**Supplemental Materials**

**Neuropsychiatric phenotypes in functional movement disorder**

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**SUPPLEMENTAL METHODS**

**Data extraction**

*Adverse life events*

Trauma history was assessed based on self-reported data initially disclosed on the intake form, and further informed during the history collected during assessment. History of a traumatic event was defined based on a positive response to the following question: “Have you ever experienced an extremely unsettling event that threatened death or serious injury (to yourself or others) and that resulted in lasting emotional difficulties?” History of abuse was defined based on a positive response to the following question, with further clarification of type of abuse: “Were you a victim of physical, emotional, or sexual abuse?” These were further explored during clinical assessment. Chronic adversity was determined based on the personal history unearthed during assessment, and included reported experience of chronic/repeated, or multiple circumstances impacting wellbeing, such as poverty, unstable housing, caregiver neglect, caregiver substance abuse or mental illness, and bullying in school, or others.

*Episodic versus constant movement symptoms*

Characterization of episodic and constant movement symptoms occurred by combining historical details with examination features, with the following caveats:

1. Classification was determined by presence/absence of motor symptoms only. The tendency for non-motor functional symptoms such as pain, fatigue, cognitive fog or other functional symptoms to be present in most patients at some level most of the time, would confound the ability to distinguish episodic from constant motor symptoms; and
2. Positive findings on examination such as inconsistency and distractibility were not sufficient to determine if the motor symptom was episodic or constant. These features are required to make a diagnosis of FMD, but do not necessarily reflect the symptom experience of the patient. In other words, the presence of distractibility would not indicate an episodic FMD (which would only apply to the time when the patient is experiencing motor symptoms).

Examples of history and examination findings leading to classification as episodic or constant FMD are listed below:

Episodic FMD:

* Paroxysmal attacks of functional movement symptoms, which may resemble functional seizures, with or without features of dissociation;
* Intermittent symptoms described on history, characterized by clear periods of time without motor symptoms, with/without identifiable triggers;
* Symptoms occurring only with action or in specific situations that interfere with activities, with recognition of symptom absence when at rest or in certain situations (e.g. functional tremor only occurring with stress or anxiety);
* Symptoms that occur only in response to identifiable triggers, for example loud sounds or busy environments, tactile stimulation/body pain, with clear evidence of periods of time without motor symptoms;
* Evidence of substantial portions or entirety of assessment without observable functional movement symptoms;
* Abnormal movements may only be evident in assessment when triggered or using suggestion, or seen only in reviewing videos provided by patient.

Constant FMD:

* Patients are unable to endorse periods of time without motor symptoms (excluding sleep);
* Motor symptoms are evident throughout the entirety of the assessment, often observable in the waiting room and upon discharging the patient;
* Non-distractible continuously present movements containing other positive signs consistent with FMD (e.g. longstanding functional tremor, functional paraplegia, fixed dystonia);
* Use of bracing/gait aids/wheelchair indicating continuously present impairment;
* Sensory-dominant FND without observable movement disorder, or exclusively subjective symptoms (e.g. subjective gait disorder with reported constant sensory symptoms, accompanied by lack of corresponding abnormal gait).

**SUPPLEMENTAL RESULTS**

**Supplemental Figure 1.** “Mixed jerks” sub-phenotypes in patients with appendicular jerks/myoclonus

**Chart, bar chart, histogram

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**Supplemental Figure 2.** Cluster analysis: Exploratory neuropsychiatric phenotypes

**![Chart

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The exploratory cluster analysis performed with (a) movement disorders presentations revealed three distinct clusters: (a1) episodic motor symptoms and tremor; (a2) episodic motor symptoms and appendicular jerks/myoclonus; (a3) constant motor symptoms and gait disorder. Exploratory cluster analysis performed combining (b) movement disorders presentations, non-motor and FMD-related factors revealed four distinct clusters: (b1) episodic symptoms, tremor, hyperarousal, cognitive fog; (b3) constant symptoms, gait disorder, hyperarousal, activity avoidance, cognitive fog, low self-agency; (b4) episodic symptoms, appendicular jerks/myoclonus, hyperarousal, (b5) constant symptoms, gait disorder, weakness, emotional avoidance, cognitive fog. Health anxiety/somatic preoccupation, pain and fatigue were ubiquitously present in every cluster, and therefore cluster b2 did not provide any additional information.

**Supplemental Table 1.** Functional movement disorder phenotypic change between assessments

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

**Supplemental Table 2.** Change in DSM-5 diagnosis between assessments

|  |  |  |  |
| --- | --- | --- | --- |
| **Phenotype** | **No change** | **Gained** | **Lost** |
| All DSM-5 Diagnoses  (*n* = 153) | 104 (66%) | 39 (25%) | 16 (10%) |
| Major depressive disorder | 45 (96%) | 1 (3%) | 1 (3%) |
| Generalized anxiety disorder | 60 (68%) | 24 (27%) | 4 (5%) |
| Panic disorder | 7 (88%) | 1 (12%) | 0 |
| Post-traumatic stress disorder | 24 (67%) | 12 (33%) | 0 |
| Bipolar I disorder | 10 (72%) | 2 (14%) | 2 (14%) |
| Schizophrenia | 2 (67%) | 0 | 1 (33%) |
| Type A personality disorder | 1 (50%) | 0 | 1 (50%) |
| Type B personality disorder | 9 (100%) | 0 | 0 |
| Type C personality disorder | 0 | 0 | 0 |
| Somatic symptom disorder | 3 (30%) | 7 (70%) | 0 |

**Supplemental Table 3.** Exploratory neuropsychiatric phenotypes: Logistic regressions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Dependent Variable** | **Independent Variable** | **OR** | **95% CI** | **p** |
| Low self-agency | Gait | 1.32 | 0.61-2.86 | 0.488 |
| Tremor | 1.81 | 0.83-3.95 | 0.133 |
| Weakness | 2.53 | 1.06-6.02 | 0.036 |
| Appendicular jerks | 1.46 | 0.67-3.18 | 0.341 |
| Fixed dystonia | 3.80 | 0.81-17.87 | 0.091 |
| Axial jerks | 3.07 | 0.85-11.12 | 0.086 |
| Facial movements | 0.96 | 0.32-2.87 | 0.945 |
| Parkinsonism | 1.63 | 0.22-11.84 | 0.629 |
| Activity avoidance | Low self-agency | 2.40 | 1.14-5.04 | 0.021 |
| Hyperarousal | 1.11 | 0.54-2.27 | 0.782 |
| Constant phenotype | 1.15 | 0.54-2.44 | 0.725 |
| Emotional avoidance | Low self-agency | 1.51 | 0.65-3.07 | 0.250 |
| Hyperarousal | 0.63 | 0.33-1.22 | 0.174 |
| Constant phenotype | 0.73 | 0.36-1.47 | 0.375 |
| Major depressive disorder | Constant phenotype | 1.58 | 0.42-5.99 | 0.500 |
| Episodic phenotype | 1.15 | 0.33-4.01 | 0.823 |
| Gait | 0.37 | 0.15-0.91 | 0.031 |
| Tremor | 0.47 | 0.20-1.12 | 0.087 |
| Weakness | 0.66 | 0.22-1.94 | 0.446 |
| Fixed dystonia | 0.41 | 0.07-2.42 | 0.321 |
| Appendicular jerks | 0.77 | 0.31-1.90 | 0.575 |
| Parkinsonism | 4.27 | 0.54-33.73 | 0.169 |
| Generalized anxiety disorder | Constant phenotype | 0.45 | 0.13-1.54 | 0.203 |
| Episodic phenotype | 0.52 | 0.16-1.70 | 0.277 |
| Gait | 1.24 | 0.58-2.69 | 0.587 |
| Tremor | 1.08 | 0.51-2.26 | 0.850 |
| Weakness | 0.64 | 0.26-1.59 | 0.337 |
| Fixed dystonia | 1.01 | 0.22-4.67 | 0.986 |
| Appendicular jerks | 1.04 | 0.47-2.28 | 0.928 |
| Parkinsonism | 0.75 | 0.10-5.42 | 0.775 |
| Post-traumatic stress disorder | Constant phenotype | 1.13 | 0.28-4.67 | 0.862 |
| Episodic phenotype | 1.36 | 0.35-5.28 | 0.653 |
| Gait | 0.83 | 0.34-2.06 | 0.694 |
| Tremor | 1.26 | 0.54-2.97 | 0.596 |
| Weakness | 1.55 | 0.55-4.36 | 0.411 |
| Fixed dystonia | 0.48 | 0.05-4.39 | 0.513 |
| Appendicular jerks | 0.99 | 0.40-2.44 | 0.978 |
| Parkinsonism | <0.001 | <0.001->1000.00 | 0.975 |
| Hyperarousal | Gait | 1.03 | 0.50-2.11 | 0.947 |
| Tremor | 1.51 | 0.73-3.11 | 0.268 |
| Weakness | 0.66 | 0.28-1.53 | 0.328 |
| Appendicular jerks | 2.14 | 1.03-4.46 | 0.043 |
| Fixed dystonia | 0.95 | 0.21-4.27 | 0.942 |
| Axial jerks | 0.88 | 0.26-3.01 | 0.842 |
| Facial movements | 0.73 | 0.27-1.92 | 0.518 |
| Parkinsonism | 0.58 | 0.08-4.12 | 0.582 |
| Symptom count | Constant phenotype | 0.83 | 0.30-2.28 | 0.719 |
| Episodic phenotype | 1.57 | 0.58-4.20 | 0.373 |
| Generalized anxiety disorder | 1.01 | 0.51-1.98 | 0.983 |
| Activity avoidance | 1.05 | 0.52-2.12 | 0.883 |
| Emotional avoidance | 0.99 | 0.53-1.85 | 0.977 |
| Low self-agency | 3.98 | 1.97-8.06 | 0.0001 |
| Perfectionism | 1.21 | 0.48-3.04 | 0.684 |
| “Go-go-go” | 1.56 | 0.68-3.60 | 0.299 |
| People pleasing | 1.86 | 0.79-4.36 | 0.154 |
| Cluster B personality traits | 1.55 | 0.69-3.49 | 0.289 |
| Propensity to dissociate | 3.05 | 1.48-6.27 | 0.003 |
| Somatic preoccupation | 1.84 | 0.66-5.15 | 0.245 |
| Hyperarousal | 1.08 | 0.57-2.04 | 0.813 |
| Symptom count | Fixed dystonia | 0.45 | 0.12-1.68 | 0.233 |
| Appendicular jerks | 1.57 | 0.72-3.40 | 0.255 |
| Gait | 1.16 | 0.49-2.73 | 0.732 |
| Tremor | 1.05 | 0.50-2.20 | 0.901 |
| Facial movements | 1.42 | 0.53-3.82 | 0.489 |
| Axial jerks | 0.46 | 0.14-1.55 | 0.209 |
| Parkinsonism | 3.40 | 0.66-18.64 | 0.142 |
| Weakness | 1.04 | 0.45-2.41 | 0.922 |
| >1 phenotype | 1.68 | 0.62-4.59 | 0.308 |

Abbreviations: CI, confidence interval; OR, odds ratio.

**Supplemental Table 4.** Exploratory psychological phenotypes: Logistic regressions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Dependent Variable** | **Independent Variable** | **OR** | **95% CI** | **p** |
| Major depressive disorder | Activity avoidance | 0.57 | 0.24-1.36 | 0.206 |
| Emotional avoidance | 0.99 | 0.47-2.11 | 0.984 |
| “Go-go-go” | 0.40 | 0.12-1.33 | 0.133 |
| Cluster B personality traits | 2.61 | 1.01-6.45 | 0.038 |
| People pleasing | 1.95 | 0.76-5.01 | 0.164 |
| Low self-agency | 1.61 | 0.74-3.52 | 0.231 |
| Propensity to dissociate | 0.52 | 0.21-1.27 | 0.149 |
| Somatic preoccupation | 1.19 | 0.51-2.77 | 0.681 |
| Generalized anxiety disorder | Activity avoidance | 1.42 | 0.66-2.99 | 0.355 |
| Emotional avoidance | 1.02 | 0.52-2.00 | 0.966 |
| “Go-go-go” | 1.77 | 0.68-4.63 | 0.247 |
| Cluster B personality traits | 1.41 | 0.60-3.34 | 0.429 |
| People pleasing | 1.34 | 0.55-3.28 | 0.518 |
| Low self-agency | 1.01 | 0.53-2.23 | 0.823 |
| Propensity to dissociate | 0.61 | 0.28-1.31 | 0.205 |
| Somatic preoccupation | 0.76 | 0.36-1.60 | 0.476 |
| Post-traumatic stress disorder | Activity avoidance | 0.60 | 0.23-1.57 | 0.294 |
| Emotional avoidance | 0.42 | 0.17-1.03 | 0.057 |
| “Go-go-go” | 1.01 | 0.29-3.53 | 0.984 |
| Cluster B personality traits | 4.74 | 1.84-12.22 | 0.001 |
| People pleasing | 0.64 | 0.19-2.17 | 0.469 |
| Low self-agency | 1.67 | 0.69-4.08 | 0.259 |
| Propensity to dissociate | 2.29 | 0.91-5.75 | 0.077 |

Abbreviations: CI, confidence interval; OR, odds ratio.

**Supplemental Table 5.** Adverse life events and trauma phenotypes: Logistic regression

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Dependent Variable** | **Independent Variable** | **OR** | **95% CI** | **p** |
| **Functional movement disorder phenotype** | | | | |
| History of traumatic experience | Constant phenotype | 0.42 | 0.09-1.98 | 0.274 |
| Episodic phenotype | 0.46 | 0.10-2.10 | 0.314 |
| Gait | 0.82 | 0.31-2.15 | 0.683 |
| Tremor | 1.77 | 0.67-4.66 | 0.246 |
| Weakness | 1.30 | 0.41-4.10 | 0.650 |
| Fixed dystonia | 2.58 | 0.28-23.84 | 0.403 |
| Appendicular jerks | 1.34 | 0.48-3.72 | 0.579 |
| Parkinsonism | 0.38 | 0.05-2.93 | 0.351 |
| Hyperarousal | Excluded from modela | | |
| History of abuse | Constant phenotype | 0.56 | 0.15-2.04 | 0.380 |
| Episodic phenotype | 1.61 | 0.46-5.58 | 0.455 |
| Gait | 1.32 | 0.58-3.00 | 0.509 |
| Tremor | 0.66 | 0.30-1.46 | 0.308 |
| Weakness | 2.15 | 0.78-5.95 | 0.140 |
| Fixed dystonia | 0.54 | 0.11-2.67 | 0.449 |
| Appendicular jerks | 0.97 | 0.42-2.25 | 0.942 |
| Parkinsonism | 0.74 | 0.10-5.48 | 0.768 |
| Hyperarousal | Excluded from modela | | |
| History of emotional abuse | Constant phenotype | 0.61 | 0.17-2.24 | 0.455 |
| Episodic phenotype | 0.83 | 0.24-2.93 | 0.775 |
| Gait | 0.85 | 0.37-1.97 | 0.712 |
| Tremor | 1.02 | 0.46-2.26 | 0.954 |
| Weakness | 2.25 | 0.81-6.23 | 0.119 |
| Fixed dystonia | 0.60 | 0.10-3.70 | 0.586 |
| Appendicular jerks | 0.54 | 0.23-1.29 | 0.167 |
| Parkinsonism | 1.43 | 0.19-10.76 | 0.728 |
| Hyperarousal | 1.98 | 0.96-4.11 | 0.066 |
| History of physical abuse | Constant phenotype | 0.34 | 0.07-1.57 | 0.166 |
| Episodic phenotype | 0.90 | 0.22-3.73 | 0.881 |
| Gait | 0.79 | 0.30-2.06 | 0.632 |
| Tremor | 1.11 | 0.46-2.70 | 0.815 |
| Weakness | 2.81 | 0.92-8.57 | 0.068 |
| Fixed dystonia | <0.001 | <0.001->1000.00 | 0.980 |
| Appendicular jerks | 1.20 | 0.47-3.04 | 0.705 |
| Parkinsonism | 3.39 | 0.44-26.12 | 0.242 |
| Hyperarousal | 2.00 | 0.87-4.56 | 0.101 |
| History of sexual abuse | Constant phenotype | 0.19 | 0.04-0.85 | 0.029 |
| Episodic phenotype | 0.62 | 0.16-2.46 | 0.493 |
| Gait | 1.23 | 0.50-3.05 | 0.654 |
| Tremor | 0.77 | 0.33-1.83 | 0.561 |
| Weakness | 2.25 | 0.78-6.50 | 0.135 |
| Fixed dystonia | 1.13 | 0.18-6.97 | 0.894 |
| Appendicular jerks | 0.98 | 0.40-2.43 | 0.968 |
| Parkinsonism | 0.45 | 0.04-4.09 | 0.523 |
| Hyperarousal | 2.24 | 1.02-4.91 | 0.045 |
| Chronic adversity/neglect | Constant phenotype | 0.43 | 0.11-1.77 | 0.243 |
| Episodic phenotype | 0.36 | 0.09-1.45 | 0.151 |
| Gait | 1.13 | 0.47-2.68 | 0.789 |
| Tremor | 1.93 | 0.81-4.58 | 0.136 |
| Weakness | 1.48 | 0.52-4.23 | 0.467 |
| Fixed dystonia | 1.08 | 0.18-6.58 | 0.934 |
| Appendicular jerks | 1.00 | 0.40-2.51 | 0.997 |
| Parkinsonism | 0.63 | 0.07-5.76 | 0.685 |
| Hyperarousal | 2.36 | 1.11-5.00 | 0.026 |
| **FMD-relevant traits** | | | | |
| History of traumatic experience | Activity avoidance | 1.14 | 0.41-3.16 | 0.804 |
| Emotional avoidance | 0.45 | 0.17-1.15 | 0.094 |
| Low self-agency | 2.05 | 0.72-5.80 | 0.177 |
| Perfectionism | 0.50 | 0.15-1.69 | 0.262 |
| “Go-go-go” | 0.39 | 0.12-1.26 | 0.117 |
| People pleasing | 12.88 | 1.56-106.18 | 0.018 |
| Cluster B personality traits | 1.94 | 0.54-6.92 | 0.308 |
| Propensity to dissociate | 1.27 | 0.44-3.71 | 0.657 |
| Somatic preoccupation | 0.80 | 0.29-2.18 | 0.661 |
| Hyperarousal | 2.44 | 0.98-6.06 | 0.056 |
| History of abuse | Constant phenotype | 1.02 | 0.29-3.61 | 0.971 |
| Episodic phenotype | 2.05 | 0.60-7.06 | 0.254 |
| Generalized anxiety disorder | 1.04 | 0.44-2.48 | 0.925 |
| Activity avoidance | 1.04 | 0.44-2.48 | 0.931 |
| Emotional avoidance | 1.56 | 0.71-3.43 | 0.273 |
| Low self-agency | 0.64 | 0.27-1.50 | 0.301 |
| Perfectionism | 0.76 | 0.25-2.34 | 0.629 |
| “Go-go-go” | 0.58 | 0.21-1.62 | 0.329 |
| People pleasing | 1.69 | 0.62-4.65 | 0.306 |
| Cluster B personality traits | 7.43 | 2.15-26.70 | 0.002 |
| Propensity to dissociate | 1.90 | 0.73-4.91 | 0.188 |
| Somatic preoccupation | 1.16 | 0.31-4.28 | 0.824 |
| Hyperarousal | 3.15 | 1.36-7.30 | 0.008 |
| History of emotional abuse | Activity avoidance | 0.93 | 0.40-2.15 | 0.867 |
| Emotional avoidance | 1.35 | 0.63-2.88 | 0.440 |
| “Go-go-go” | 0.54 | 0.18-1.60 | 0.264 |
| Cluster B personality traits | 4.38 | 1.56-12.24 | 0.005 |
| People pleasing | 1.54 | 0.61-3.91 | 0.365 |
| Low self-agency | 0.50 | 0.22-1.11 | 0.089 |
| Propensity to dissociate | 0.62 | 0.26-1.49 | 0.286 |
| Somatic preoccupation | 0.80 | 0.36-1.79 | 0.584 |
| Hyperarousal | Excluded from modela | | |
| History of physical abuse | Activity avoidance | 0.71 | 0.29-1.75 | 0.454 |
| Emotional avoidance | 1.27 | 0.57-2.80 | 0.557 |
| “Go-go-go” | 0.28 | 0.06-1.31 | 0.106 |
| Cluster B personality traits | 1.22 | 0.44-3.34 | 0.706 |
| People pleasing | 0.52 | 0.20-1.91 | 0.408 |
| Low self-agency | 1.96 | 0.47-2.42 | 0.883 |
| Propensity to dissociate | 1.47 | 0.61-3.53 | 0.388 |
| Somatic preoccupation | 0.84 | 0.36-1.96 | 0.678 |
| Hyperarousal | Excluded from modela | | |
| History of sexual abuse | Activity avoidance | 1.04 | 0.44-2.50 | 0.927 |
| Emotional avoidance | 0.99 | 0.44-2.21 | 0.982 |
| “Go-go-go” | 0.90 | 0.30-2.71 | 0.848 |
| Cluster B personality traits | 4.30 | 1.57-11.76 | 0.005 |
| People pleasing | 1.42 | 0.53-3.77 | 0.486 |
| Low self-agency | 0.68 | 0.29-1.57 | 0.364 |
| Propensity to dissociate | 1.74 | 0.73-4.16 | 0.210 |
| Somatic preoccupation | 0.69 | 0.30-1.57 | 0.376 |
| Hyperarousal | Excluded from modela | | |
| Chronic adversity/neglect | Activity avoidance | 0.44 | 0.19-1.00 | 0.050 |
| Emotional avoidance | 1.00 | 0.46-2.20 | 0.993 |
| “Go-go-go” | 0.77 | 0.27-2.17 | 0.619 |
| Cluster B personality traits | 2.02 | 0.70-5.82 | 0.194 |
| People pleasing | 2.15 | 0.77-6.04 | 0.145 |
| Low self-agency | 2.04 | 0.88-4.69 | 0.095 |
| Propensity to dissociate | 1.18 | 0.48-2.88 | 0.715 |
| Somatic preoccupation | 0.76 | 0.33-1.77 | 0.538 |
| Hyperarousal | Excluded from modela | | |

aVariables with small n (e.g., cell counts <5) or a high level of homogeneity (e.g., variable was present in >90% of an outcome level) were removed from models.

Abbreviations: CI, confidence interval; OR, odds ratio.