Unawareness

Somatosensory Amplification

Perez et al, *J Neuropsychiatry Clin Neurosci* 2012;
Perez et al, *EEG Clin Neurosci* 2015

MGH Neuroimaging Study Methods: Inclusion Criteria

• Inclusion Criteria (23 patients with FND):
  – All patients met diagnostic criteria for FND including:
    • clinically-established Functional Movement Disorders (n=12)
    • documented (n=6) or clinically-established (n=1) nonepileptic seizures
    • positive examination findings for functional weakness (n=11)
    • 7 out of 23 subjects had non-dermatomal sensory deficits
    • 7 out of 23 subjects also had mixed motor FND

Perez, Matin et al., 2017 JNNP
Primary Measures of Interest:
FND Symptom Severity

**Patient Health Questionnaire-15**
- Stomach pain
- Back pain
- Pain in your arms, legs, or joints (knees, hips, etc.)
- Menstrual cramps or other problems with your periods [Women only]
- Headaches
- Chest pain
- Dizziness
- Fainting spells
- Feeling your heart pound or race
- Shortness of breath
- Pain or problems during sexual intercourse
- Constipation, loose bowels, or diarrhea
- Nausea, gas, or indigestion
- Feeling tired or having low energy
- Trouble sleeping

**Conversion Disorder subscale of the Screening for Somatoform Symptoms-7 Scale**
- Impaired coordination or balance
- Paralysis or localized weakness
- Difficulty swallowing or lump in the throat
- Aphonia (loss of voice)
- Urinary retention
- Hallucinations
- Loss of touch or pain sensation
- Unpleasant numbness or tingling sensations
- Double vision
- Blindness
- Deafness
- Seizures
- Amnesia (loss of memory)
- Loss of consciousness
Other Measures

• **Childhood Trauma Questionnaire**
  – cumulative indices of abuse (sexual, physical and emotional)

• **Life Events Checklist-5**
  – a 17 category measure of lifetime adverse events

• **PTSD Checklist-5**
  – a 20-item measure of PTSD symptoms
Neuroimaging Methods

• SPM Based Voxel-Based Morphometry
  – MPRAGE sequence acquired on a 3T Siemens Trio Scanner
  – Preprocessing via SPM8 and VBM toolbox:
    • Tissue segmentation (Gray Matter, White Matter, CSF)
    • DARTEL Registration (spatial normalization across subjects)
    • Normalization to MNI Space
    • Analyses also controlled for whole-brain differences
  – 2nd Level Analysis
    • SPM-based multiple regression examined relationships between a covariate of interest and gray matter volumes with age and gender as nuisance variables (N=23) or only age as nuisance variable for all female subset (N=18)
    • Secondary analyses also included BDI-II or STAI-Trait as nuisance variables
Relationship between Functional Neurological Symptoms and Childhood Abuse (N=23)
Gray Matter Associations with Functional Neurological Symptoms and Childhood Abuse in Women (N=18)

A) L Insula Gray Matter (-40, 12, -11) vs. Patient Health Questionnaire

B) L Insula Gray Matter (-42, 9, -12) vs. Screening for Somatoform Symptoms CD Subscale

C) L Insula Gray Matter (-39, 9, -12) vs. Childhood Trauma Questionnaire-Abuse

All images displayed at an uncorrected p value of 0.005
All above findings statistically significant for small-volume-corrections at p<0.05

Perez, Matin et al., 2017 JNNP
Gray Matter Volume Associations with PTSD Symptoms and Lifetime Trauma Burden (N=23)

A) R ACC Gray Matter (0, 30, 24) vs. PTSD Checklist-5: Hyperarousal

B) L Hippocampal Gray Matter (-33, -27, -12) vs. LEC “Happened To Me” Events
SF-36 (Quality of Life)
Role Limitations Due to Emotional Problems

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

(Circle One Number on Each Line)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Cut down the <strong>amount of time</strong> you spent on work or other activities</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>18. <strong>Accomplished less</strong> than you would like</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19. Didn’t do work or other activities as <strong>carefully</strong> as usual</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Bilateral Amygdalar Volume Increases Associated with Role Limitations Due to Emotional Problems

Findings hold for BDI, STAI-Trait

\[ P_{\text{whole-brain-corrected FWE}} = 0.044 \]

\[ P_{\text{small-volume-corrected FWE}} = 0.031 \]

Perez, Williams et al (In Preparation)
Increased Periaqueductal Gray (PAG) Volume Associated with Role Limitations Due to Emotional Problems

Findings hold for BDI, STAI-Trait

Region of interest based on 10 mm sphere centered at 1,-29,-12

P_{small-volume-corrected FWE} = 0.001

Perez, Williams et al (In Preparation)
Increased Right Amygdalar Volume Associated with Trait Anxiety

\[ P_{\text{small-volume-correctedFWE}} = 0.023 \]

Perez, Williams et al (In Preparation)
Data Interpretation of Amygdalar Findings

- Are these findings disease related?
  Or
- Are these findings compensatory in nature?
  Or
- Do they reflect functions such as an amplified negative expectation bias/ negative attention bias
Acknowledgements

**MGH Team/ Collaborators**
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Chris Stephen
Sean Glass
Anthony Guarino

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W. Curt LaFrance Jr.

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THANK YOU!
Early Literature Guiding Treatment

• Trieschmann, RB 1970
  – Case series of 3 patients with abnormal walking due to conversion disorder
  – Behavioral approach based on learning theory, i.e. Symptoms viewed as a learned maladaptive response to stress
  – Desired movements are positively reinforced with praise while undesirable movements are ignored

Early Literature Guiding Treatment

• Trieschmann, RA 1970 (cont’d)
  – Patient agrees to diagnosis and plan
  – Eliminate abnormal walking by confining the patient to a wheelchair
  – Eliminate conversation about and attention given to abnormal gait
  – Physical Therapy for step by step approach to training ambulation. Not allowed to progress until mastery of current step
  – Counseling to address stress management

Limited but Growing Body of Literature

Where have studies taken place?

Summary of Evidence to Date

• Gender: >70% female
• Age: 40 years (range 16-77)
• Symptom duration: 20 days – 24 years
• Treatment duration: 5 days to 6 months
• Outcomes:
  – 54-69% improvement at discharge
  – ↓ 10% - ↑ 20% change at long term follow-up
  – Relapses 22% - 66% but most responded well to follow-up intervention
Survey of Physiotherapists in UK

- 77% reported treating patients with FND
- Moderate levels of interest in treating this group
- Perceived barriers to care included:
  - Lack of support from non-PT colleagues
  - Inadequate service structure
  - Low confidence in knowledge as compared to other patient populations.

Edwards et al. 2012

Limitations in Literature

- Description of interventions
- Treatment duration, intensity and setting
- Optimal outcome measures

Insufficient evidence to develop a guideline

Biopsychosocial Approach
Predisposing, Precipitating & Perpetuating Factors

- Occupational Therapists, Physiotherapists, Neurologists and Neuropsychiatrists with extensive experience in treating patients with FND
- Combined existing evidence in the literature with experience from health professionals
- Recommendations, NOT a guideline

Nielsen G et al, 2014

Physical Therapy Examination

- Detailed History and Systems Review
  - Patient’s understanding and confidence in diagnosis
  - Do they desire improvement and have goals?
  - Details of symptoms and effect on day to day function
- Tests & Measures
  - Greater emphasis on activity performance
  - Observe movement patterns & postures
  - Impairments do not always correlate with function

Reinforce normal examination results

Physical Therapy Intervention

- Movement Retraining
- Education
- Medical management
- Other

Biopsychosocial Approach
Physical Therapy Examination
Physical Therapy Intervention

Biopsychosocial Approach
Predisposing, Precipitating & Perpetuating Factors
General Treatment Principles

- Build trust before challenging
- Project confidence
- Create expectation of improvement
- Open communication with team & patient
- Involve family
- Limit “hands-on” treatment
- Foster independence
- Goal directed rehab focusing on function & automatic movement
- Don’t reinforce abnormal movement/patterns
- Avoid adaptive equipment if possible
- Recognize & challenge unhelpful thoughts

4 Primary Areas of Physical Therapy Intervention

- Education
- Retraining movement with diverted attention
- Demonstration that normal movement can occur
- Changing maladaptive behavior related to symptoms

Education

- Ensure an understanding of the FND diagnosis
- Acknowledge symptoms are common and real
- Express optimism that symptoms can get better
- Reinforce positive clinical signs
- Explain that a variety of factors can trigger FND
- Clarify terminology/reinforce science
- Introduce role of PT as re-training the nervous system to help re-gain control over movement

Examples of Explaining FND

- “You have functional weakness”
- “You have functional tremor”
- “Your nervous system is not functioning properly but it is not damaged. There is a problem in the way your brain is sending messages to your arm/leg”
- “This is not your fault but there are things you can do to get better”

Retraining Normal Movement

- Demonstrate normal movement in the context of other activities
  - Review observations of normal movement that occur during the PT examination
- Stimulate automatic movements
  - Use of automatic balance reactions
  - Rapid, rhythmic movements
- Distraction
  - Competing cognitive task, conversation

Additional Consensus Recommendations

- Develop a graded exercise program
- Minimize use of adaptive aids and external support when possible
- Education for family/caregivers to reduce positive reinforcement of undesired movements and to increase positive reinforcement of desired movements in the home setting
- Develop self-management plan for discharge

Nielsen G et al. 2014
Case 1 Outpatient

- 69 y.o. male reported onset of symptoms six to eight months post right sphenoid wing meningioma resection (2003)
- Initial symptoms triggered by fluorescent lights, ceiling fans and excess stimulation preceded by a "warm shiver" with a feeling of anxiety and palpitations
- Initially described as a stomping motion during sit to stand transitions, when changing from one surface on the floor to another, when walking through a doorway
- Currently experiences some stomping but also a sense of a loss of equilibrium causing him to take steps to the side and backwards, or a feeling of being stuck in place
- Symptoms are intermittent, may not occur for 3-4 days at a time

Functional Status

<table>
<thead>
<tr>
<th>Functional Activity</th>
<th>Current Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADLs</td>
<td>Independent in personal care, difficulty with sit to stand transitions</td>
</tr>
<tr>
<td>IADLs</td>
<td>Drives without difficulty, able to perform most activities with intermittent disruptions in walking, sit to stand</td>
</tr>
<tr>
<td>Work/Leisure</td>
<td>Able to maneuver on power boat without difficulty, able to perform counseling activities and preside over funerals, able to walk in conservation area near home</td>
</tr>
<tr>
<td>Mobility</td>
<td>Difficulty performing sit to stand, intermittent foot stomping with sidestepping when walking, able to run/jog, no falls</td>
</tr>
</tbody>
</table>

History

- Social:
  - Lives at home with his wife
  - Part-time psychotherapist, marriage counselor and minister
  - One son and one daughter (grown)
- Medical:
  - History LBP
  - Right Sphenoid wing Meningioma resected 2003
  - Anxiety/Depression
  - Appendectomy 2002
  - GERD
  - Rosacea

Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfuzosin (UROXATRAL)</td>
<td>Urinary retention</td>
</tr>
<tr>
<td>Cetirizine (ZYRTEC)</td>
<td>Allergies</td>
</tr>
<tr>
<td>Doxycycline monohydrate (MONODOX)</td>
<td>Rosacea</td>
</tr>
<tr>
<td>Finasteride (PROSCAR)</td>
<td>Urinary retention</td>
</tr>
<tr>
<td>Omeprazole (PRILOSEC)</td>
<td>GERD</td>
</tr>
<tr>
<td>Cholecalciferol (VIT D3)</td>
<td></td>
</tr>
<tr>
<td>Omega-3 fatty acids-fish oil</td>
<td></td>
</tr>
</tbody>
</table>

Systems Review

- Cardiovascular and Pulmonary System
  - BP 126/75, HR 72, RR 16
- Musculoskeletal System
  - Height: 6 feet, weight: 275 lbs.
  - LE strength 5/5, ROM WNL
- Integumentary System
  - No evidence of bruising
- Communication, Affect, Cognition
  - Intact, able to provide accurate history
Neurological Examination

- Oculomotor control WNL
- Coordination WNL
  - Finger to nose, Rapid Alternating Movements UE & LE
- Deep Tendon Reflexes WNL
  - Quadriceps (L3), Gastroc-soleus (S1)
- Sensation
  - Intact light touch, intact vibratory sense bilaterally; Great toe test 5/5 bilaterally
- Motor Control WNL
  - Full isolated movement
- Muscle Tone WNL

Postural Control & Gait

- Postural Control
  - Attempts at tandem standing result in increase foot stomping/side stepping (astasia-abasia)
- Gait
  - Cautious with reduced arm swing, reduced step length, reduced amplitude of movement throughout
  - Gait speed:
    - 0.31 meters/second with altered movements
    - 2.0 meters/second without altered movements

Evidence for a Functional Neurological Disorder

- Postural Control
  - Pull test is floridly abnormal
  - Slight tap at shoulders results in multiple backward steps
  - Arms flail out to sides and trunk bends forward
  - Appears stable when he eventually catches himself
  - No fall
- Tandem Gait
  - Severe instability with significant stomping and side stepping
  - No falls

Evidence for a Functional Neurological Disorder

- Sit to stand
  - Able to rise without UE assist but almost immediately after assuming a standing position foot stomping occurs, patient feels unsteady, taking occasional side steps before stabilizing himself
- Gait
  - Punctuated by sudden paroxysms of instability with arms going out to the side and stomping of his feet with sidestepping but maintains good balance

Establish Strategies for Reducing Atypical Movements

- Sit to stand
  - Introduce dual task or distracter
    - Patient broke sit to stand into 5 segments, tapping the side of his thigh 5 times as he rose
    - Gradually increase speed so that movement becomes more automatic
- Gait
  - Counting through turns
  - Step back, side when anticipating stutter step
  - Count steps when going from one room to the next
Physical Therapy Intervention

Education

• Reviewed normal examination results/Confirmed diagnosis of FND
• Ascertained understanding of and agreement with FND diagnosis
• Education regarding FND as a problem with the way the brain is communicating with the muscles to generate movement
• Reinforced patient’s ability to perform movements with a more typical pattern using strategies
• Expressed optimism for favorable outcome
• Instructed wife not to provide external support and need for positive reinforcement of more normal patterns of movement
• Determined feasible goals for inter-session time frames
• Encouraged patient to explore strategies to promote more normal movement

Goals

• Patient goals
  – Decrease freezing/stomping episodes
• PT goals
  – Sit to stand without Loss of balance or excessive stomping
  – Demonstrate knowledge of strategies to promote typical movement patterns
  – Normalize walking pattern

Intervention

• 6 visits since evaluation
• Continued identification of strategies to reduce atypical movement and allow
  – Side, back stepping
  – Counting during turns
  – Lateral weight shifts, toe tapping to prevent episodes of foot stomping
  – Sit to stand with a push and slide (patient)
  – Reduced arm swing (patient)
• Review feedback strategies at home
• Development of self management plan

Sit to Stand

Walking

Outcomes

Self Report

% Improved

Baseline

Visit 2  Visit 4  Visit 6

80%

Back Pain
Case 2 Inpatient

**History of Present Illness**
- 49 y.o. woman s/p slip and fall while shoveling snow
- Presents to ED with involuntary jerking movements of arms/legs and LE weakness R>L
- Reports 2 wk h/o “foot drop” and RLE>LLE involuntary movements
- MRI of spine: no cord compromise
- Admitted due to inability to ambulate

**Past Medical History**
- Blau Syndrome (granulomatous arthritis)
- Anterior Cervical Discectomy Fusion C5-6 C6-7 in March 2016 following progressive decline in gait limited by weakness and spasticity RLE>LLE. MRI: severe stenosis at C5-C7
  - Discharged to subacute rehab
  - Surgical follow up April 2016 “stiff, wide-based gait, ataxic, clumsy”
  - Surgical follow up June 2016 “steady without device”

**Social / Occupational History**
- Social:
  - Lives in 2-story home
  - Lives with husband and 2 teenage children
  - Function: Independent in ADLs and IADLs
  - Exercise: Likes to walk. Has not returned to gym since surgery
- Occupation:
  - Recently took a job doing administrative work in dental office
  - Previously worked as a dental hygienist 3x/week and taught 2x/week in college dental program

**SYSTEMS REVIEW**
- Arousal, Attention, Cognition
  - Intact, pleasant and able to provide full history
- Cardiovascular and Pulmonary
  - HR 60 BP 114/60 RR 18
- Integument
  - Intact, no signs of bruising
- Musculoskeletal
  - WNL UEs, weakness RLE>LLE (see strength & motor control)

**EXAMINATION**
- Reflexes:
  - MAS: 1 bilat.gastroc.
  - DTR: B quadriceps 3+, B gastroc. 3+
- Sensation: Intact light touch and proprioception
- Strength: Inconsistently sustains contraction during MMT

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<th>Wrist Ext</th>
<th>Grip</th>
<th>Hip Flex</th>
<th>Hip Ext</th>
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<th>Knee Flex</th>
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<th>Ankle Dorsiflex</th>
<th>Ankle Plantarflex</th>
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EXAMINATION

• Motor Control
  – Isolated movements observed
  – With testing: occasional episodes of brief, rapid hip flexion or kicking foot outwards. Brief periods of thrusting trunk forward.

• Gait
  – Rolling walker and wide BOS. Variability of movements with excessive waist-high stepping and forceful trunk flexion. No foot drop noted. In stance, observed foot inversion and flexion of toes. Intermittent knee buckling without collapse.

GOALS

• Patient Goals
  – To have abnormal movements stop
  – To return to walking

• PT Goals
  – To demonstrate knowledge of strategies to minimize abnormal movements
  – To ambulate independently for transition to home
  – To normalize walking pattern with/without device

PHYSICAL THERAPY INTERVENTION: Patient Education

• Ascertained patient’s understanding of diagnosis of FND. Patient looking to confirm her understanding of www.neurosymptoms.org information
• This is a “software problem” not a “hardware problem”
• Discussed strategies that positively influenced movement during treatment
• Set expectations for performance during and between PT sessions
• (e.g., decreased need to use walker)
• Expressed optimism for positive outcome with prescribed plan of care
• Encouraged patient independence and decreased assistance from others

PHYSICAL THERAPY INTERVENTION: Functional Training

• Strategies used:
  – Walking by sliding feet
  – Sliding feet progressed to gradual slight lifting of foot
  – Walking backwards and sideways
  – Walking at faster pace
  – Walking with rhythmic counting
  – Using light support on railing vs. use of walker
  – Walking up and down stairs

Strategies: walker and sliding feet

Strategies: sliding feet, light support, counting
Strategies:
Backwards & Sideways walking

Strategies:
stair climbing

Evidence for a
Functional Neurological Disorder
- Movement inconsistent with strength grades (e.g., hip flexion)
- Give-way weakness with strength testing
- Movement variable and incongruous with organic disorders
- Abnormal movements primarily with gait; no reports of abnormal movements with toileting and showering
- Distraction and selected strategies reduce abnormal movements
- Episodes of sudden severe instability, buckling without falling, and ability to stabilize without assist

Discharge Planning
Factors considered for recommending home discharge:
- Patient confident regarding discharge home
- Patient open to the diagnosis of FND
- Good social supports
- Willing and able to return for outpatient PT
- Willing and able to follow up with outpatient FND neurologist

Case 3 Outpatient
- 28 year old male diagnosed with Lyme disease Summer 2011 – 2-3 weeks Doxycycline
- July 2011 returned to ER due to persistent symptoms
  - IV Ceftriaxone for presumptive Lyme's; Lumbar puncture negative
- September 2011, returned to ER due to complaints of:
  - Spine pain, Bilateral leg pain with walking, Bilateral hand pain, Migrating joint pain
- Normal lumbar puncture and examination at ER
- Symptoms persisted intermittently, waxing and waning
- Referred to PT March 29, 2016 without clear diagnosis
  - Reported symptoms drastically worse since flu in February

Functional Status

<table>
<thead>
<tr>
<th>Functional Activity</th>
<th>Current Performance</th>
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<tr>
<td>ADLs</td>
<td>Sleep: poor quality reported</td>
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<td>Transitional Movements: slowed</td>
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<td>Personal care: independent however slowed overall</td>
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<td>IADLs</td>
<td>Not currently driving; difficult as a passenger as jerking of car causing increased pain</td>
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<td>Laying down improves pain symptoms</td>
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<tr>
<td>Work/Leisure</td>
<td>Works as a high school teacher in Hungary - on leave right now.</td>
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<tr>
<td>Mobility</td>
<td>Using cane for all mobility - limited to short distances (one block max prior to resting)</td>
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<td>Not currently exercising; was running 20-40 miles per week</td>
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History

- Social
  - Single
  - Lives with a roommate
  - High School teacher; not currently working
  - History of physical abuse by older brother

- Medical
  - Lyme disease
  - ADHD

- Medications
  - Adderall
  - Pamelor (nortriptyline)

Systems Review

- Cardiovascular and Pulmonary System
  - BP 140/84, HR 72, RR 16

- Integument System
  - No evidence of bruising

- Communication, Affect, Cognition
  - Intact, able to provide accurate history

Neurological Examination

- Oculomotor examination WNL
- Coordination WNL but slowed
  - Finger to nose, Rapid Alternating Movements UE & LE
- Deep Tendon Reflexes WNL
  - Quadriceps (L3) Gastrosoleus (S1)
- Vestibular Function WNL
- Sensation
  - Intact light touch LE's, reported some numbness in fingers, intact vibratory sense bilaterally; Great toe test 5/5 bilaterally
- Motor Control WNL
  - Full isolated movement

Musculoskeletal Examination

- Pain 4/10 spine
- Range of Motion (active) WNL
- Muscle Strength
  - Hip flexion: unable to tolerate resistance due to pain
  - Knee extension: give-way weakness bilaterally
- Standing posture:
  - Weight shifted to the right
  - Arms at sides

Postural Control & Gait

- Postural Control
  - Firm surface eyes open 20 seconds
    - Exaggerated hip strategy without taking a step
  - Firm surface eyes closed 12 seconds
    - Exaggerated hip strategy without taking a step
  - Tandem gait: Unable
    - With multiple steps (Astasia-abasia)

- Gait
  - Initial contact foot flat, decreased stance time right, slowed speed, decreased step length, decreased amplitude of all components of gait, Left UE in flexion and adduction, right UE “tremor”
Outcome Measures

- Five Times Sit to Stand test
  - 20.9 seconds
- Activities Specific Balance Confidence Scale
  - 42%

Evidence for a Functional Neurological Disorder

- High degree of variability in symptom
- Waxing and waning of symptoms
- Flexor posturing of fingers that is distractible
- Symptoms worse when focusing on them
- Features of astasia-abasia in gait

Goals

Patient goal
Improve symptoms, return to work

Physical Therapy goals

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<thead>
<tr>
<th>Impairment Level</th>
<th>Activity Level</th>
<th>Participation Level</th>
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<tr>
<td>Tolerate standing EC x 30 seconds with appropriate balance strategies</td>
<td>Walk &gt; 1 city block without cane prior to rest break</td>
<td>Resume Jogging 25% of previous level for participation in health &amp; wellness regimen</td>
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<td>mCTSIB 3/4 positions without loss of balance</td>
<td>Sit to/from stand without UE assist</td>
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<td>Gait velocity &gt; .8 m/s</td>
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Case 3

- No FND diagnosis initially
- Intervention designed to increase automaticity of movement with focus on education regarding strategies to limit atypical movement
- Cessation of Neurology work-up and diagnosis of FND 4 weeks after beginning PT

Physical Therapy Intervention

- Increase automaticity of movement using dual task activities and distraction
  - FTSTS with dual task - reaching
  - Ball toss
  - Gait with ball toss forward to backward
  - Lateral shuffles
  - Lunge
  - Finger opposition to distract right UE "tremor"
- Education regarding use of dual task activities to limit atypical movements

Physical Therapy Intervention (1-2X/week)

- Treadmill at 2.4 MPH alternating walking/running
- Treadmill at 8.5 MPH No evidence of abnormal movement
- Tandem gait with typical postural control strategies

Diagnosis

- Treadmill at 8.5 MPH
- No evidence of abnormal movement