4th International Conference on Functional Neurological Disorders

JUNE 19-21, 2022
BOSTON, MA

2022 Abstracts

IMPACT OF COVID-19 ON STROKE EPIDEMIOLOGY AND CLINICAL STROKE PRACTICE AT UTMB

Sheina Duncan (The University of Texas Medical Branch, shduncan@utmb.edu*), Bradley Nus, Lauren Bluhm, Brandon Okeke, Michelle Vu, Arun Chhabra*

Objective: To investigate the impact of the COVID-19 pandemic on stroke epidemiology and care of stroke patients in the UTMB Health System.

Background: During the COVID-19 pandemic, studies have shown a reduction in stroke hospitalizations in the US and around the world. [1] Several studies note fear of exposure as a contributing factor for this decline and concerns regarding stroke care. [2]

Methods: UTMB Stroke Program data was used to evaluate the following categories: modes of transportation, time to intravenous thrombolytic therapy (tPa), duration of hospital stays, and pre/post discharge modified Rankin scores (mRS). Two-tailed Paired Sample T-tests were conducted to extrapolate trends prior/during the COVID-19 pandemic and/or the rise of the delta variant specifically.

Results: The analysis indicated a significant increase in EMS from home/scene transports ($P < 0.0001$) during the COVID-19 pandemic compared to pre-pandemic, and higher pre-mRS prior to the rise of delta variant cases in Texas ($P < 0.0001$). [Figure 1] [Figure 2]

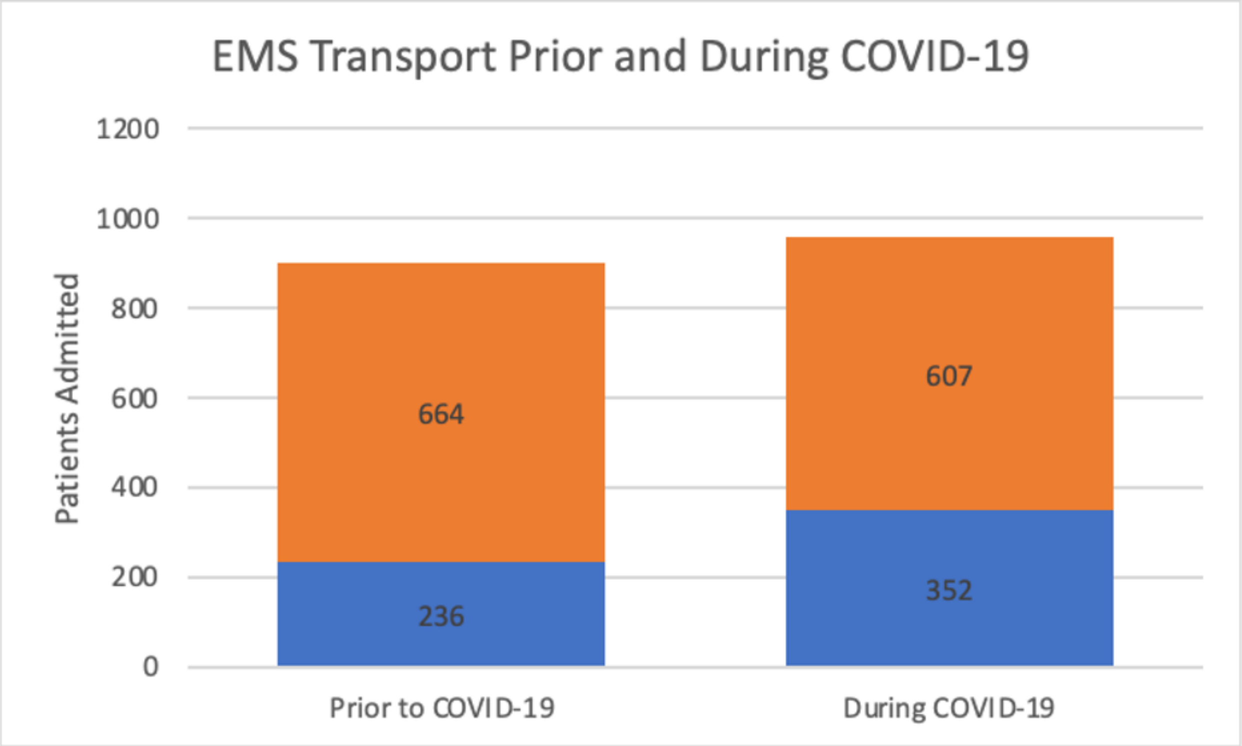


Figure 1 EMS Transport Prior and During COVID-19

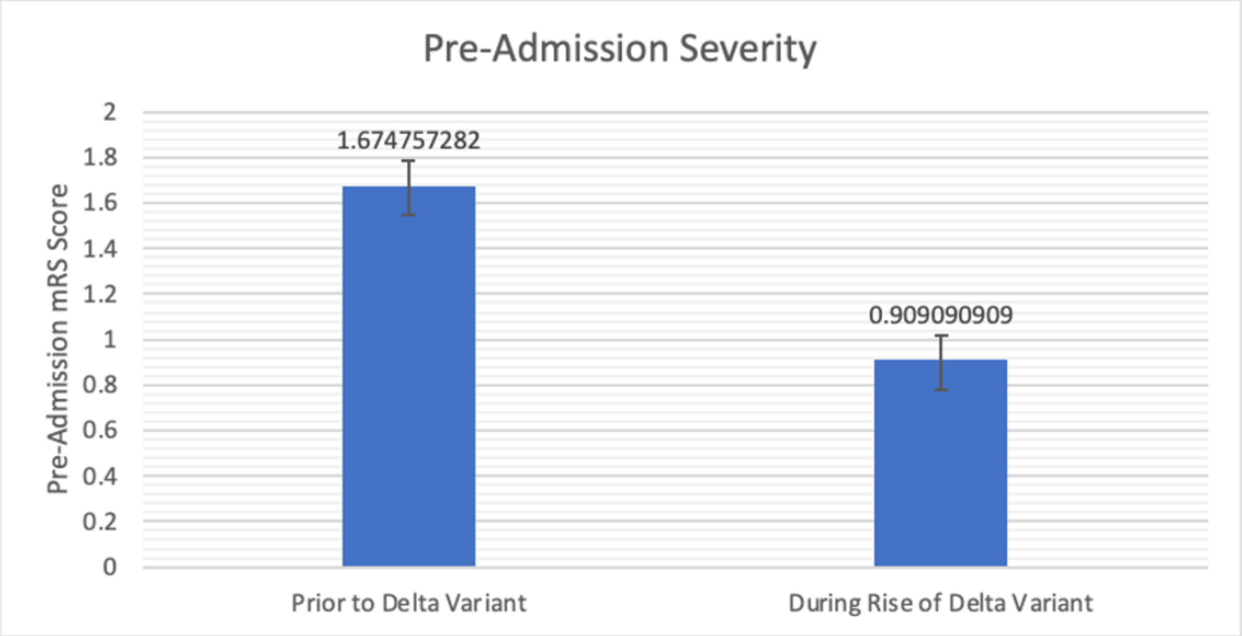


Figure 2 Pre-Admission Severity

Conclusion: A rise in EMS transports rather than private/taxi transports may be indicative of limited means of transportation in Galveston County and/or the reluctance of individuals to travel to the hospital due to fear of exposure. Such fear may increase total hospital visits, as symptoms become more severe before medical attention is sought, which was shown. A significant decrease in pre-mRS and no difference in time to IV tPa, duration of hospital stays, or post-mRS may indicate optimal stroke care despite challenges imposed by COVID-19 variants.

References:

1. Nogueira RG, Abdalkader M, Qureshi MM, et al. Global impact of COVID-19 on stroke care. Int J Stroke. 2021;16(5):573-584. doi:10.1177/1747493021991652
2. Sharma M, Lioutas VA, Madsen T, et al. Decline in stroke alerts and hospitalisations during the COVID-19 pandemic. Stroke Vasc Neurol. 2020;5(4):403-405. doi:10.1136/svn-2020-000441

LINKING GENE EXPRESSION PATTERNS AND BRAIN MORPHOMETRY TO TRAUMA AND SYMPTOM SEVERITY IN PATIENTS WITH FUNCTIONAL SEIZURES

Johannes Jungilligens (University Hospital Bochum, johannes.jungilligens@rub.de*), Stoyan Popkirov, David L. Perez, Ibai Diez*

Objective: To illuminate potential gene expression influences in neuroanatomical variation related to adverse life experiences (ALEs) and functional neurological symptom severity in patients with functional seizures.

Background: ALEs increase the susceptibility to psychopathologies, likely through neurodevelopmental and genetic effects. FS is a model disorder to help advance understanding of disease-related and transdiagnostic brain-trauma relationships.

Methods: The first aim was to study the relationship between specific ALEs and patient-reported symptom severity (Somatoform Dissociation Questionnaire, SDQ-20) in 20 patients with FS. Thereafter, we examined relationships between indices of functional neurological symptom severity and magnitude of previously experienced ALE subtypes with gray matter volumes using voxel-based morphometry (VBM). Lastly, spatial similarities were tested for between gray matter alterations and gene expression profiles from the Allen Human Brain Atlas (a brain-wide gene expression atlas) – aimed to identify genetic pathways dually implicated in the association of volumetric gray matter variations with functional neurological symptom severity and trauma burden.

Results: SDQ-20 scores correlated with sexual trauma, emotional neglect, and threat to life experiences burden. In VBM analyses, increased SDQ-20 scores related to decreased bilateral insula, left orbitofrontal, right amygdala, and perigenual/posterior cingulate gray matter volumes. Increased sexual trauma burden correlated with decreased right posterior insula and putamen volumes; increased emotional neglect related to decreased bilateral insula and right amygdala volumes. Genes overrepresented in adrenergic, serotonergic, oxytocin, opioid, and GABA receptor signaling pathways were spatially correlated with symptom severity and sexual trauma VBM findings; these findings also mapped onto cortical and amygdala maturation trajectories.

Conclusions: Individual differences in functional neurological symptom severity and ALE burden were associated with gray matter alterations in cingulo-insular and amygdala areas in patients with FS. Exploratory neuroimaging-genetics analyses underscored the potential role of genes involved in stress-related signaling pathways and neurodevelopment in the pathophysiology of this condition. This study underscores the clinical and neurobiological importance of investigating a trauma subtype of FS and FND more broadly – while also maintaining a focus on the study of individual differences.

LA BELL'S INDIFFÉRENCE: THE IMPORTANCE OF PHYSICAL EXAM

Julio Quezada (Children's Mercy Hospital, jfquezada@cmh.edu*)*

An 18-year-old woman presented to the pediatric emergency room with a history of sudden onset left sided weakness and numbness. On the day of the emergency room visit, she developed numbness that involved her entire left hemibody. Her school nurse noted she was weak on her left side and had difficulty walking. Additionally she reported blurry vision in her left eye, dizziness, nausea and difficulty with coordination. She has a longstanding history of migraines and a family history of autism and epilepsy. They moved to Kansas City a few months prior to emergency room visit, due to mom being a victim of intimate partner violence. In Kansas city, they were living with a friend, but the home environment became hostile when a gun was brought home by the family friend, so they moved out to a homeless shelter. This last move happened about two weeks prior to symptom onset. Patient also reported having "no friends at school". In the emergency room, she was diagnosed with functional neurological disorder due to the exam findings of left sided giveaway weakness that resolved with distraction, normal finger to nose, and numbness in her face along with a subtle left facial droop. Physical exam done during neurological consult was concerning for prior findings, but also for decreased/slow blinking on the left eye, decreased strength of left upper eyelid, and mildly abnormal gait (swaying side to side). She also reported a history of food tasting different, having had a "cold" one week prior, and admitting to high stress at home. Due to concern for Bell's palsy and functional hemiplegia, a brain MRI was obtained that revealed asymmetric enhancement of the distal canalicular segment of left cranial nerve 7, favored to reflect inflammation. The patient was diagnosed with Bell's palsy and started on a steroid taper. She was also diagnosed with functional hemiplegia and had good acceptance of the diagnosis. She was referred for CBT therapy and scheduled for follow up with neurology.

This case reflects the importance of performing a thorough physical exam in patients with suspected functional neurological disorders (FND). It highlights the fact that FND is not protective of other conditions, and may coexist with other conditions that should also be addressed. If unchecked, our patient would have run the risk of long term neurological sequelae of untreated Bell's palsy.

BRIDGING STRUCTURAL AND FUNCTIONAL BIOMARKERS IN FUNCTIONAL MOVEMENT DISORDER USING NETWORK MAPPING

Petr Sojka (Charles University in Prague, sojka5tr@gmail.com*), Matěj Slovák, Gabriela Věchetová, Robert Jech, David L. Perez, Tereza Serranová*

Objectives: To investigate gray matter volumetric profiles in FMD, and related findings to resting-state functional connectivity (rsFC) using Human Connectome Project data.

Background: There are gaps in our neurobiological understanding of functional movement disorder (FMD).

Methods: Volumetric differences between 53 FMD patients and 50 controls were examined, as well as relationships between individual differences in FMD symptom severity and volumetric profiles. Atrophy network mapping also probed whether FMD-related structural alterations preferentially impacted brain areas with dense rsFC.

Results: Compared to controls, the FMD cohort did not show any volumetric differences. Across FMD patients, individual differences in symptom severity negatively correlated with right supramarginal and bilateral superior temporal gyri volumes [Figure 1]. Symptom severity-related structural alterations mapped onto regions with dense rsFC - identifying several disease epicenters in default mode, ventral attention and salience networks [Figure 2].

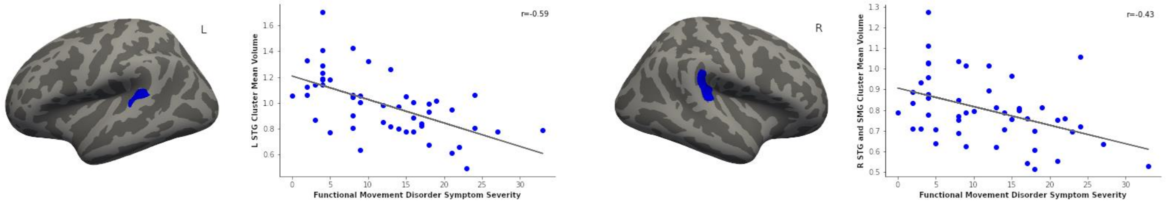


Figure 1

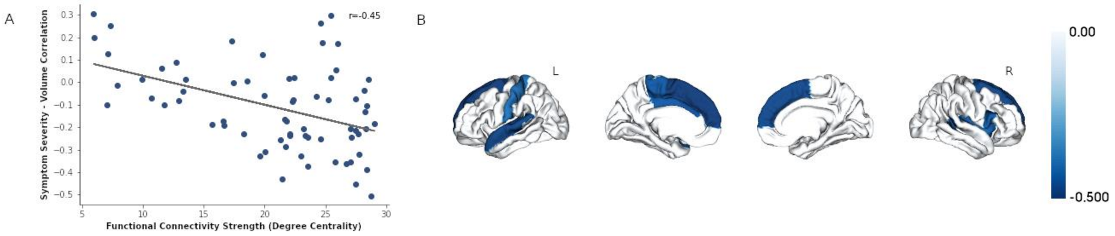


Figure 2

Conclusion: This study supports that FMD is a multi-network disorder with an important role of temporoparietal junction.

References:
Perez, D.L., Nicholson, T.R., Asadi-Pooya, A...& Aybek, S. (2021) Neuroimaging in Functional Neurological Disorder: State of the Field and Research Agenda. Neuroimage Clin, 30, 102623.

Fox, M.D. (2018) Mapping Symptoms to Brain Networks with the Human Connectome. New England Journal of Medicine, 379, 2237-2245.

THE INVEST TRIAL: A RANDOMISED FEASIBILITY TRIAL OF PSYCHOLOGICALLY INFORMED VESTIBULAR REHABILITATION VERSUS CURRENT GOLD STANDARD PHYSIOTHERAPY FOR PEOPLE WITH PERSISTENT POSTURAL PERCEPTUAL DIZZINESS

David Herdman (King's College London & St George's University Hospital NHS Foundation Trust, davidherdman7@hotmail.com*), Sam Norton, Louisa Murdin, Kate Frost, Marousa Pavlou, Rona Moss-Morris*

Objective: To determine the feasibility and acceptability of conducting a randomised controlled trial of cognitive-behavioural therapy informed vestibular rehabilitation (the INVEST intervention) designed for functional dizziness.

Background: Persistent Postural Perceptual Dizziness (PPPD) is a common and disabling functional neuro-vestibular disorder. Many patients remain disabled by symptoms despite vestibular rehabilitation.

Methods: A two-armed parallel groups randomised feasibility study of INVEST vs. a time matched gold standard vestibular rehabilitation (VR) control. Participants with PPPD (persistent postural perceptual dizziness) were recruited from a tertiary (specialist) vestibular clinic in London, UK. Participants were individually randomised using a minimisation procedure with allocation concealment. Measures of feasibility and clinical outcome were collected and assessed at four months. Exploratory estimates of treatment effect were computed.

Results: Forty patients (80% female, mean age 44.5 years ± 17) with PPPD were recruited and randomised to six sessions of INVEST (n=20) or current gold standard VR (n=20). Overall, 59% of patients screened met the inclusion criteria, of which 80% enrolled. Acceptability of INVEST, as assessed against the Theoretical Framework of Acceptability (TFA), was excellent and 80% adhered to all 6 sessions. There were small to moderate treatment effects in favour of INVEST across all measures, including dizziness handicap, negative illness perceptions, symptom focussing, fear avoidance, and distress (standardised mean difference [SMD]g = 0.45; SMDg = 0.77; SMDg = 0.56; SMDg = 0.50, respectively). No intervention-related serious adverse events were reported.

Conclusions: Strong support for the feasibility of a full-scale trial was provided. Both arms had high rates of recruitment, retention, and acceptability. There was promising support of the benefits of integrated cognitive behavioural therapy-based vestibular rehabilitation compared to current gold standard vestibular rehabilitation. The study fulfilled all the a-priori criteria to advance to a full-scale efficacy trial.

INCREASED SUICIDE ATTEMPT RISK IN PEOPLE WITH EPILEPSY IN THE PRESENCE OF CONCURRENT PSYCHOGENIC NONEPILEPTIC SEIZURES

Irene Faiman (King's College London, irene.faiman@kcl.ac.uk*), John Hodsoll, Allan H Young, Paul Shotbolt*

Objective: To test the hypothesis that people with concurrent diagnosis of epilepsy and psychogenic nonepileptic seizures (PNES) are at increased risk of attempting suicide as compared to people with epilepsy alone or PNES alone. To report on suicide rates.

Background: Suicide is three times more frequent in people with epilepsy and particularly in the presence of psychiatric comorbidities. [1] Approximately 12% of people with epilepsy have concurrent PNES. [2] Identifying high-risk groups is a global and clinical priority for suicide prevention.

Methods: Retrospective cohort study from the UK's largest tertiary mental health care provider, with linked nation-wide admission and mortality data from the Hospital Episode Statistics (HES) and Office for National Statistics (ONS). Oxfordshire C Research Ethics approval (18/SC/0372). Participants were 2460 people with a primary or secondary diagnosis of epilepsy, PNES, or concurrent epilepsy and PNES attending between 01/01/2007 and 18/06/2021. Exclusion criteria were a diagnosis of structural brain disease or psychotic disorder. The outcome was first hospital admission for suicide attempt (ICD-10 X60-X84). A Firth's Bias-Reduced Logistic Regression was performed to estimate the association between diagnostic group and suicide attempt-related admissions, controlling for gender, ethnicity and five psychiatric comorbidities. ONS deaths by suicide were reported.

Results: Nine percent of participants had at least one suicide attempt-related hospital admission. For people with concurrent diagnosis of epilepsy and PNES, the odds for suicide attempt-related admissions were 2.52 times the odds of people with epilepsy alone (OR: 0.40; CI: 0.21 to 0.79; p = 0.01). Odds were comparable between people with concurrent diagnosis and people with PNES alone (OR: 0.75; CI: 0.41 to 1.48; p = 0.40). Post-hoc analyses revealed that the odds of people with PNES alone having a first admission for suicide attempt were 1.93 times the odds of people with epilepsy alone (OR: 0.52; CI: 0.38 to 0.70; p<.001). Deaths by suicide accounted for 1.23% (2/163) of all deaths. These were 0.85% (1/118) in the epilepsy group, and 2.63% (1/38) in the PNES group. No estimate could be provided for the group with concurrent diagnosis due to low numbers (0 deaths by suicide in 7 deaths).

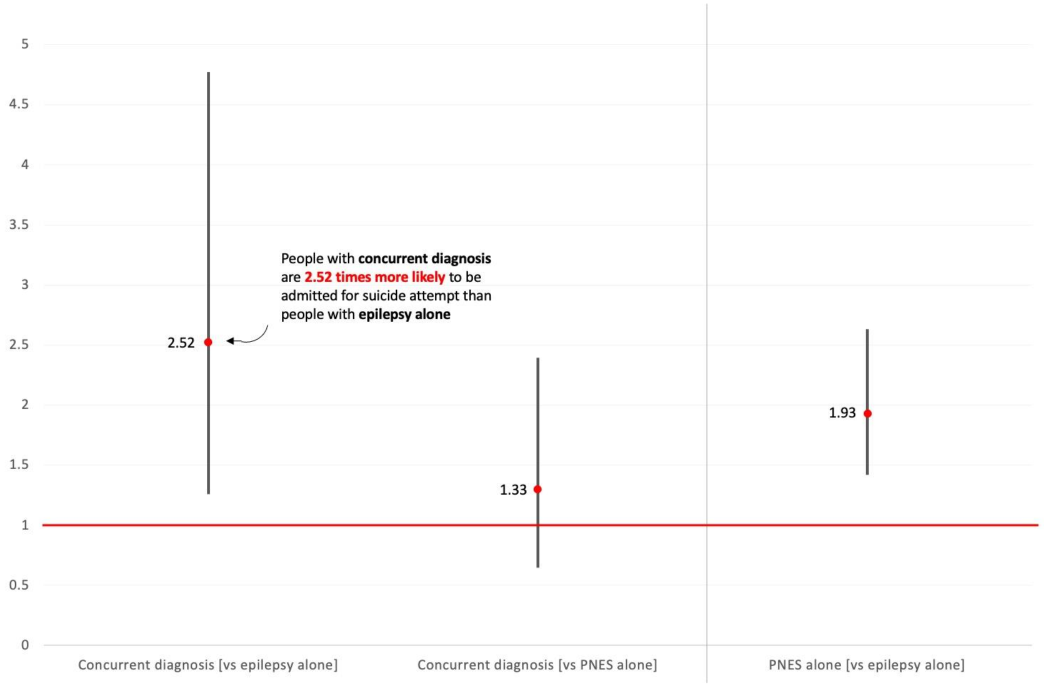


Figure 1.

Conclusions: People with concurrent diagnosis of epilepsy and PNES or PNES alone have significantly increased odds of hospitalisation due to suicide attempt as compared to people with epilepsy alone (152% and 93% increase respectively). These findings have direct implications for the clinical management of suicide risk in people with epilepsy.

It is essential to investigate cases where there is a suspicion for coexisting seizure types, as a concurrent diagnosis of epilepsy and PNES is associated with a different risk profile and a significantly increased risk of hospitalisation due to suicide attempt. People with concurrent diagnosis of epilepsy and PNES are a high-risk category that should be target of enhanced risk monitoring and preventive psychosocial interventions.

References:

1. Bell GS, Gaitatzis A, Bell CL, Johnson AL, Sander JW. Suicide in people with epilepsy: how great is the risk? Epilepsia. 2009;50(8):1933–42.

2. Kutlubaev MA, Xu Y, Hackett ML, Stone J. Dual diagnosis of epilepsy and psychogenic nonepileptic seizures: systematic review and meta-analysis of frequency, correlates, and outcomes. Epilepsy Behav. 2018;89:70–8.

THORACIC MYOCLONUS AND ATYPICAL SPASMODIC DYSPHONIA OR FUNCTIONAL SPEECH DISORDER: A CASE DISCUSSION

Rene Utianski (Mayo Clinic, utianski.rene@mayo.edu*)*

Objective: To demonstrate the importance of identifying positive pertinent signs for diagnosis of a functional speech disorder, taking a detailed case history, and not prescribing over-importance of incidental, often irrelevant findings from other tests or procedures, including EMG and laryngoscope.

Background: The patient is a 71-year-old female seen for evaluation after a five-month history of persistent voice difficulties along with involuntary inspiratory movements. Her past and recent medical history was overall benign, although, upon further questioning, it was revealed she had previous loss of voice several years prior, without clear etiology, that resolved following acupuncture treatment. She had a baseline essential tremor which worsened significantly with onset of acute speech difficulties.

Methods: She underwent multi-disciplinary workup, led by ENT with later involvement of neurology and speech pathology. Laryngoscope with ENT showed asymmetric vibration and significant supraglottic hyperfunction. Intermittently, the arytenoid cartilages dropped into the glottis during inhalation. There was intermittent movement of the pharynx, soft palate, larynx, and visualized upper aerodigestive tract with attempts to vocalize. The true vocal folds showed normal and full motion with complete abduction and incomplete adduction. Immediately after voicing there was intermittent narrowing at the glottis. The patient rated her voice as 25% of normal with extra effort and extreme concern. Total score on the Voice Handicap Index-10 (VHI-10) was 29/40. EMG revealed organic thoracic myoclonus, attributed as the etiology of the involuntary inspiratory movements. MRI of the cervical and thoracic spine showed no clear spinal cord abnormalities. Botox injections were considered, but with the number of levels of involvement, primary site of injection could not be identified.

Results: Overall, it was described she had an unusual constellation of symptoms, with an abnormal laryngeal exam. The involuntary inspiratory movements were accompanied by a snort, that were attributed to thoracic myoclonus. Her speech was described as “not a typical presentation of spasmodic dysphonia” with intermittent strain. But what was it? Speech pathology evaluation raised concern for a functional speech disorder given the mismatch between physiological exam findings and perceptual features (namely, presence of hyperfunction with perception of “weakness”), clinical course, and patient reports of internal inconsistency.

Conclusions: The patient presented with a functional voice disorder which resolved with behavioral intervention, which targeted minimizing tension and promoting smooth, outward flow of speech. The video demonstrates the progression of improvement and the patient’s relief with her diagnosis, prognosis, and improvement.

TREATING A CASE OF FUNCTIONAL FOREIGN ACCENT SYNDROME

Rene Utianski (Mayo Clinic, utianski.rene@mayo.edu*)*

Objective: To demonstrate the methods utilized in treating a functional communication disorder characterized by non-native speech and language intrusions.

Background and Methods: The patient is a 59-year-old monolingual English-speaking gentleman with a history of non-specific body pain diagnosed initially as a connective tissue disease that ultimately resolved spontaneously, and remote episodic stuttering. In late 2020 he had sudden onset of a “Canadian” accent for about two weeks, followed by two weeks of a “Cajun” accent, after which he began speaking with a non-specific “eastern European” accent. At onset of accented speech, he also noted frontal head pressure. Others noted fluctuations in speech quality, that he did not. If he spoke slowly, it diminished but did not resolve the accent. He endorsed increased word-finding difficulties and using words unexpected for his baseline speaking style. After a few weeks he began to walk slowly, unsteadily, and ultimately required a gait aid. He noted visual disturbances, ringing in his ears, and attentional difficulties. As a result of the symptoms, he reduced his workload and stopped driving. Investigations included neuropsychometric testing, MRI, thyroid function, B12, A1c, EEG, amongst others, which were all unrevealing.

Results and Conclusions: During the speech evaluation, he had a non-specific “eastern European” accent. He had unexpected, and new, hand gestures. He had further impact on his language, such as using formal words “could not” instead of contractions, starting a sentence with "erm," responding "no no" or "yes yes," and non-native word order. We discussed these symptoms occur outside of an individual’s volitional control. However, I reiterated that with effort he could bring the movements under his control. I encouraged him to be mindful of how his speech looks and feels and modify his speech as he hears the "accent;" we specifically discussed the placement of his tongue when making "r" sounds. After some improvements I recommended that he do some reading aloud, hourly, and that he work to exert control over his improving speech pattern during conversation with family. He later returned for intensive outpatient therapy, with four physical and occupation therapy sessions daily for gait disturbance and once-daily speech therapy. We used the exercise of modeling a different accent which promoted control over doing something differently. We addressed his non-verbal communication and gestures; he was able to reduce and modify the movements with mild cuing.

With behavioral intervention he was able to recognize and correct speech sound errors, at first in structured tasks such as reading and repetition, and ultimately in conversation. At the start of the evaluation he estimated his speech at 20% of normal functioning, then 40%, 80%, and ultimately 100% of normal. Language changes resolved without direct intervention. He also had near resolution of physical changes.

The patient presented with a functional communication disorder characterized by non-specific, non-native speech, language, and even non-verbal communication, intrusions which resolved with symptomatic, targeted behavioral intervention.

THE NEUROCOGNITIVE MECHANISMS UNDERLYING DISSOCIATIVE AMNESIA: AN ANALYSIS OF TWO CASES

Laura Marsh (University of Cambridge, laura.marsh@mrc-cbu.cam.ac.uk*), Dace Dace Apšvalka, Nobuhito Abe, Jun Kawaguchi, Michael C Anderson*

Objective: To examine the possible role of memory control systems in dissociative amnesia.

Background: The mechanisms underlying dissociative amnesia are poorly understood. One theory suggests that memory retrieval is 'blocked' by prefrontal control. A parallel body of experimental work has identified a memory control system that can inhibit retrieval.

Methods: Re-analysed fMRI data from two previously reported cases of dissociative amnesia (Kikuchi et al. 2009). Both patients had retrograde amnesia covering several years, with preserved anterograde memory. In the scanner, they were shown reminders of people from the forgotten period (current colleagues), as well as a period they could still remember (school friends). Contrasting the forgotten with the remembered condition, and examined the extent to which the activated regions overlapped with regions involved in retrieval control. Examined the effective connectivity between the right dorsolateral prefrontal cortex (DLPFC) and hippocampus when patients were reminded of forgotten colleagues.

Results: Observed increased DLPFC activation and decreased hippocampal activation in response to reminders of forgotten colleagues, relative to remembered high school friends. There was extensive overlap between these regions, and those engaged during typical laboratory-based tasks of memory inhibition [Figure1]. Using dynamic causal modelling, found evidence that the right DLPFC downregulated the hippocampus when the patients were reminded of colleagues they could no longer recognise. This pattern was no longer evident following memory recovery in one patient, but persisted in the second patient who remained amnesic.

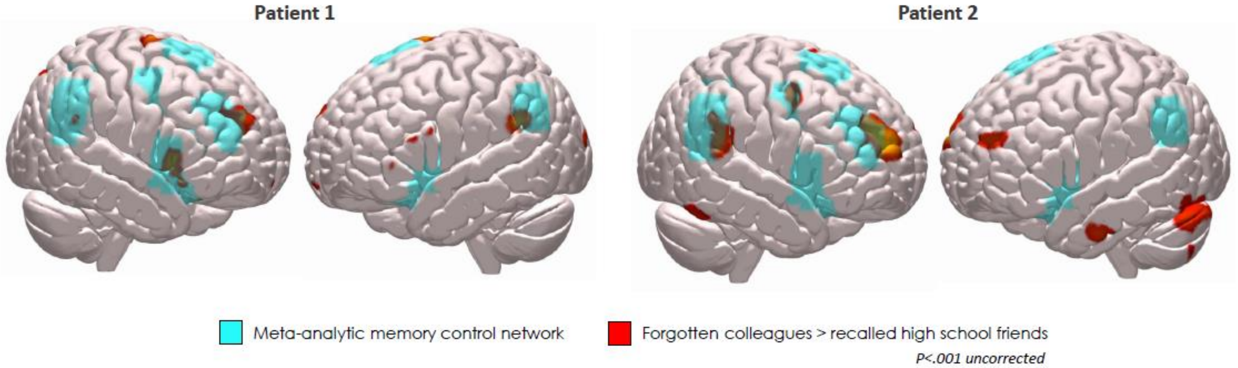


Figure 1.

Conclusions: These findings provide preliminary evidence that retrieval control systems may be erroneously or maladaptively recruited, inhibiting retrieval of personal memories in dissociative amnesia. This retrieval block is often temporary, and may occur on a semi- or sub-conscious level. Further research with larger samples is required, but these findings may provide a mechanistic target for current and future treatment approaches.

References:

Kikuchi, H; Fujii, T; Abe, N; Suzuki, M; Takagi, M; Mugikura, S; Takahashi, S; Mori,E. Memory Repression: Brain Mechanisms underlying Dissociative Amnesia. J Cogn Neurosci 2010; 22 (3): 602–613. doi: https://doi.org/10.1162/jocn.2009.21212

EXAGGERATION IN FND?

Anne-Catherine Huys (Cambridge University Hospitals, anne-catherine.huys.15@ucl.ac.uk*), Patrick Haggard, Kailash Bhatia, Mark Edwards*

Objective: To test the common prejudice of exaggeration in functional neurological disorder.

Background: People with functional neurological disorder are frequently presumed to exaggerate their symptoms or perceive them in an exaggerated manner.

Methods: A) Subjective versus objective tremor severity during a reaching movement were compared in 17-21 functional, 19-21organic tremor patients and 20-23 healthy controls; both by retrospectively estimating the average of hundreds of reaching movements, and in real-time by adapting the tremulousness of the movement‘s visual feedback.
B) Pain ratings of electrotactile stimuli were compared between 18 people with functional neurological disorder and 29 healthy controls.
C) The degree of self-consciousness about their movements was compared between 52 people with functional, 41 with equivalent organic movement disorders and 57 healthy controls, by means of the movement self-consciousness subscale of the Movement Specific Reinvestment Scale.

Results: A) People with functional tremor did not overestimate their tremor severity compared to the control groups, neither when estimating their tremor severity in retrospect nor in real-time.
B) People with functional neurological disorder did not overrate painful stimuli compared to healthy controls.
C) Compared to healthy controls, both movement disorders group scored higher on the self-consciousness scale (functional: mean=16.9, organic: mean=18.0, healthy: 10.1, range 5-30), but without significant difference between the functional and organic groups.

Conclusions: Neither of these three differing measures of exaggeration showed a significant difference between the respective functional groups and controls. The widespread notion of exaggeration in FND might need to be reassessed. Common observations possibly interpreted as exaggeration are symptom exacerbation and marked effort during clinical examination, with the same action executed normally when done implicitly. Another example are patients with intermittent symptoms describing them as constant. It is well known that functional symptoms increase with attention and improve or even disappear with distraction. Thus, symptom exacerbation with attention offers an alternative explanation for many observations commonly interpreted as “exaggeration”.

References:

Huys A-CML, Beck B, Haggard P, Bhatia KP, Edwards MJ. No increased suggestibility to placebo in functional neurological disorder. Eur J Neurol 2021;28:2367–71.

Huys A-CML, Bhatia KP, Haggard P, Edwards MJ. Symptom-Triggered Attention to Self as a Possible Trigger of Functional Comorbidity. Mov Disord Clin Pract 2021;8:159–61.

NEUROMODULATION FOR THE TREATMENT OF FUNCTIONAL NEUROLOGICAL DISORDER AND SOMATIC SYMPTOM DISORDER: A SYSTEMATIC REVIEW

Adriano Mollica (Sunnybrook Health Sciences Centre, ag.mollica@gmail.com*), Chika Oriuwa, Anthony Feinstein, Peter Giacobbe, Nir Lipsman, David L. Perez, Matthew Burke*

Background: Functional neurological disorder (FND) and somatic symptom disorder (SSD) are complex neuropsychiatric conditions that have been linked to circuit-based dysfunction of brain networks. Neuromodulation is a novel therapeutic strategy capable of modulating relevant brain networks, making it a promising potential candidate for the treatment of these patient populations.

Methods: Conducted a systematic review of Medline, Embase, and PsychINFO up to March 4, 2021. Trials investigating neuromodulation devices for the treatment of functional neurological disorder or somatic symptom disorder were selected. Studies were excluded if they were not focused primarily on FND or somatoform disorders, case reports or series (n<3), not original research (reviews, opinion articles), conference abstracts, not available in English text, or did not use neuromodulation (other treatments or technologies). Extracted variables included study design, demographic and clinical characteristics, psychiatric comorbidity, neurostimulation protocols, clinical outcome measures and results.

Results: There were 404 studies identified with 12 meeting inclusion criteria [Figure 1]. 221 patients were treated in the included studies with mean study sample size of 18 (4-70). Five were randomized control trials, five were case series (n>4), and two were retrospective cohort studies. Only four studies used a sham-controlled clinical trial design. Most studies were not blinded (three studies were double-blinded, and two were single-blinded. Treatment protocols varied from one single stimulation session to 12 weeks of stimulation. Functional motor symptoms (six weakness, four movement disorders) were the most studied sub-populations. TMS was the most frequently used device (ten studies), followed by ECT (one study) and direct-current stimulation (one study) [Figure 2]. Treatment protocols varied in intended therapeutic mechanism(s): eight studies aimed to modulate underlying network dysfunction, five aimed to demonstrate movement (one also leveraged the former), and 3 boosted their primary mechanism with enhanced suggestion/expectation [Figure 3]. All but one study reported positive results; however, methodological/outcome heterogeneity, mixed study quality, and small sample sizes precluded quantitative meta-analysis.

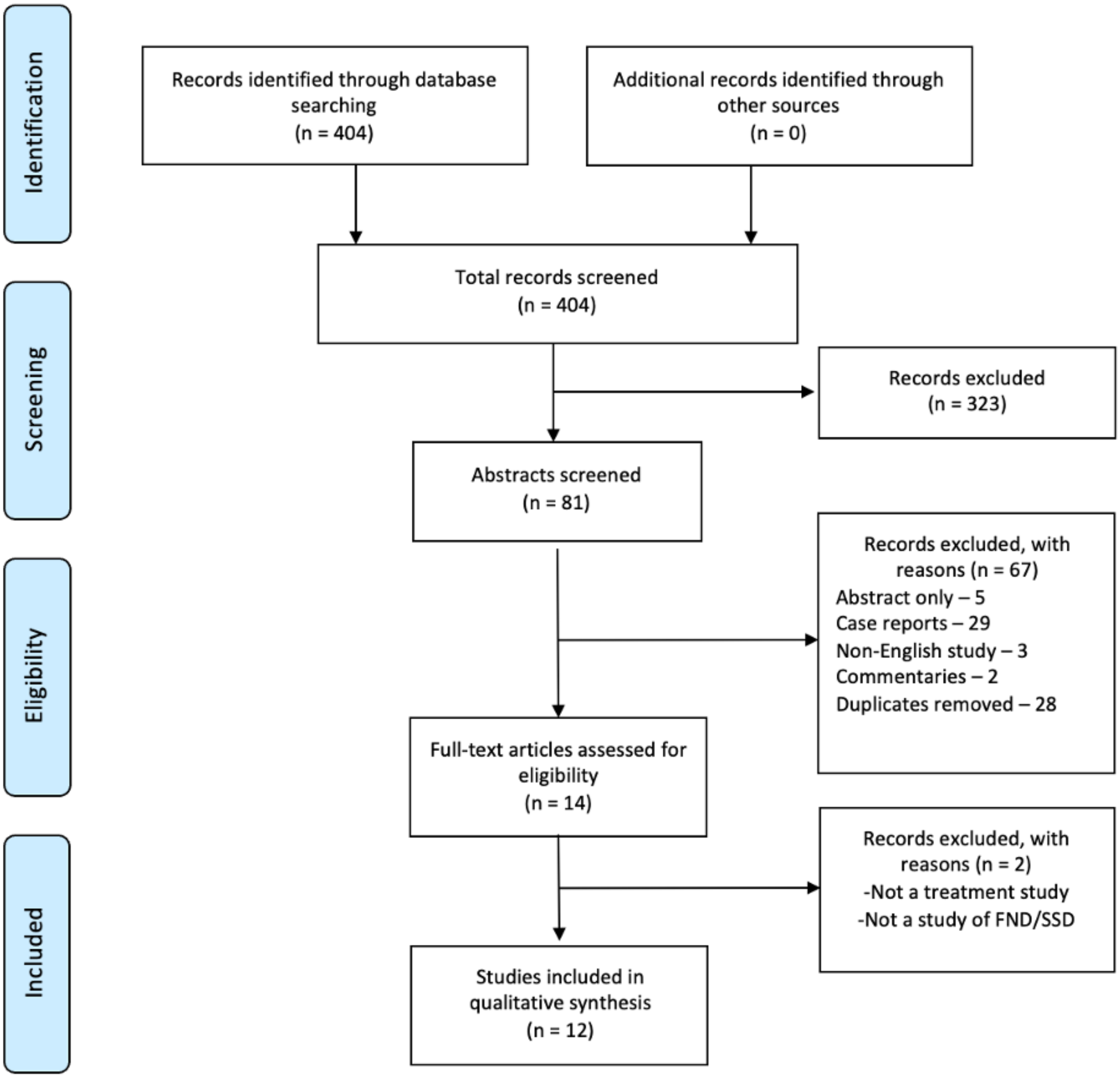
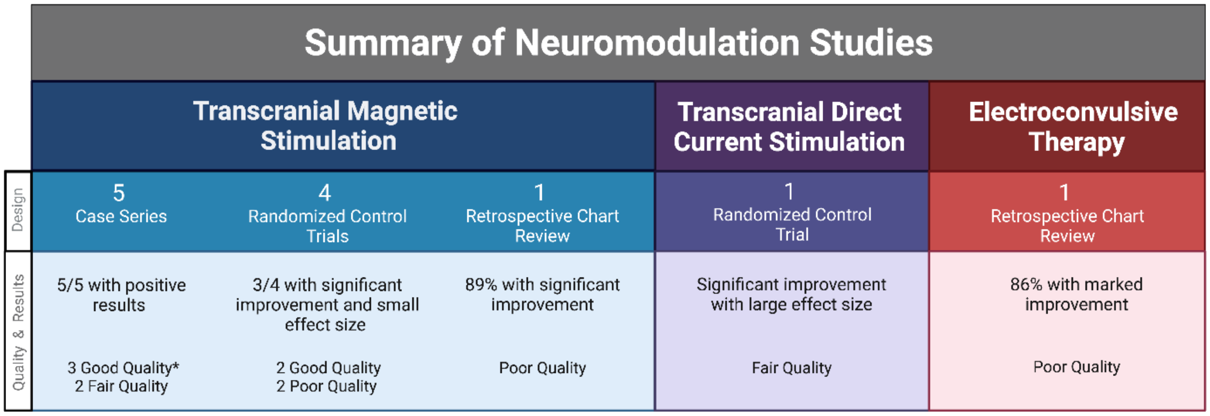

Identification
Screening
Eligibility
Included
Records identified through database searching (n = 404)
Additional records identified through other sources (n = 0)
Total records screened (n = 404)
Records excluded (n = 323)
Abstracts screened (n = 81)
Records excluded, with reasons (n = 67)
Abstract only – 5
Case reports – 29
Non-English study – 3
Commentaries – 2
Duplicates removed – 28
Full-text articles assessed for eligibility (n = 14)
Records excluded, with reasons (n = 2)
-Not a treatment study
-Not a study of FND/SSD
Studies included in qualitative synthesis (n = 12)

Figure 1.



Summary of Neuromodulation Studies	Transcranial Magnetic Stimulation			Transcranial Direct Current Stimulation	Electroconvulsive Therapy
Design	5 Case Series	4 Randomized Control Trials	1 Retrospective Chart Review	1 Randomized Control Trial	1 Retrospective Chart Review
Quality & Results	5/5 with positive results 3 Good Quality* 2 Fair Quality	3/4 with significant improvement and small effect size 2 Good Quality 2 Poor Quality	89% with significant improvement Poor Quality	Significant improvement with large effect size Fair Quality	86% with marked improvement Poor Quality

Figure 2.

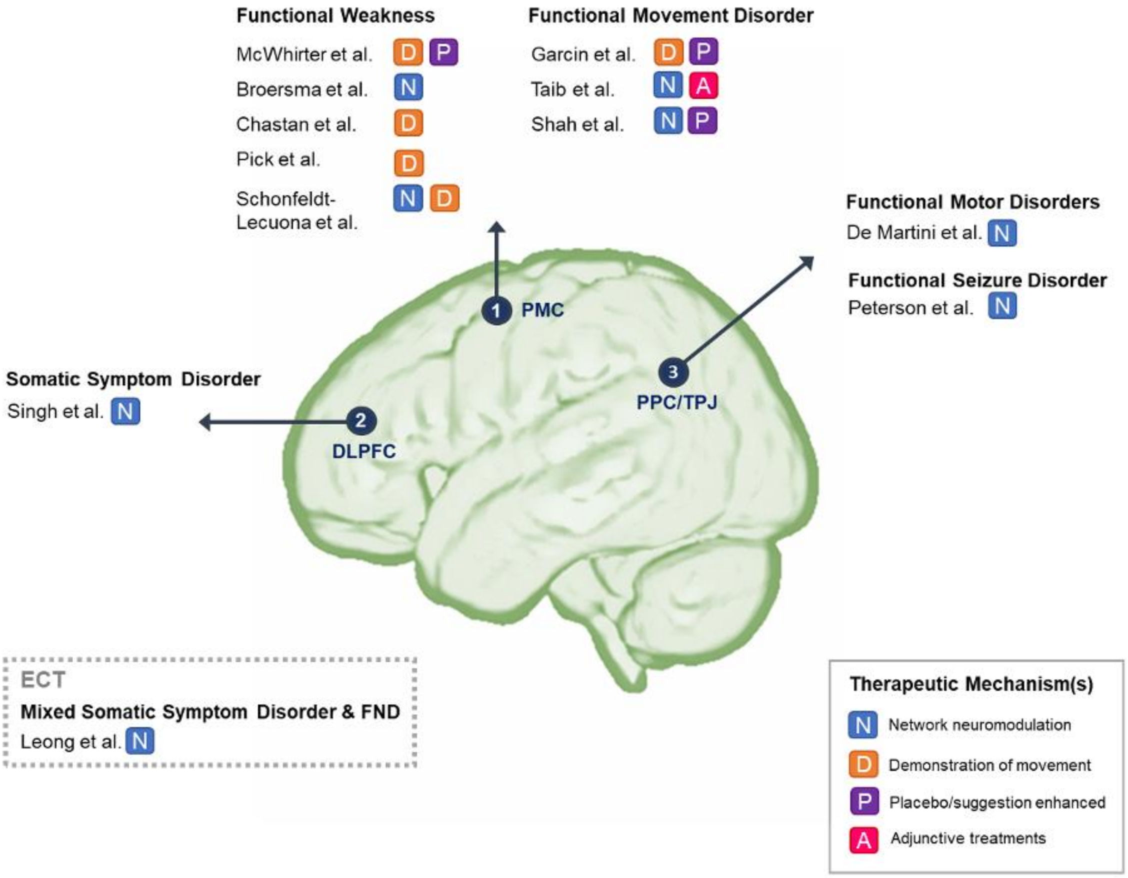


Figure 3.

Conclusion: Neuromodulation, particularly TMS for the treatment of functional motor symptoms, shows preliminary promise in a growing line of research. Larger, sham-controlled studies are needed to further establish efficacy and better understand therapeutic mechanisms.

EXECUTIVE DYSFUNCTION IN FUNCTIONAL MOVEMENT DISORDERS - THE FLIPSIDE OF DISTRACTIBILITY

Anne-Catherine Huys (Cambridge University Hospitals, anne-catherine.huys.15@ucl.ac.uk*), Kailash Bhatia, Mark Edwards, Patrick Haggard*

Objective: To test the alerting, orienting and executive attentional networks in functional movement disorders.

Background: Attentional mechanisms play a crucial role in functional neurological disorder, raising the question if there is some primary or secondary attentional dysfunction.

Methods: Thirty people with a functional movement disorder, 30 people with an equivalent organic movement disorder and 30 healthy controls performed the attention network test.
Participants are asked to press a left or right button as quickly as possible in response to a left or right pointing target arrow presented slightly above or below the fixation point. The target arrow is surrounded by either neutral flankers (lines), congruent flankers (same direction as the target arrow), or incongruent flankers (opposite direction to the target arrow) and preceded by either no cue, a temporally informative cue, or a temporally and spatially informative cue. This test allows to separately evaluate the alerting, orienting and executive attentional networks.

Results: The alerting and orienting components of attention were normal in people with functional movement disorders. However, executive control of attention, which in this task involved conflict resolution, was impaired compared to healthy controls and people with an organic movement disorder.

Conclusions: People with functional movement disorders have impaired executive function. We postulate that rather than it being a primary, predisposing characteristic, it is secondary to overutilisation of limited attentional resources for explicit control of movements which are normally performed implicitly. Importantly, executive dysfunction, provides an explanation for seemingly unrelated symptoms typically reported by people with functional movement disorders: concentration difficulties and fatigue.

References:

Huys A-C, Bhatia K, Edwards M, Haggard P. The Flip Side of Distractibility—Executive Dysfunction in Functional Movement Disorders. Front Neurol 2020;11:969.

DON´T LOOK - MISDIRECTED ATTENTIONAL FOCUS IN FUNCTIONAL TREMOR

Anne-Catherine Huys (Cambridge University Hospitals, anne-catherine.huys.15@ucl.ac.uk*), Patrick Haggard, Kailash Bhatia, Mark Edwards*

Objectives: To evaluate if attention is misdirected in functional tremor, and if so, if such an attentional focus is a beneficial compensatory strategy, or rather detrimental to movement and therefore possibly involved in symptom generation.

Background: Attention plays a crucial role in functional movement disorders. Symptoms worsen with attention and improve with distraction. Yet it is not known which aspect of attention is detrimental and whether it is misdirected in functional movement disorders.

Methods: Three groups, each of around 20 subjects, were compared: functional versus organic action tremor patients and healthy controls. Participants moved their finger from a starting position to a target, with their hand hidden underneath a horizontal screen displaying the start, target and current finger position. The natural focus of attention during movement was established by means of change detection tasks, with the premise that a change in the attended modality would be detected more readily. Subsequently it was tested if the thus established natural focus of attention had a positive or negative impact on movement (trajectory straightness), by manipulating the participants´ attentional focus on different aspects of their reaching movement.

Results: In contrast to both control groups, the spontaneous focus of attention in functional tremor was on the ongoing visual feedback of the movement. This focus of attention had a negative impact on the straightness of the trajectory in all three groups (worse motor performance with attention to indirect visual feedback, to accuracy and when instructed to move slowly, with improved motor performance without visual feedback and when instructed to move fast). Furthermore, motor performance improved in the functional tremor group but not in either control group, when the movement was performed without attention, as an apparent insignificant preparatory movement.

Conclusions: This study provides experimental evidence for improvement of movement with distraction in a functional movement disorder. Furthermore, since absence of attention to movement has no effect on movement performance in either control group, but improves it in functional tremor, it can be deduced that there is something detrimental about attending to movement in functional tremor. In functional tremor, the normal allocation of attention during movement is disproportionally altered towards the ongoing visual feedback. Such an attentional focus worsens performance in all three groups. Thus, a misdirected attentional focus onto the ongoing visual feedback of the movement is likely to contribute to symptom generation in functional tremor.

References:

Huys A-CML, Haggard P, Bhatia KP, Edwards MJ. Misdirected attentional focus in functional tremor. Brain 2021; 144(11):3436–50.

ATTITUDES TO PLACEBO IN FND - A PATIENT AND HEALTHCARE PROFESSIONAL SURVEY

Anne-Catherine Huys (Cambridge University Hospitals, anne-catherine.huys.15@ucl.ac.uk*), Hannah D. Franklin, Kailash Bhatia, Jon Stone, Mark Edwards*

Objective: To evaluate patients' and healthcare professionals' attitudes towards deceptive and open-label placebo treatments in functional neurological disorder (FND), compared to other conditions, its perceived effectiveness and current use.

Background: People with functional neurological disorder occasionally exhibit dramatic placebo effects. Yet, there are many potential risks associated with its use and so it is prohibited in most healthcare systems.

Methods: A sixteen-item anonymous survey enquired about attitudes towards deceptive and open-label placebo treatments in clinical practice, its perceived effectiveness and current use. The following groups completed the survey: 288 people with a neurological condition, 138 people with a functional neurological disorder, 61 people with a medical condition, 59 healthy controls and 112 healthcare professionals, of which 45 neurologists and 20 psychiatrists/psychologists.

Results: Sixty-nine percent of non-professionals and 48% of healthcare professionals overall agreed with the use of deceptive placebo treatments. However, 22% of FND and 12% of other patients strongly disagreed. Forty-one percent of FND patients, 46% of other patients and 70% of healthy controls believed that a deceptive placebo would improve their own symptoms. Healthcare professionals estimated it to be effective in 31% of purely organic and in 55% of purely functional symptoms. Major concerns involved the undermining of trust.

Only one-third of professionals had ever used either form of placebo and if so, very rarely and mostly for non-specific or functional symptoms and as a diagnostic tool.

Open-label placebo was felt to be rather ineffective.

Conclusion: Many lay people and healthcare professionals consider deceptive placebo treatments to be effective. The overall attitude to it is favourable amongst lay people, without clear difference between FND and other patient groups. Healthcare professionals are more conservative. However, it is crucial to note that a considerable percentage of patients, more so in the FND group, strongly oppose it. The prohibition of deceptive placebo in most countries appears in line with general concerns and some strong opposition.

In all groups there is marked scepticism as to the effectiveness of open-label placebo. Future studies will show if the negative attitude to open-label placebo is justified or if this ethically viable option deserves more consideration.

CLINICAL MRI MORPHOLOGICAL ANALYSIS OF FUNCTIONAL SEIZURES COMPARED TO SEIZURE-NAÏVE AND PSYCHIATRIC CONTROLS

Wesley Kerr (University of Michigan, kerrwe@med.umich.edu*), Hiroyuki Tatekawa, John Lee, Amir Karimi, Siddhika Sreenivasan, Joseph O'Neill, Ivanka Savic, Nilab Nasrullah, Randall Espinoza, Katherine Narr, Noriko Salamon, Nicholas Beimer, Lubomir Hadjiiski, Dawn Eliashiv, William Stacey, Jerome Engel, Jr.*

Objective: To evaluate whether MRI morphometry from clinically obtained MRIs differed between patients with functional seizures (FS) and clinically relevant comparison populations.

Background: FS, also known as psychogenic nonepileptic seizures (PNES), were long thought to have no brain correlates. Functional and structural neuroimaging have identified objective signs of this disorder.

Methods: Quality-screened clinical-grade MRIs were acquired from 666 patients from 2006 to 2020. Morphometric features were quantified with FreeSurfer v6. Mixed-effects linear regression compared the volume, thickness, and surface area within 201 regions-of-interest for patients with FS, compared to seizure-naïve patients with depression, anxiety, and obsessive-compulsive disorder (OCD), respectively, and to other seizure-naïve controls with similar quality MRIs, accounting for the influence of multiple confounds including depression and anxiety based on chart review.

Results: After Bonferroni-Holm correction, patients with FS compared with seizure-naïve controls exhibited thinner bilateral superior temporal cortex (left 0.053mm, p=0.014; right 0.071mm, p=0.00006), thicker left lateral occipital cortex (0.052mm, p=0.0035), and greater left cerebellar white-matter volume (1085mm3, p=0.0065). These findings were not accounted for by lower MRI quality in patients with FS.

Conclusions: These results reinforce prior indications of structural neuroimaging correlates of FS and, in particular, distinguish brain morphology in FS from that in depression, anxiety, and OCD. Future work may entail comparisons with other psychiatric disorders including bipolar and schizophrenia, as well as exploration of brain structural heterogeneity within FS.

OUTCOMES OF TAILORED PSYCHOTHERAPY FOR DISSOCIATIVE SEIZURES IN A DEVELOPING FUNCTIONAL NEUROLOGY SERVICE

James Mitchell (University of Liverpool, james.mitchell@Liverpool.ac.uk*), Christine Burness, Michael Walsh, Katie Katie Robb, Mariana Decheva, Jayne Martlew*

Objective: To demonstrate the effectiveness of a short, tailored psychotherapy intervention for patients with dissociative seizures in a clinical setting.

Background: Dissociative seizures (DS) can cause distress and disability comparable to that caused by epileptic seizures. There is growing evidence to suggest psychological therapy can be effective in treating DS, although the treatment approaches are varied.

Methods: Present outcome data from a developing functional neurological disorders service in the North West of England, offering short term psychotherapy to consecutive eligible patients with a diagnosis of DS. Patients were assessed for clinical and psychological variables before and after psychotherapy using the GAD-7 screening score for generalised anxiety disorder, the Work and Social Adjustment Scale (WSAS) to assess functional status, the PHQ-15 somatic symptoms scale, PHQ-9 depression score and PCLC PTSD symptom score.

Results: Eighty-six patients (67 female) were referred for psychotherapy with a clinical diagnosis of DS. The mean number of therapy sessions was 5.94 (95% CI 5.04 to 6.84). Patients had significant improvements in GAD-7 sumscores (Z=-2.549, p=0.011), PHQ-15 (p=0.028), PHQ-9 (Z=-3.202, p<0.001) as well as PCLC PTSD symptom scores (Z=-2.288, p=0.022), comparing pre and post treatment values. Whilst there was a reduction in the median WSAS scores comparing pre and post treatment values (30 to 22.5), this difference was not significant (Z=-1.932, p=0.053). DS frequency improved in 67.4% of patients (95% CI 52.0% to 80.5%).

Conclusions: Although this is an observational study, findings support the notion that tailored psychotherapy is a clinically effective intervention to improve psychological status, quality of life and dissociative seizure frequency in a real-world clinical setting. Further work is currently underway to assess outcomes over a longer duration to ascertain whether our findings are reproducible, and the benefits are sustained.

FUNCTIONAL GAIT DISORDER – CLINICAL PRESENTATION, PHENOTYPES, AND IMPLICATIONS FOR TREATMENT

Sara Issak (Epworth Healthcare & The University of Melbourne, sissak@student.unimelb.edu.au*), Gavin Williams, Richard Kanaan, Glenn Nielsen, Natalie Fini*

Objective: To provide an overview of the current literature of functional gait disorders (FGD), including diagnosis, clinical presentation, phenotypes and treatment.

Background: FGD is a common presentation of functional neurological disorders (FND) that causes disability. Motor and non-motor symptoms can contribute to FGD, but little is known of FGD characteristics, prevalence, severity and the impact of these symptoms.

Methods: A narrative overview of published literature on FGD was undertaken. A search for published literature on FGD was conducted using relevant databases, authoritative texts, reference checking and citation tracking. The information was collated and presented in the review.

Results: Phenotypic features and clinical signs are seen in FGD that demonstrate inconsistency and incongruity with structural disease. FGD are multidimensional and disabling, with numerous phenotypes described in the literature. 'Knee buckling', 'astasia-abasia' and 'excessive slowness' are commonly reported phenotypes [Table 1]. Motor symptoms such as weakness or tremor, and non-motor symptoms, such as pain and fatigue may contribute to the disability and distress in FGD [Table 2]. A limited number of treatment studies have specifically focussed on FGD, however, reporting of outcomes from motor-FND cohorts has demonstrated short and long-term improvements in walking ability through multidisciplinary rehabilitation.

Table 1. Reported phenotypes of functional gait disorders

Phenotype	**Description**
Psychogenic Rhomberg	The person falls forwards in standing
Uneconomic postures	Large displacement of centre of gravity
Walking on ice	Slow gait, sliding feet on floor
Sudden buckling of knees without falling	Sudden and paroxysmal giving way of knees during walking
Excessive slowness/cautious	Slow, hesitant gait
Dragging of one foot	Leg is usually dragging behind during swing phase of gait without any dorsiflexion of the foot
Truncal imbalance	Lateral displacement of the trunk during gait
Functional Dystonic gait	Altered posturing of the limbs or trunk in gait
Functional Tremulous gait	Tremor during gait cycle that affects trunk or limbs
Tightrope walking	Narrow based gait, using external supports for balance
Neurological disease mimics	Examples include ataxic gait, choreiform gait (flailing movements of limbs or trunk), spastic gait (scissoring movements of lower limbs) or trendelenburg gait (waddling of hips)

Table 2. Reported functional motor symptoms and non-motor symptoms of FND that may contribute to FGD

Motor symptoms	Non-motor symptoms
Rigidity	*Pain*
Tremor	*Fatigue*
Ataxia	*Dizziness*
Bradykinesia	*Fear of moving*
Dystonia	*Anxiety/Depression*
Myoclonus	*Fear of falling*
Weakness	*Dissociation*
Altered balance	*Altered sensation*
	Visual symptoms
	Headache
	Seizures
	Cognitive symptoms
	Bowel and bladder symptoms

Conclusions: Numerous FGD phenotypes have been reported in the literature. The relative contribution of motor and non-motor symptoms in FGD remains unknown, but it is likely that non-motor symptoms increase the illness burden and should be considered during assessment and treatment. Recommended treatment for FGD involves multidisciplinary rehabilitation, but optimum treatment elements, including dosage, setting and intensity are yet to be determined. Further exploration of the characteristics of FGD, including the prevalence and severity of motor and non-motor symptoms may support targeted treatment and improved outcomes.

References:

Tinazzi M, Pilotto A, Morgante F, Marcuzzo E, Cuoco S, Ceravolo R, et al. Functional gait disorders: Demographic and clinical correlations. Parkinsonism Relat Disord. 2021 Oct;91:32–6.

Věchetová G, Slovák M, Kemlink D, Hanzlíková Z, Dušek P, Nikolai T, et al. The impact of non-motor symptoms on the health-related quality of life in patients with functional movement disorders. J Psychosom Res. 2018 Dec 1;115:32–7.

SLEEP RECORDING FOR THE DIAGNOSIS AND TREATMENT OF PARAPLEGIA

Béatrice Garcin (Hôpital Avicenne, Hôpitaux Universitaires de Paris-Seine Saint Denis [HUPSSD], Beatrice.garcin@aphp.fr*), Raphael Vollhardt, Isabelle Arnulf*

Objective: To explore whether spontaneous movements occur during awakening periods and to use these potential movements to reinforce diagnostic explanation.

Background: The use of an altered state of consciousness has already been suggested for investigating FND (e.g. using propofol).[1] If a person paralyzed during the day moves at night during awakenings, a video polysomnography could bring interesting diagnostic and therapeutic elements in a safer way.

Methods: A 31-year-old woman developed paraplegia following a well-treated herpetic myeloradiculitis (Elsberg syndrome), without any contributing factor and without abnormalities on cerebral and spinal cord MRI, cerebrospinal fluid analysis, EMG and motor and sensory evoked potentials. Despite rehabilitation, a nearly complete flaccid paraplegia persisted, including muscular contractions without any observed movement, and the need for a wheelchair. Some discrepancies on motor examination (including fluctuating motor deficit on different manoeuvers) suggested a functional neurological disorder (FND).[2] She was offered a nighttime video-polysomnography with EMG leads placed on tibialis anterior and rectus femoris muscles, to support this diagnosis and guide its management.

Results: Although the patient could not perform any voluntary movement of the lower limbs, the video polysomnography showed frank and numerous movements of the thighs and legs during awakenings and arousals, in stages N2, N3 and REM sleep. EMG leads recorded abundant leg muscle activity, contrasting with the absence of activity recorded before sleep. These elements confirmed the diagnosis of FND. The video-clips (indicating that her brain "knew how to move") were shown and explained to the patient to guide her rehabilitation. She started moving her legs again a few days later, to walk with human assistance two months later and to walk normally after six months.

Conclusions: This case illustrates the value of using video-sleep studies, which are safer than sedation, for the diagnosis and treatment of severe motor FND. It also raises the question of "more automatic" motor control structures during repositioning in microarousal.

References:

1. Stone J, Hoeritzauer I, Brown K, Carson A. Therapeutic sedation for functional (psychogenic) neurological symptoms, J Psychosom Res 2014;76(2):165-8 doi: 10.1016/j.jpsychores.2013.10.

2. Espay AJ, Aybek S, Carson A, et al. Current concepts in diagnosis and treatment of functional neurological disorders, JAMA Neurol 2018;75(9):1132–1141 doi: 10.1001/jamaneurol.2018.1264

MEMORY PERFECTIONISM IS ASSOCIATED WITH PERSISTENT MEMORY COMPLAINTS AFTER CONCUSSION

Edwina Picon (The University of British Columbia, epicon@psych.ubc.ca*), Evgenia Todorova, Daniela Palombo, David L. Perez, Andrew Howard, Noah Silverberg*

Objective: To investigate the relationship between memory perfectionism (highly valuing memory ability and intolerance of minor memory lapses) and persistent memory complaints after concussion.

Background: The etiology of persistent memory complaints after concussion is poorly understood. In the unifying theory of Functional Cognitive Disorder (Teodoro et al., 2018), memory perfectionism is thought to predispose people to developing subjective memory problems in the absence of corresponding episodic memory impairment.

Methods: This study was a secondary analysis of baseline data from a randomized controlled trial. Adults (N=77; 61% women) with persistent symptoms following concussion were recruited from outpatient specialty clinics. Participants completed neuropsychological tests of episodic memory (National Institutes of Health Toolbox Cognition Battery) and performance validity (Test of Memory Malingering-Trial 1) and questionnaires measuring memory perfectionism (Metamemory in Adulthood-Achievement subscale), forgetfulness and other postconcussion symptoms (Rivermead Postconcussion Symptoms Questionnaire; RPQ), and depression (Patient Health Questionnaire-2) at M=17.8 weeks post-injury. Patients with vs. without severe memory complaints (based on the RPQ) were compared.

Results: Memory perfectionism was associated cross-sectionally with severe memory complaint, after controlling for objective memory ability, overall cognitive ability, and depression (95% confidence interval for odds ratio = 1.11 to 1.40). Sensitivity analyses showed that this relationship did not depend on use of specific objective memory tests nor on inclusion of participants who failed performance validity testing. In a control comparison to test the specificity of identified relationships, memory perfectionism was not associated with severe fatigue (95% confidence interval for odds ratio = 0.91 to 1.07).

Conclusions: Memory perfectionism may be a risk factor for persistent memory symptoms after concussion, with potential relevance to the spectrum of Functional Cognitive Disorders more broadly. A full mechanistic model for persistent memory complaints following concussion awaits further validation and will likely include several other biopsychosocial-informed pre- and post-injury factors.

References

Teodoro, T., Edwards, M. J., & Isaacs, J. D. (2018). A unifying theory for cognitive abnormalities in functional neurological disorders, fibromyalgia and chronic fatigue syndrome: systematic review. Journal of Neurology, Neurosurgery & Psychiatry, 89(12), 1308-1319.

EARLY MALADAPTIVE SCHEMA IN FUNCTIONAL MOTOR DISORDERS: A NOVEL PSYCHOPATHOLOGICAL KEY FACTOR?

Guilhem Carle (Saint Exupery Clinic, guilhemcarle@gmail.com*), Béatrice Garcin, Bertrand Degos, Thierry Gendre, Marion Houot, Richard Levy, Francine Mesrati*

Objective: To explore early maladaptive schemas (EMS) as a predisposing factor in functional motor disorder (FMD) patients in comparison to patients presenting with Parkinson's Disease (PD) and Organic Dystonia (OD).

Background: A number of associated factors have been identified in FMD.[1] EMS are well-known predisposing psychological factors for various mental and physical disorders (i.e. obesity, personality disorders) but have surprisingly raised little concern in the FMD research field.

Methods: Thirty-two FMD patients, 28 PD patients and 20 OD patients were included from a previous cohort study[2] over a period of two years. All participants filled the Young Schema Questionnaire (YSQ-S3, French Version) sent by mail. This 90-item self-questionnaire, rated on a 6-point Likert-type ranking scale ranging from one (“completely untrue of me”) to six (“describes me perfectly”) explores 18 schemas, each schema being composed of five items. EMS were compared between the three groups using linear mixed models, and associations were investigated with the modified Abnormal Involuntary Movement Scale (AIMS, severity of motor symptoms); Hospital Anxiety and Depression Scale (HADS, anxiety/depression symptoms); Composite International Diagnosis Interview (CIDI, self-reported childhood traumatic events) and the Somatoform Dissociation Questionnaire (SQD-20, dissociative symptoms).

Results: FMD patients had significantly worsen scores for the self-sacrifice schema compared to PD and OD patients (Mean difference estimate ± Standard Error: FMD versus PD 6.59±1.30, p<0.001 ; FMD versus OD 9.57±1.43, p<0.001) [Figure 1]. None of the other schemas were significantly different between groups. There was no association found between YSQ-S3 scores and age, gender, educational level, AIMS, HADS, CIDI and SDQ-20.

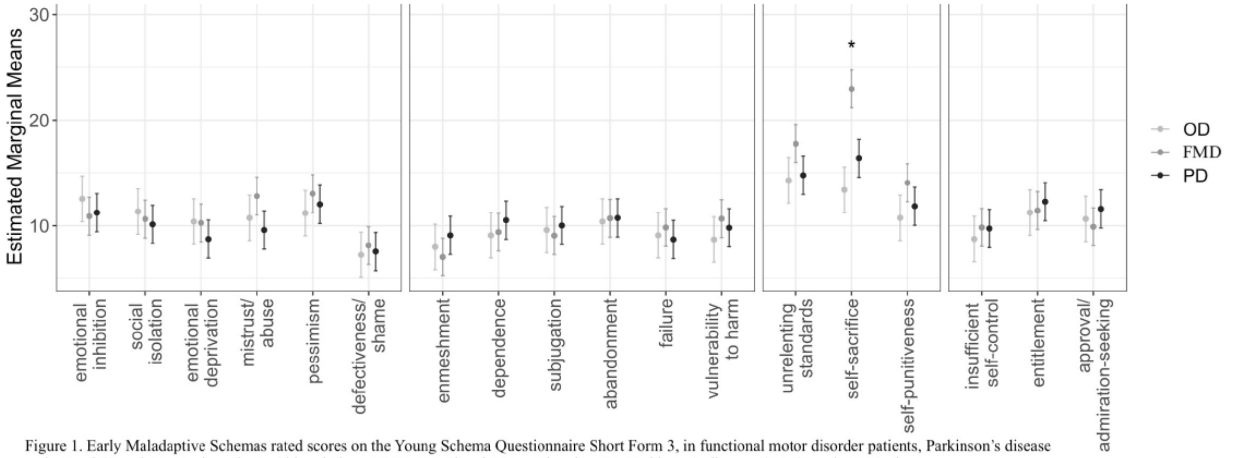


Figure 1. Early Maladaptive Schemas rated scores on the Young Schema Questionnaire Short Form 3, in functional motor disorder patients, Parkinson’s disease patient and Organic Dystonia patients. Abbreviations: FMD=Functional Motor Disorder, PD=Parkinson’s disease, OD=Organic Dystonia

Figure 1.

Conclusion: Higher scores for the self-sacrifice schema were reported in FMD patients compared to PD and OD patients. This psychological factor may be independent from the severity of symptoms, anxiety, depression, dissociative symptoms and some trauma event exposure. We suggest that it may be a significant predisposing and/or perpetuating factor in FMD. We hypothesize that such schema may be integrated as a core component in the FMD pathophysiological model, related to various mediating factors involved in the survival optimization system activation. Such study will hopefully lead to more research on EMS as underlying psychological factors in FMD.

References:

1. Espay AJ, Aybek S, Carson A, Edwards MJ, Goldstein LH, Hallett M, et al. Current Concepts in Diagnosis and Treatment of Functional Neurological Disorders. JAMA Neurol. 2018 Sept 1;75(9):1132-1141.

2. Gendre T, Carle G, Mesrati F, Hubsch C, Mauras T, Roze E, et al. Quality of life in functional movement disorders is as altered as in organic movement disorders. J Psychosom Res. 2019 Jan;116:10-16.

RECALL OF MEMORY FAILURES IN ADULTS WITH PERSISTENT SYMPTOMS FOLLOWING CONCUSSION

Mathilde Rioux (University of British Columbia, mrioux@psych.ubc.ca*), Noah Silverberg, Daniela Palombo, Edwina Picon, Victoria Wardell, M. Lindy Le*

Objective: To characterize a hallmark internal inconsistency in FCD – heightened memory for forgetting – in this population.

Background: Paradoxically, people with FCD can describe instances of memory failure with vivid detail, possibly because emotional arousal during memory failures facilitates encoding of these events. This phenomenon has not been studied in concussion.

Methods: Adults with chronic post-concussion symptoms (N=37, M=42.7 years old; 70.3% woman; M=24.9 months post-injury) and normal-range performance on conventional neuropsychological tests completed the Functional Memory Disorder Inventory (Schmidtke & Metternich, 2009), a measure of memory complaint severity, and the Autobiographical Interview (AI; Levine et al., 2002). The AI was used to quantify the richness of narrative recollections of recent instances when they forgot something and (control) personal events that did not involve forgetting. Linear regression modeling assessed the relationship between memory complaint severity and AI variables, including memory details, valence, arousal, and rehearsal.

Results: There was no association between memory complaint severity and AI memory details for forgetting vs. control events (B = .021, 95% CI = -.604, .646). We further found no association between memory complaint severity and AI details overall (collapsing across forgetting and control events) (B = .025, 95% CI = -.346, .395). Participants with greater memory complaints experienced past memory lapses as more negative than control memories (B = -.054, 95% CI = -.108, -.001), though memory complaints were not associated with arousal (B = .020, 95% CI = -.016, .056) or rehearsal of the memories (B = .004, 95 % CI = -.025, .033).

Conclusions: Autobiographical recall of memory lapses appears preserved but not selectively heightened in people who report experiencing severe memory problems in daily life long after concussion. This inconsistency supports the conceptualization of persistent memory complaints after concussion as FCD. More research is needed to better understand the biopsychosocial mechanisms underlying persistent memory complaints and inform the development of effective treatments.

References:

Levine, B., Svoboda, E., Hay, J. F., Winocur, G., & Moscovitch, M. (2002). Aging and autobiographical memory: dissociating episodic from semantic retrieval. Psychology and aging, 17(4), 677–689.

Schmidtke, K., & Metternich, B. (2009). Validation of two inventories for the diagnosis and monitoring of functional memory disorder. Journal of psychosomatic research, 67(3), 245–251. https://doi.org/10.1016/j.jpsychores.2009.04.005

COMING UNSTUCK IN TIME: A CASE STUDY OF DISSOCIATION IN TIME IN GANSER SYNDROME

Muhammad Faisal Amir Malik (Institute of Psychiatry, Rawalpindi Medical University, faisalamir797@gmail.com*), Rawalpindi, Bahjat Najeeb, Ammara Kanwal*

Objectives: To present a case of Ganser syndrome in a patient from Pakistan following a financial stressor. To discuss the presentation and pattern of dissociation in subjective time in the patient.

Background: Ganser syndrome is a rare disorder characterized by 'approximate answers'. Other findings such as dissociative symptoms, pseudo-hallucinations, and clouding of consciousness are also often seen.[1]

Methods: A case study.

Results: A 40-year-old man presented with 10 days of confusion and odd talk following a significant financial stressor. He also claimed to be living in 2011. He had been cleared on neurological examination. On the first mental state examination, he gave 'approximate answers' to simple factual questions, denied any stressor, and appeared indifferent to his condition [Figure 1].

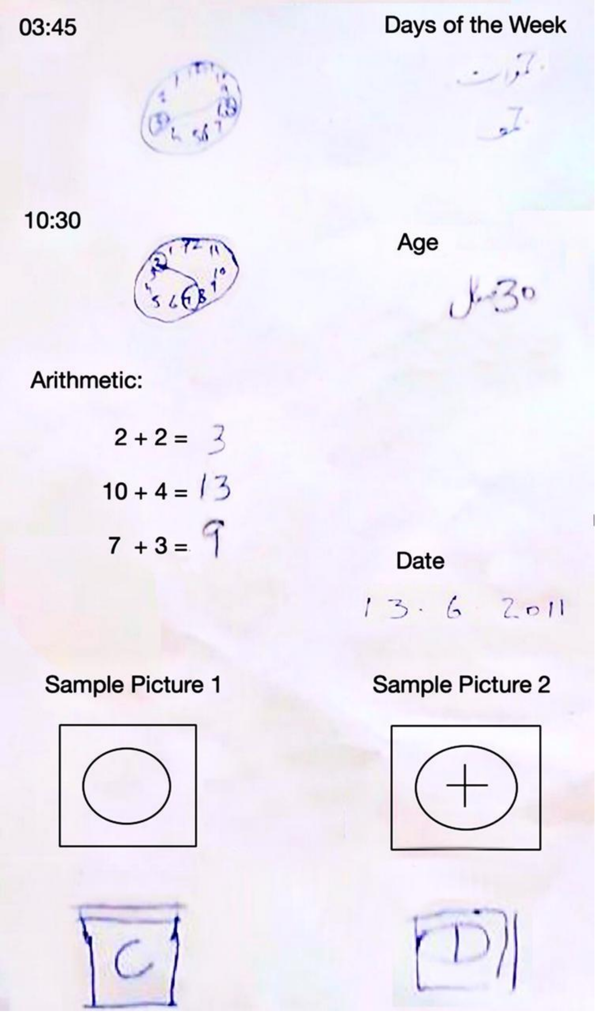


Figure 1.

During the stay, he provided approximate answers to factual and numerical questions, and his responses to personal questions, like where he was living, his age, the number and ages of his children, were mostly consistent with his station in life in 2011. Over multiple sessions, he started to answer correctly, acknowledged his distress, and came to the present [Figure 2].

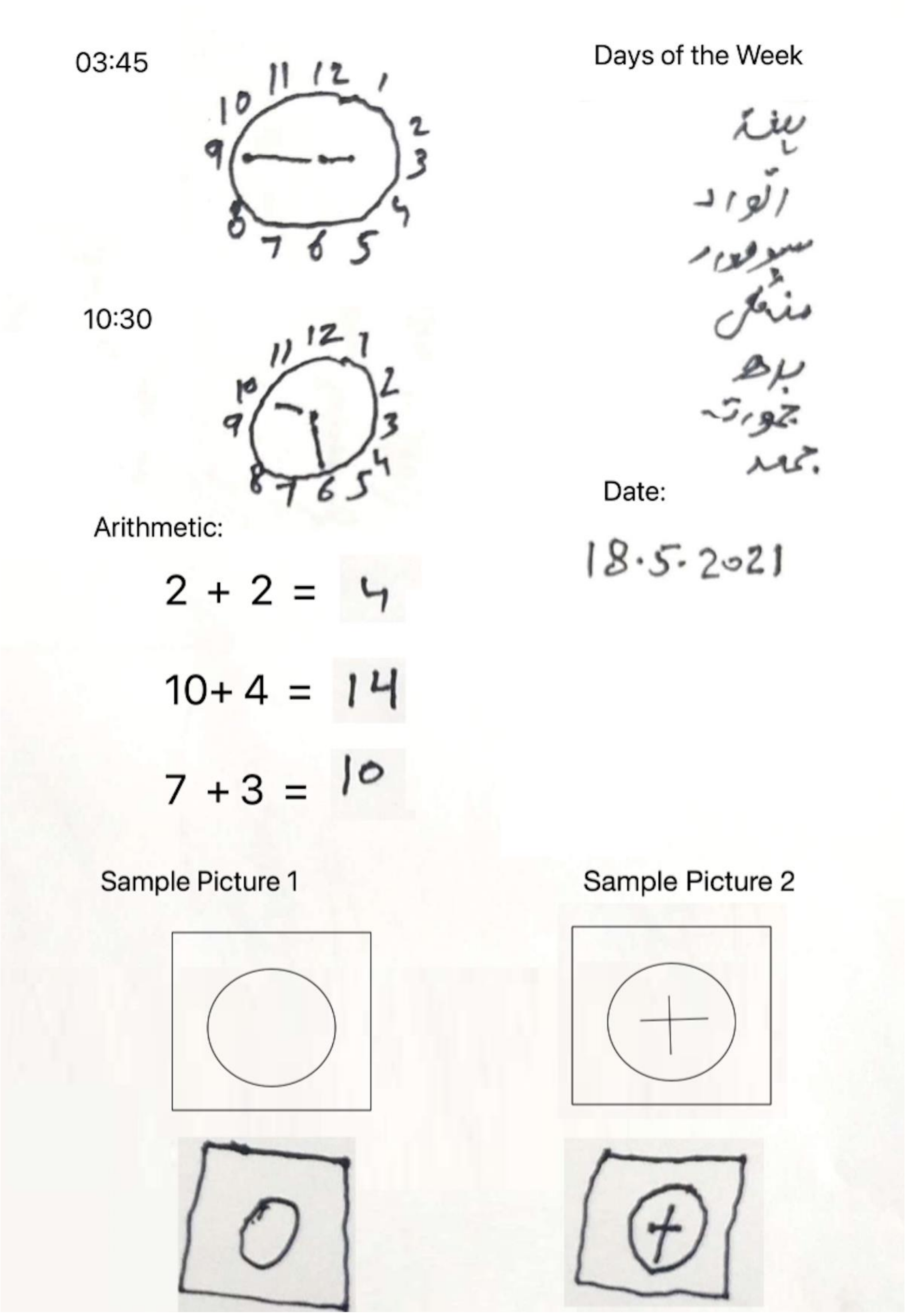


Figure 2.

Conclusions: Once considered to be a phenomenon limited to the prisons and to the Western hemisphere, Ganser syndrome is now understood to occur across all cultures and in various settings following trauma. The debate regarding the etiology of Ganser Syndrome appears to be settling in favor of dissociative causation.[1]

Time-related dissociation is a rare phenomenon, where disintegration in time is seen following significant trauma.[2] Succeeding a financial stressor, our patient was stuck in the past, denying any memory of the present. After reattribution and mindfulness-based sessions, our patient gradually came back to the present.

References:

1. Dieguez S. (2018). Ganser Syndrome. Frontiers of neurology and neuroscience, 42, 1–22. https://doi.org/10.1159/000475676

2. Holman, E. A., & Silver, R. C. (1998). Getting "stuck" in the past: temporal orientation and coping with trauma. Journal of personality and social psychology, 74(5), 1146–1163. https://doi.org/10.1037//0022-3514.74.5.1146

KEY LEARNING FROM A PILOT MULTIDISCIPLINARY PAEDIATRIC FND SERVICE: THE IMPORTANCE OF TRUST, RESPECT AND UNDERSTANDING

Jenny Jim (The Children's Trust, jjim@thechildrenstrust.org.uk*)*

Objective: To present our reflections and key learning from implementing a pilot paediatric FND service.

Background: There is a dearth of dedicated services to paediatric FND. The pilot is still ongoing with one young person completed and two in progress. All the young people have made significant and remarkable gains.

Methods: A 20-week outpatient package was offered following an initial inpatient assessment and relationship building phase. The package was developed through reviewing the literature, existing service models, and liaising with professionals. The package was delivered in-person and virtually. The team consisted of occupational therapy, clinical psychology, speech and language therapy, physiotherapy, medical consultant in paediatric neurodisability and educational psychology.

The principles of assessment and intervention for each young person were the same but implementation was highly idiosyncratic. All young people set their own goals, and these were reviewed regularly using a solution-focused framework.

Results: All three young people achieved their goals (evidenced by quantitative and qualitative measures), with some before expected time frames allowing further goals to be set. Some examples of this are: successfully returning to school having not attended for nearly two years, learning ways to be able to reconnect and enjoy socialising with old friends, making new friends, and being able to pace effectively to re-engage meaningfully with cherished hobbies.

Key interventions were psychoeducation, co-producing shared formulations across levels of the system, fatigue management, relapse management, neuropsychological assessment, and reinforcing self-management and generalisation of skills/strategies to wider and wider environments.

Conclusions:
Key learning was that successful implementation needed to be built on a foundation trust and shared understanding. All young people and their families came from a context of not having been believed and their trust in professionals undermined.

Each package became highly bespoke not only to the young person’s needs and motivators, but to those in the different layers of the ecological system including family, peers and school.

The team implicitly used a young person-centred approach founded on a developmental framework that gave paramount respect for their identity needs, knowing that these would lead to true and meaningful change.

NEURODEVELOPMENTAL DISORDERS AND FUNCTIONAL NEUROLOGICAL SYMPTOMS: SCREENING OF AUTISTIC TRAITS IN PEOPLE WITH FUNCTIONAL NEUROLOGICAL DISORDERS

Belen Gonzalez (St Georges's University of London, belen.glez.herrero@gmail.com*), Francesca Morgante, Javier Pagonabarraga, Biba Stanton, Mark Edwards*

Objective: To examine self-reported autistic traits in people with functional neurological disorders (FND) and the prevalence of diagnosed autism spectrum disorders (ASD) among people with FND and their close relatives.

Background: Recent observations suggest that autistic traits may be a risk factor for developing FND,[1 2] but there is very little published data on the relationship between FND and autism.

Methods: The design was a cross-sectional observational international survey of members of the patient organisation FNDHope, using a self-completed questionnaire: The Adult Autism Subthreshold Spectrum (AdAS Spectrum). The AdAS Spectrum assess a broad range of threshold and sub-threshold manifestations of the autism spectrum. It encompasses seven domains with 160 dichotomous items (yes/no). Over six weeks, respondents were recruited internationally through an open-access online questionnaire. Cases with high levels of missing data (> 10% in the same domain or the whole questionnaire) were removed from the analysis.

Results: There were 354 respondents with a mean age of 37.8 ± SD 15.4 years (female sex 90%, female gender identity 87%). Previous diagnosis of neurodevelopmental disorder, NDDs (ASD, attention deficit hyperactivity disorder, learning disabilities or intellectual disabilities) was present in 75 (21.2%), and 190 (53.7%) had a relative with NDDs (for 49,5%, this was their children). There was sufficient data to analyse the AdAS score in 344 participants. This analysis found three (3) groups: group A (9.6%) with respondents below the cut-off for subthreshold autistic traits; group B (21.2%) self-reporting significant subthreshold autistic traits; and group C (69.2%) scoring in the range suggesting a clinically significant ASD. Group C had a significantly lower mean age compared to group B (p= .004) and group A (p <.02). Respondents previously diagnosed with NDDs had significantly higher scores in the AdAS questionnaire (p<.001). Positive family history of an NDDs was significantly related to higher scores (p=.01).

Conclusions: In this group of people with FND, diagnosed ASD, self-reported autistic traits, and having children with ASD were all very common. Our sample was self-selected, and the AdAS spectrum is not a diagnostic instrument. Further studies are needed to provide more evidence regarding the prevalence of ASD and autistic traits in people with FND and the experience of care and treatment in autistic people with FND.

References:

1. Ekanayake V, Kranick S, LaFaver K, et al. Personality traits in psychogenic nonepileptic seizures (PNES) and psychogenic movement disorder (PMD): Neuroticism and perfectionism. J Psychosom Res 2017;97:23-29. doi: 10.1016/j.jpsychores.2017.03.018 [published Online First: 2017/06/14]

2. McWilliams A, Reilly C, Gupta J, et al. Autism spectrum disorder in children and young people with non-epileptic seizures. Seizure 2019;73:51-55. doi: 10.1016/j.seizure.2019.10.022 [published Online First: 2019/11/20]

TRAUMA IN FUNCTIONAL NEUROLOGICAL DISORDERS: PATIENTS' EXPERIENCES WITH HEALTHCARE PRACTITIONERS AND ITS EFFECTS ON DIAGNOSIS ACCEPTANCE

Sandra MISDRAHI (Université Paris Cité, s.misdrahi@gmail.com*), Marcela Gargiulo, Estelle Louët, Manuella De Luca*

Objectives: 1) To explore FND patients' care story narratives and relationships with healthcare professionals (HCPs). 2) To deepen the understanding of the role of past trauma in this relationship and in diagnosis acceptance.

Background: Patients value personality and listening skills in HCPs1; they thus seem vital to a successful alliance. Often tied to FND2, traumatic events (TE) can be explored. No known work has been done on their place in these relationships.

Methods: This ongoing doctoral research in psychology includes 20 strictly FND-diagnosed adult patients aged 20-60 recruited in a neuromyology unit at the Pitié-Salpêtrière University Hospital in Paris, France. Mixed methods were used, associating psychological assessment and a semi-directed interview, analyzed thematically and discursively. All patients filled out a consent form. Three different case studies of patients scoring at least one TE in the Trauma History Questionnaire (THQ) will be studied. Analysis focus will be on the psychological evaluation, reflective functioning (RFQ) as well as the narratives of the history of the disorder, the care, and the place of the TE in their lives and in the relationship to HCPs.

Results: Three patients aged 32-56 relate different TEs at different points: respiratory distress from aspiration, therapeutic abortion, sexual abuse. One suffers from deglutition disorders, one motor disorders in the lower body, one muscle weakness on half their body. All tend to show certainty about mental states (MSC) on the RFQ. They see HCPs as helpless, which can cause confusion post-diagnosis. Paradoxically, if patients show passive compliance with prescriptions and what they convey to their HCPs, they are more dubious regarding their diagnosis when meeting a psychologist. Only one patient thinks their TE fully explains their disorder. Communication on TEs varies from total transparency to wariness, above all due to the idea it may confirm the diagnosis.

Conclusions: Communication on TE poses questions on what is repeated from their lives in relationships with HCPs: what could be shameful, normalized or denied if shared. Transparency can allow emotional detachment, reluctance, active refusal that TE could mark the present. For patients it would assert the diagnosis "for good" and HCPs would stop examinations and care, which can lead to abandonment anxiety. Given our first results, it seems that it is the affective valence linked to TE rather than its nature, recency or symptoms that influence diagnosis acceptance. The tendency for MSC – relative to ability to question oneself - could also explain these difficulties. This and potential links to TE could be determined with further research.

References

Nunes, J. M., Ventura, T., Encarnação, R., Pinto, P. R., & Santos, I. (2013). What do patients with medically unexplained physical symptoms (MUPS) think? A qualitative study. Mental Health in Family Medicine, 10(2), 67–79.

Ludwig, L., Pasman, J. A., Nicholson, T., Aybek, S., David, A. S., Tuck, S., … Stone, J. (2018). Stressful life events and maltreatment in conversion (functional neurological) disorder: systematic review and meta-analysis of case-control studies. The Lancet Psychiatry, 5(4), 307–320. https://doi.org/10.1016/S2215-0366(18)30051-8

ASSOCIATIONS BETWEEN FUNCTIONAL NEUROLOGICAL DISORDER AND PERSISTENT POST CONCUSSION SYNDROME

Kaiden Jobin (University of Calgary, kaiden.jobin1@ucalgary.ca*), Meng Wang, Sané du Plessis, Chantel Debert*

Objective: To evaluate the relationship between functional neurological disorder (FND), age, sex, injury characteristics, medical history, severity of symptoms, anxiety, and depression in patients with persistent post concussion symptoms (PPCS).

Background: Studies of FND etiology have commented on the potential role of previous injury in the development of FND.[1] However, none have considered the potential role of concussion and how persisting concussion symptoms may relate with FND symptomology.

Methods: This cohort study recruited 53 participants with a diagnosis of PPCS (ICD-10 criteria) three months – five years post-injury from the greater community and a specialized brain injury clinic. Demographic and injury characteristics were collected. Participants completed the following: conversion disorder subscale of the screening for somatoform disorders (SOM-CD), rivermead post-concussion questionnaire (RPQ), patient health questionnaire nine (PHQ-9) and generalized anxiety disorder seven (GAD-7). Spearman correlations were used to assess the unadjusted association between PPCS and FND. To control for potential confounders, multiple linear regression models were conducted to evaluate the adjusted association between PPCS and FND symptom severity scores.

Results: Based on spearman correlation, SOM-CD score was significantly and positively correlated with RPQ13 score ($\hat{\rho}=0.7$;$p<0.001$), with RPQ3 score ($\hat{\rho}=0.62$;$p<0.001$), with PHQ-9 score ($\hat{\rho}=0.62$;$p<0.001$), and with GAD-7 score ($\hat{\rho}=0.62$;$p<0.001$). After adjusting for age, sex, time since injury, mechanism of injury, and previous concussion history, we found that RPQ13($(\hat{\beta}_{RPQ13})=0.31$ (SE=0.06);$p<0.001$), GAD7 ($(\hat{\beta}_{GAD7})=0.52$ (SE=0.10);$p<0.001$), and PHQ9 ($(\hat{\beta}_{PHQ9})=0.50$ (SE=0.10);$p<0.001$) were still statistically significantly related to SOM-CD. Specifically, with per unit increase of RPQ13 score, the estimated rate of change for SOM-CD was around 0.3, after controlling for other covariates.

Conclusions: Results suggest that PPCS and FND are strongly associated indicating a relationship between symptom severity of these disorders in PPCS patients. This supports established FND models where fear associated neuroplasticity causes functional changes in neural networks associated with emotional processing.[2] PPCS is often characterized by fear of symptom burden and as such, PPCS and FND may be linked through fear associated neurological changes. The variables found to influence the model; age, sex, and concussion history; are associated with the positive relationship between FND and PPCS. Future studies should consider age, sex and previous concussion history when exploring FND in patients with persistent symptoms following concussion.

References:

1. Fobian AD, Elliott L. A review of functional neurological symptom disorder etiology and the integrated etiological summary model. J Psychiatry Neurosci. 2019 Jan;44(1):8–18.

2. Roelofs JJ, Teodoro T, Edwards MJ. Neuroimaging in Functional Movement Disorders. Curr Neurol Neurosci Rep [Internet]. 2019 [cited 2021 Sep 15];19(3).

FUNCTIONAL COGNITIVE DISORDER IS A MULTISYSTEM CONDITION AFFECTING REACTION TIME AND METACOGNITION

Tiago Teodoro (St George's University Hospitals, tiago.teodoro@nhs.net*), Akihiro Koreki, Jiaying Chen, Jan Coebergh, Norman Poole, Joaquim Ferreira, Mark Edwards, Jeremy Isaacs*

Objective: To test the hypothesis that Functional Cognitive Disorder (FCD) is characterised by a combination of heightened subjective mental effort, exhausted attentional reserve and metacognitive failure, alongside normal function in other cognitive domains.

Background: FCD corresponds to the experience of persistent, problematic cognitive symptoms showing internal inconsistency. They are not explained by structural pathology of the central nervous system.

Methods: An experimental paradigm was developed consisting of a colour-word Stroop task in which attentional demand was varied by task difficulty (congruent versus incongruent cues) and the presence of a secondary auditory stimulus (passive or active listening to an oddball-type paradigm). Subjective mental effort, objective performance (reaction times and accuracy), metacognition and EEG-based biomarkers of mental workload (P300 suppression induced by auditory task, mid-frontal theta enhancement and parietal alpha suppression) were measured.

Results: Nineteen patients with FCD and 23 healthy controls were tested. FCD patients reported higher levels of depression, anxiety, fatigue, pain, sleep disruption, dissociation and obsessiveness. FCD was associated with slower reaction times; however the Stroop effect on performance was similar in both groups. FCD patients reported greater mental workload and poorer self-rated performance when performing the congruent Stroop task in noisy conditions. However, response accuracy did not differ between groups in any condition, suggesting that FCD patients are more prone to metacognitive error. P300, mid-frontal theta and parietal alpha were similar in both groups, regardless of task difficulty.

Conclusions: Based on this sample, functional cognitive disorder was characterised by altered mood, somatic complaints and a tendency to dissociation and obsessiveness, suggesting syndromic overlap with mood disorders, chronic fatigue and pain. FCD was associated with metacognitive failure in that patients reported high subjective mental effort and poor self-reported performance but were just as accurate as controls. However, FCD patients were slower than controls, providing some objective support for the subjective "brain fog" commonly reported in this condition. No evidence of changes in EEG biomarkers of mental workload was found. The mechanism of slowing in FCD and its relationship with mood and other factors needs further exploration.

FUNCTIONAL NEUROLOGICAL DISORDER, CEREBELLAR ATAXIA, AND STIFF-PERSON SYNDROME: WALKING THROUGH DIFFERENTIATING GAIT FEATURES

Benjamin Smart (Wake Forest School of Medicine, bensmart121@gmail.com*), Luciana Giambarberi*

Objective: To differentiate functional gait disorder (FGD), a subtype of functional movement disorder, from cerebellar ataxia and Stiff-Person Syndrome (SPS) through a case of SPS associated with panic attacks misdiagnosed as FND.

Background: FGD is difficult to diagnose due to heterogenous presentations. Gait abnormalities are also features of cerebellar ataxia and SPS, two neuroimmunological disorders associated with glutamic acid decarboxylase 65-kilodalton isoform (GAD65) antibodies.

Methods: Records were reviewed for the patient, a 50-year-old female with a history of epilepsy s/p vagal nerve stimulator (VNS), cervical spinal stenosis; psychiatric history of insomnia, generalized anxiety disorder (GAD), post-traumatic stress disorder (PTSD), and panic attacks. She also has uncharacterized memory impairment.

Results: The patient experienced eight years of worsening muscle stiffness in her neck, right leg and arm, and pain in her back, right arm, right leg, and right ankle. Walking became harder over time, leading to cane use. Periodic muscle spasms correlated with panic attack frequency and caused falls. She was evaluated over the years by neurology, neurosurgery, internal medicine, and a chiropractor. Physical exams consistently had increased RLE muscle tone causing impaired gait. A baclofen trial was unsuccessful. Neuroimaging, MRI brain and cervical spine, was unable to explain symptoms. Her muscle stiffness/spasms were attributed to FND and epilepsy; she was referred to psychiatry. Her psychiatrist noticed the patient's stiffness historically improved when taking clonazepam. SPS was added to the differential diagnosis. Anti-GAD serum antibody level was significantly elevated (2,910 nmol/L; reference <= 0.02 nmol/L). Diazepam 5 mg QID was started. One month later, she reported improving muscle stiffness and gait without falls. She reported improving anxiety without further panic attacks.

Conclusions: Our patient suffered for nine years before serum GAD65-Ab testing, leading to SPS diagnosis. Even with telehealth, gait must be examined. FGD features may include antalgic, buckling, or waddling gait.[1] FGD often have unexplained variability over time and situation. Cerebellar ataxia may present with prolonged stance and balance abnormalities such as widened gait and decreased step length. In SPS, gait is slow and broad-based to prevent falls; it is consistent over time and setting.[2] Painful spasms in SPS can be precipitated by emotional stress, which could lead to FGD misdiagnosis.

References:

1. Nonnekes J, Růžička E, Serranová T, Reich SG, Bloem BR, Hallett M. Functional gait disorders: A sign-based approach. Neurology [Internet]. 2020 Jun 16 [cited 2022 Mar 14];94(24):1093–9. Available from: https://n.neurology.org/content/94/24/1093

2. Hadavi S, Noyce AJ, David Leslie R, Giovannoni G. Stiff person syndrome. Pract Neurol [Internet]. 2011 Oct 1 [cited 2022 Mar 7];11(5):272–82. Available from: https://pn.bmj.com/content/11/5/272

ATTACHMENT STYLE AND BRAIN ABNORMALITIES IN PATIENTS WITH PNEE

Nuanqiu Hou (Le Bonheur Children's Hospital, nhou1@uthsc.edu*), Tracee Ridley-Pryor, Shalini Narayana*

Objective: To study the relationship between adverse childhood events and attachment style in patients with psychogenic non-epileptic events (PNEE), and to assess if the grey matter volume of Anterior Cingulate Cortex (ACC) alters in patients with PNEE.

Background: Patients with PNEE frequently present dysfunctional attachment style and alexithymia. Adverse childhood events (ACEs) are correlated to alexithymia and therefore can be potential predisposing factors for PNEE.

Methods: To examine 25 patients (range, 8–21 years of age) with video-EEG–confirmed PNEE, and 25 age-gender-race–matched patients with epilepsy diagnosis at Le Bonheur Children's Hospital, Memphis, TN. To conduct a retrospective chart review for the following variables: demographics, medical history, neurological/psychological disorder diagnoses, and past trauma/stress events. To administer four questionnaires: Inventory Parents and Peers Attachment – Revised; Family Affluence Scale Questionnaires; Finding Your ACE Score, and Self Perception Profile. MRIs will be obtained from patients' chart. Fisher's exact test and Mann-Whitney U test will be used to analyze data. FSL-voxel based morphometry will be used to analyze MRIs.

Results: This study is currently enrolling patients. The preliminary data shows that patients with PNEE demonstrate more trust and higher sense of alienation for their peers than for parents. In final analysis, it is expected trauma/stress to impact our patients with PNEE disproportionally. Patients with PNEE are expected to display higher levels of emotional dysregulation and dysfunctional attachment, demonstrated as an increased level of communication and decreased level of trust with parents, lower level of self-perception, and higher ACE score. Data is expected to demonstrate grey matter volume of ACC reduction compared to patients with epilepsy, and that ACC grey matter volume will correlate to emotional dysregulation.

Conclusions: This study will add to the PNEE literature since few studies have looked at the impact of adverse childhood events and attachment style on pediatric patients with PNEE. Understanding the impact of ACEs and the implications of attachment style in patients with PNEE can aid clinicians in developing targeted treatment and may improve the efficiency of psychotherapy. Understanding ACC volume change in patients with PNEE may help further study the biological basis of comorbidity between PNEE and other mental illnesses. Assessing the relationship between brain abnormalities and psychological/physical symptoms may provide better understanding of PNEE from biological, psychological, and social standpoints.

Funding: Dean's Research Fellowship Award, College of Nursing, The University of Tennessee Health Science Center.

ROLE OF PHYSICAL THERAPISTS IN DIAGNOSIS OF FUNCTIONAL NEUROLOGICAL DISORDERS

Kelly Anderson (OSF Center for Health Streator, anderson.kelly.1985@gmail.com*)*

Objectives: To demonstrate the importance of physical therapists' knowledge of Functional Neurological Disorders (FND), and the current role in clinical tests to help ensure patients are getting proper care.

Background: Patient is a 50-year-old female with a multi-year history of left posterior cruciate ligament injury at work with eventual total knee arthroplasty (TKA) and finally revision of TKA who presented to physical therapy.

Methods: Videography was used with distraction techniques including carrying weights and bouncing a ball with gait, and moving from sitting to standing holding cups of water in each hand. There was visible variability in the patterning of the patient's movement when comparing movement with and without distraction. Weakness was assessed with unilateral muscle testing followed by bilateral testing of knee flexion and extension. Of note, the patient demonstrated decreased resistance in the non-surgical lower extremity and increased resistance with her surgical lower extremity with the bilateral testing which is an atypical finding. Video images were shared with the primary care team to support referral to a Movement Disorder Specialist.

Results: The patient was diagnosed with a FND within three months of the therapist recognizing potential signs and symptoms. She continued physical therapy with interventions targeting the FND. The patient progressed to ambulating with a cane independently and safely in the community and was able to take care of her son. Although she did not have full resolution of her symptoms, she understood her diagnosis with the potential prognosis of further improvement. The case report illustrates the importance of the therapist recognizing the possibility of a FND, performing the proper clinical tests, advocating for the patient to be assessed by a specialist for a formal diagnosis, and subsequently receiving the appropriate treatment.

Conclusions: There is an opportunity for patients to be referred to Movement Disorder Specialists faster if physical therapists are more educated in FND. The time therapists spend with patients is an advantage they have along with their skill set to properly perform the clinical testing that has been outlined in the research for generalist physicians to differentiate potential FND.[1] Along with having an important role in the treatment of patients with FND, [2] there is potential that they may be the first health care provider to observe the signs and symptoms of FND, as demonstrated in the case above. Educating physical therapists and all allied health professionals about FND should be a priority to expedite and positively impact patient care.

References:

1. Stone J, Burton C, Carson, A. Recognising and explaining functional neurological disorder. British Medical Journal 2020;371:m3745. http://dx.doi.org/10.1136/bmj.m3745

2. Nielsen G, Stone J, Matthews A, Brown M, et al. Physiotherapy for functional motor disorders: a consensus recommendation. Journal of Neurology Neurosurgery Psychiatry 2015;86:1113-1119. http://dx.doi.org/10.1136/jnnp-2014-309255

HOW CONFIDENT ARE YOU IN DIAGNOSIS OF SEIZURES BASED ON HISTORY, VIDEO, OR EEG ALONE?

Wesley Kerr (University of Michigan, kerrwe@med.umich.edu*), William Stacey, Nicholas Beimer*

Objective: This case is a cautionary tale about reliance on any single source of diagnostic information to make an accurate diagnosis of functional seizures (FS), epilepsy, or both.

Background: The accuracy of epileptologists viewing a high-quality seizure video to identify functional versus epileptic seizures exceeds 90%. To achieve a “documented” level of certainty, the seizure must be observed with concurrent video and EEG of all typical seizure behaviors.

Methods: A 23-year-old woman with prior substance use of cocaine and heroin, childhood sexual trauma, current emotional abuse, and a 4 year-old son with generalized-onset epilepsy, who had onset of seizures at age 12, taking lamotrigine and levetiracetam who had three seizure types: (1) cloudy vision, eyes fluttering, and side-to-side head shaking with intermittent responsiveness for minutes occurring every other day, (2) brief pause in conversation for 2-3 seconds with post-pause confusion occurring up to hundreds per day, and (3) body then limb stiffening and shaking for 4 to 5 minutes without oral trauma or incontinence occurring every 6 months. We present this history, a video, and video-EEG of an illustrative seizure.

Results: Based on the history without video or EEG, the FS Likelihood Score indicated a 90% likelihood of FS. A patient video obtained during video-EEG illustrates an ictal behavior of her type 1 seizure, which was a typical FS, but an astute observer may notice a brief pause in the middle of the seizure. When concurrent EEG is added, the FS was interrupted by a typical absence seizure with corresponding generalized 3 Hz polyspike and wave, establishing a diagnosis of comorbid FS and generalized-onset epilepsy. Review of the EEG alone revealed frequent absence seizures lasting 3-4 seconds each, which were her type 2 seizure. A type 3 seizure was not captured.

Conclusions: Concurrent ictal video-EEG remains the gold standard for the diagnosis of epileptic and functional seizures. This cautionary tale illustrates the risks of relying on history alone, video alone, or EEG in isolation. History or video could lead to premature closure that she had functional seizures alone, whereas the EEG findings alone indicated clear epileptic seizures. Accurate diagnosis relied on observation of both ictal behaviors to indicate concurrent epileptic and functional seizures. Therefore, in the setting of conflicting information or uncertainty, there is caution that more definitive diagnostic evaluation should be pursued.

References:

Tatum et al.

Kerr et al. Objective score from initial interview identifies patients with probable dissociative seizures. Epilepsy Behav 2020.

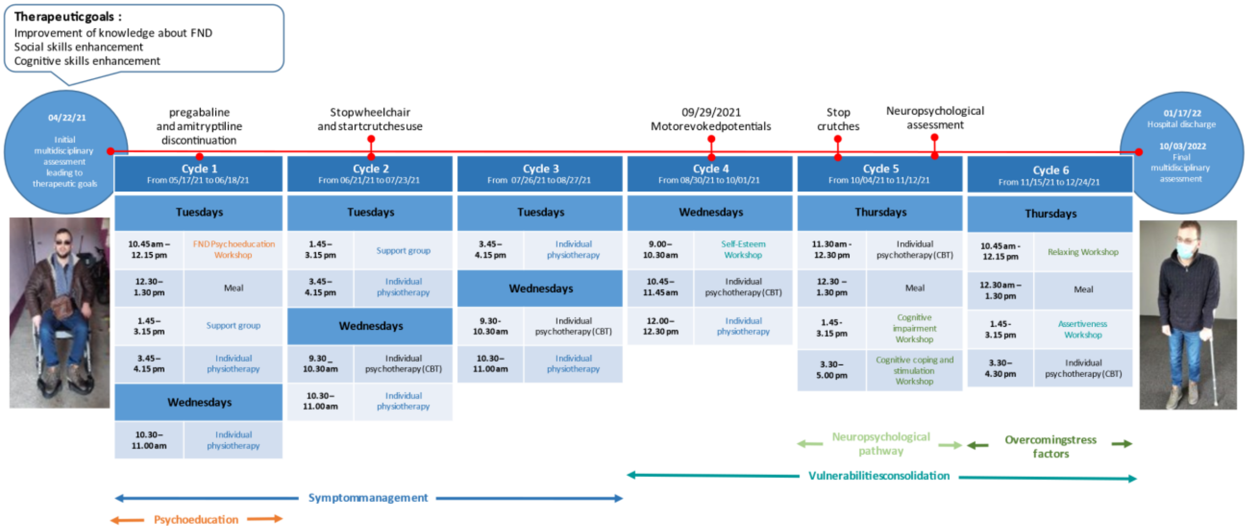
FUNCTIONAL NEUROLOGICAL DISORDERS MULTIDISCIPLINARY DAY HOSPITAL IN FRANCE: A CASE REPORT

Julien Labouré (Bipol-AIR Center, julien.laboure@outlook.com*), Kevin Margheriti, Marianne Vivier, Camille Sage, Béatrice Garcin, Coraline Hingray, Guilhem Carle, Axelle Gharib*

Objective: To report the case of a 26-year-old male presenting with bilateral lower limb functional motor weakness who followed our functional neurological disorder (FND) multidisciplinary care program developed within the day hospital of the bipol-AIR Center (Lyon, France).

Background: FND is a common and disabling condition. Consensus-based treatments for FND use variety of therapeutic strategies including physiotherapy (distraction, retraining programs) and psychotherapy.

Case report: Bilateral lower limb functional motor weakness diagnosis was made in January 2019 after one year of symptoms duration. Despite several treatments, a progressive worsening of motor symptoms led the patient to require the use of a wheelchair from April 2020 (modified Rankin scale: 4). The patient was included to a FND personalized multidisciplinary care program (including physiotherapy, individual psychotherapy and workshops based on cognitive behavioral therapy, body mind techniques and social rehabilitation) from April 2021 to January 2022 running in the bipol-AIR Center. [Figure 1] He benefited from an initial assessment and completed several questionnaires: World Health Organization Quality of Life –BREF (WHOQOL-BREF), Toronto Alexithymia Scale -20 (TAS-20), Dissociative Experiences Scale (DES), Pittsburgh Sleep Quality Index (PSQI). The psychiatric evaluation (Clinical Global Impression (CGI), Mini International Neuropsychiatric Interview (MINI)) did not find any associated mental disorder and the patient did not identify any associated risk factor despite several months of psychological follow-up.



Cycle 1 From 05/17/21 to 06/18/21	
Tuesdays	
10.45 am – 12.15 pm	FND Psychoeducation Workshop
12.30– 1.30 pm	Meal
1.45– 3.15 pm	Support group
3.45– 4.15 pm	Individual physiotherapy
Wednesdays	
10.30– 11.00 am	Individual physiotherapy

Cycle 2 From 06/21/21 to 07/23/21	
Tuesdays	
1.45– 3.15 pm	Support group
3.45– 4.15 pm	Individual physiotherapy
Wednesdays	
9.30_ 10.30 am	Individual psychotherapy (CBT)
10.30– 11.00 am	Individual physiotherapy

Cycle 3 From 07/26/21 to 08/27/21	
Tuesdays	
3.45– 4.15 pm	Individual physiotherapy
Wednesdays	
9.30- 10.30 am	Individual psychotherapy (CBT)
10.30– 11.00 am	Individual physiotherapy

Cycle 4 From 08/30/21 to 10/01/21	
Wednesdays	
9.00– 10.30 am	Self-Esteem Workshop
10.45– 11.45 am	Individual psychotherapy (CBT)
12.00– 12.30 pm	Individual physiotherapy

Cycle 5 From 10/04/21 to 11/12/21	
Thursdays	
11.30 am - 12.30 pm	Individual psychotherapy (CBT)
12.30 – 1.30 pm	Meal
1.45- 3.15 pm	Cognitive impairment Workshop
3.30– 5.00 pm	Cognitive coping and stimulation Workshop

Cycle 6 From 11/15/21 to 12/24/21	
Thursdays	
10.45 am - 12.15 pm	Relaxing Workshop
12.30 am – 1.30 pm	Meal
1.45- 3.15 pm	Assertiveness Workshop
3.30– 4.30 pm	Individual psychotherapy (CBT)

Figure 1: FND-focused Care Program

Results: The personalized care helped the patient to walk again without adaptive aids (modified Rankin scale: 0) from October 2021 (six months after admission). Additionnally, he identified several psychosocial factors which helped to adapt the care program towards personality traits psychotherapy (such as perfectionism overcoming). Indeed, while the patient was a train driver for two weeks, a person committed suicide under his train. In the following, he developed perfectionistic traits that led to major professional conflicts. In the perspective of vocational rehabilitation, the patient performed a neuropsychological assessment which revealed attentional fluctuations impacting different cognitive functions such as episodic verbal memory, working memory or visuo-constructive functions. When he asked to be discharged in January 2022, he started using crutches once again (modified Rankin scale: 1), arguing that it helped dealing with right knee chronic pain. He continued to be directed to keep on following the care program in order to consolidate the previous clinical improvement but he denied it, favoring his investment in his vocational rehabilitation. In March 2022, all measured parameters were improved [Figure 2] apart from the psychiatric evaluation which revealed a mild social anxiety disorder, scored on Liebowitz Social Anxiety Scale (fear: 11; avoidance: 33; total: 44). Additionally, the improvement of episodic verbal memory brought to mind better attentional capacities which was consistent with the decrease in dissociative experiences and sleep quality improvement. [Table 1]

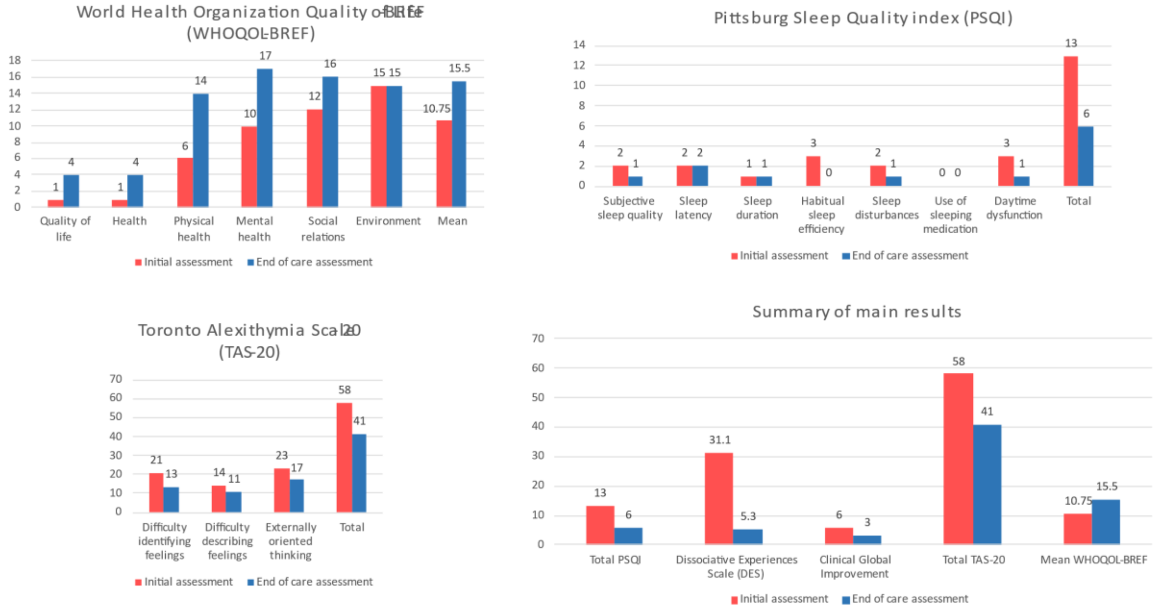
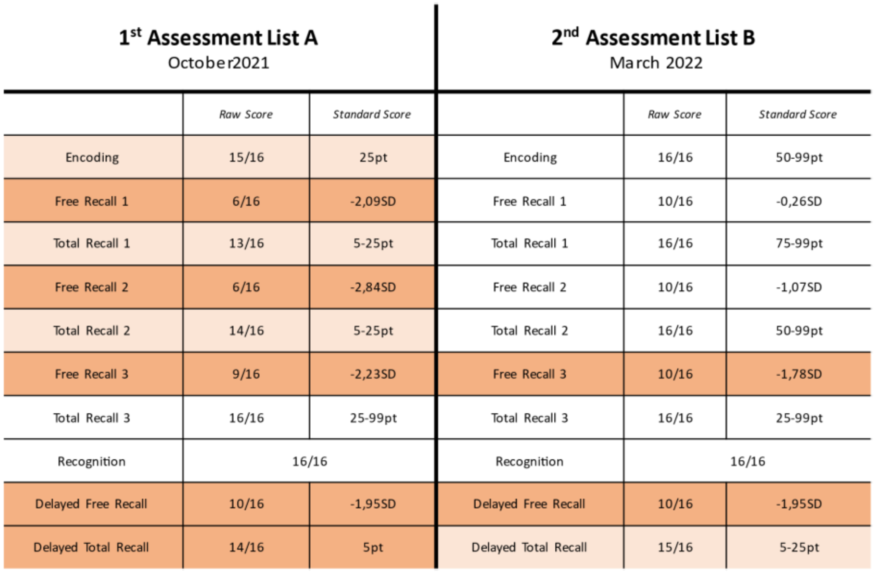


Figure 2: Main results at initial assessment (April the 22nd of 2021) and after discharge (March the 10th of 2022)



1st Assessment List A October2021			2nd Assessment List B March 2022		
	Raw Score	*Standard Score*		*Raw Score*	*Standard Score*
Encoding	15/16	25pt	Encoding	16/16	50-99pt
Free Recall 1	6/16	-2,09SD	Free Recall 1	10/16	-0,26SD
Total Recall 1	13/16	5-25pt	Total Recall 1	16/16	75-99pt
Free Recall 2	6/16	-2,84SD	Free Recall 2	10/16	-1,07SD
Total Recall 2	14/16	5-25pt	Total Recall 2	16/16	50-99pt
Free Recall 3	9/16	-2,23SD	Free Recall 3	10/16	-1,78SD
Total Recall 3	16/16	25-99pt	Total Recall 3	16/16	25-99pt
Recognition	16/16		Recognition	16/16	
Delayed Free Recall	10/16	-1,95SD	Delayed Free Recall	10/16	-1,95SD
Delayed Total Recall	14/16	5pt	Delayed Total Recall	15/16	5-25pt

Table 1: Grober and Buschke Scale (episodic verbal memory) in October 2021 and March 2022. Pathological score in deep orange and limit score in light orange *(SD : standard deviation, pt : percentile).*

Conclusions: The FND multidisciplinary care program the patient received for nine months improved his physical performances, his quality of life, the quality of his sleep, and his attentional functions. In addition, the treatment reduced the frequency of dissociative experiences and alexithymia. We assume the social anxiety disorder was present at initial assessment but the patient did not complain about it due to reluctance or misidentification. The care program probably taught him to practice self-assessment and identify his social anxiety disorder.

References:

Schmidt T, Ebersbach G, Oelsner H, Sprock A, R. König I, Bäumer T, Münchau A, Weissbach A. Evaluation of Individualized Multi-Disciplinary Inpatient Treatment for Functional Movement Disorders. Movement disorders clinical practice 2021; 8(6): 911–918.

Jacob A, Kaelin D, Roach A, Ziegler C, LaFaver K. Motor Retraining (MoRe) for Functional Movement Disorders: Outcomes From a 1-Week Multidisciplinary Rehabilitation Program. PMR 2018; 10(11): 1164-1172.

PRACTICAL APPLICATION OF A TREATMENT FRAMEWORK FOR FUNCTIONAL NEUROLOGIC DISORDERS: A CASE SERIES

Jessica Royal (Spaulding Rehabilitation Network, jessica.l.royal@gmail.com*), Emily Bloom*

Objective: To highlight successful outcomes achieved with physical therapy interventions guided by this framework.

Background: Functional Neurological Disorder (FND) is characterized by impaired functioning of the nervous system in the absence of structural deficits or disease processes. Physical therapy has been identified as a crucial component in the treatment of individuals with FND presenting with functional limb weakness and gait disturbances. Four core guiding principles have been proposed for the treatment of FND with motor symptoms: 1) Education on the diagnosis, 2) Demonstration that normal movement can occur, 3) Retraining movement with diverted attention, and 4) Changing maladaptive behaviors related to symptoms.

Methods: The following case series follows two females diagnosed with functional neurological disorder with motor symptoms. Patient 1 presented with astasia-abasia with ataxic characteristics while Patient 2 presented with astasia-abasia with hemiparetic characteristics. Both individuals were treated by outpatient neurologic physical therapists two-three times per week immediately following discharge from acute care hospitals. Treatment was focused on functional retraining with positive reinforcement within the construct outlined by the four guiding principles described above. Progress was tracked using functional outcomes such as gait speed, use of assistive device, and Five Times Sit to Stand (5xSTS).

Results: Both individuals presented here demonstrated significant improvements in the initial two weeks of physical therapy intervention. Each individual met the minimally clinically important difference for measures of walking speed, functional lower extremity strength and endurance. Patient 1's gait speed improved from 0.43 m/s with RW to 1.19 m/s without a device and her 5xSTS decreased from 13.25 sec to 7.75 sec. Patient 2's gait speed improved from 0.29 m/s with RW to 0.89 m/s without a device. Her 5xSTS improved from 33.57 sec to 10.95 sec. Despite these initial improvements, both patients later experienced repeated relapses and Patient 1 underwent a second inpatient admission.

Conclusion: Four core guiding principles have been proposed to structure interventions for individuals with FND. This case series details practical applications of that construct to two individuals with differing functional motor presentations. Both patients demonstrated significant initial improvements with physical therapy intervention structured around these principles. Both patients also experienced considerable relapses over their course of care. In conclusion, PT intervention for FND guided by these foundational principles is an efficient and effective part of the FND treatment plan; however behavioral health support may be critical for lasting resolution of symptoms.

References:

Nielsen, G., Stone, J., Matthews, A., Brown, M., Sparkes, C., & Farmer, R. et al. (2014). Physiotherapy for functional motor disorders: a consensus recommendation. Journal Of Neurology, Neurosurgery & Psychiatry, 86(10), 1113-1119. doi: 10.1136/jnnp-2014-309255

Maggio, J., Ospina, J., Callahan, J., Hunt, A., Stephen, C., & Perez, D. (2020). Outpatient Physical Therapy for Functional Neurological Disorder: A Preliminary Feasibility and Naturalistic Outcome Study in a U.S.

Cohort. The Journal Of Neuropsychiatry And Clinical Neurosciences, 32(1), 85-89. doi: 10.1176/appi.neuropsych.19030068

PRELIMINARY DATA FROM THE FIRST FUNCTIONAL NEUROLOGICAL DISORDERS MULTIDISCIPLINARY DAY HOSPITAL IN FRANCE

Julien Labouré (Bipol-AIR Center, julien.laboure@outlook.com*), Kevin Margheriti, Sarah Saussac, Laure Ayats, Béatrice Garcin, Coraline Hingray, Guilhem Carle, Axelle Gharib*

Objective: To describe an innovative multidisciplinary approach for functional neurological disorders (FND), developed within the day hospital of the bipol-AIR Center (Lyon, France).

Background: Various models of FND care management have been proposed over the last years. Protocols vary according to the health systems available. In any case, multidisciplinary approach, including physiotherapy and psychotherapy have been recognized.

Methods: FND patients took part in a personalized multidisciplinary care program (workshops and individual consultations) based on cognitive-behavioral therapy, mindbody techniques, physiotherapy and social rehabilitation. [Figure 1] The therapeutic goals were defined during an initial multidisciplinary assessment (psychiatrist, neurologist, physiotherapist, psychologist) and reevaluated every 6 months. The primary endpoint was the score at the World Health Organization Quality of Life –BREF (WHOQOL-BREF), completed by patients prospectively at admission and during follow-up. A study case control (in which the case is its own control) was conducted to evaluated the impact of the care program. Quantitative values are presented in medians (first quartile - third quartile), Wilcoxon test was used for comparison, p-value for significance was 0.05.

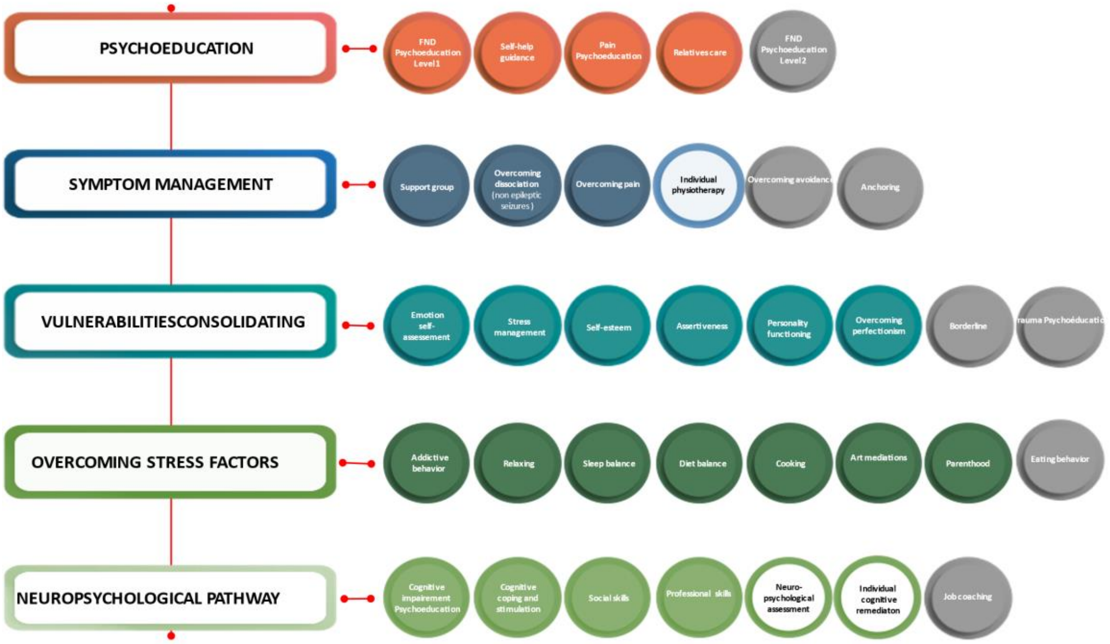
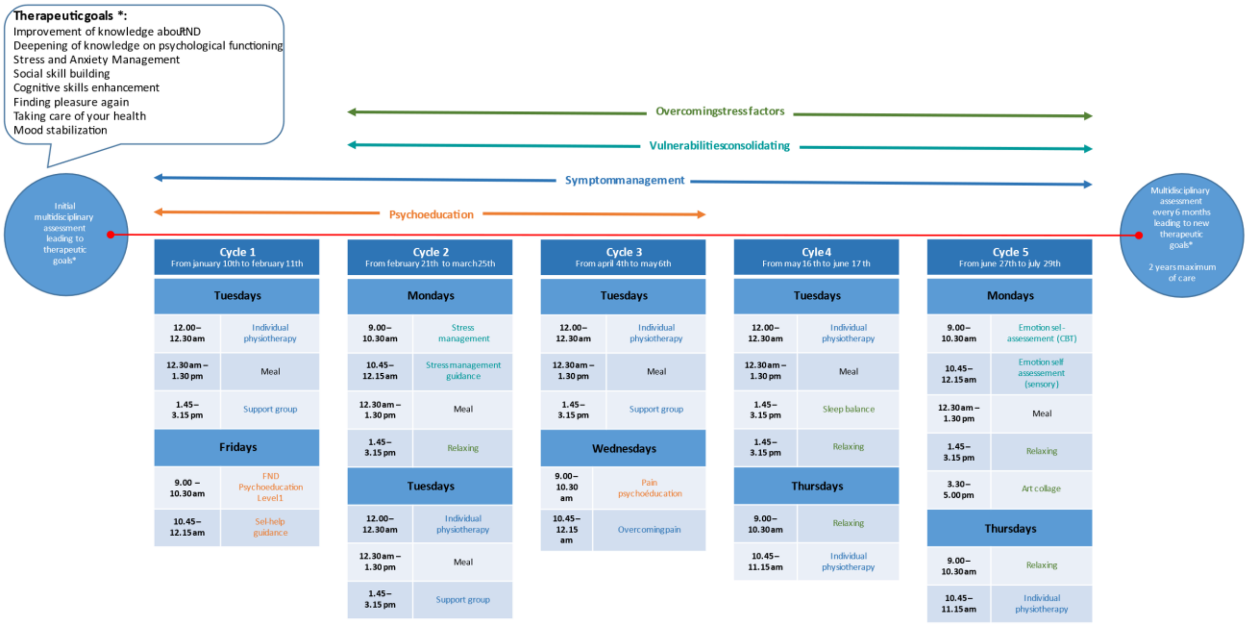


Figure 1: Therapeutic interventions (workshops and individual consultations) within the day hospital the bipol -AIR Center in Lyon (future therapeutic interventions in grey).

Results: Between November 2020 and February 2022, 18 patients [Table 1] completed questionnaires at least two times in a year of care and were included. They were admitted to the Center from one to several half-day periods of time per week, depending on their availabilities and needs, over a maximal period of two years. [Figure 2] The selected workshops and individual consultations were validated by the referring physician and the patient according to the therapeutic goals. All patients received individual physiotherapy except for those with non-epileptic seizures, who participated to anchoring workshops. Preliminary outcomes showed a significant increase of WHOQOL-BREF subscales: quality of life [3.0 (2.0 – 3.75) vs 4.0 (3.25 – 4.0), p=0.010], health [2.0 (1.0 – 2.75) vs 3.0 (2.0 – 3.75), p=0.037] and physical health [9.5 (7.0 – 13) vs 12,0 (10 – 14) p=0.048].

Mean age (year)	37.5 (± 12.3)
Gender	Women: 50.0% (n=9) Men: 50.0% (n=9)
Disease duration at admission	< 2 years: 44.4% (n=8) > 2 years: 55.6% (n=10)
Care duration	Patients discharged: 38.9% (n=7) with 10.7 (± 1,8) months of care Outpatients: 61.1% (n=11)
Main phenotype	Sensorimotor deficit: 55.6% (n=10) Non epileptic seizure: 27.7% (n=5) Movement disorder: 11.1% (n=2) Other: 5.6% (n=1)

Table 1 : Description of included patients.



Cycle 1
From january 10th to february 11th

Tuesdays	
12.00– 12.30am	Individual physiotherapy
12.30am – 1.30 pm	Meal
1.45– 3.15 pm	Support group

Fridays	
9.00 – 10.30am	FND Psychoeducation Level1
10.45– 12.15am	Sel-help guidance

Cycle 2
From february 21th to march25th

Mondays	
9.00– 10.30am	Stress management
10.45– 12.15am	Stress management guidance
12.30am – 1.30 pm	Meal
1.45– 3.15 pm	Relaxing

Tuesdays	
12.00– 12.30am	Individual physiotherapy
12.30am – 1.30 pm	Meal
1.45– 3.15 pm	Support group

Cycle 3
From april 4th to may6th

Tuesdays	
12.00– 12.30am	Individual physiotherapy
12.30am – 1.30 pm	Meal
1.45– 3.15 pm	Support group

Wednesdays	
9.00– 10.30 am	Pain psychoéducation
10.45– 12.15 am	Overcomingpain

Cyle4
From may 16 th to june 17 th

Tuesdays	
12.00– 12.30am	Individual physiotherapy
12.30am – 1.30 pm	Meal
1.45– 3.15 pm	Sleep balance
1.45– 3.15 pm	Relaxing

Thursdays	
9.00– 10.30am	Relaxing
10.45– 11.15am	Individual physiotherapy

Cycle 5
From june 27th to july 29th

Mondays	
9.00– 10.30am	Emotion sel-assessement (CBT)
10.45– 12.15am	Emotion self assessement (sensory)
12.30am – 1.30 pm	Meal
1.45– 3.15 pm	Relaxing
3.30– 5.00pm	Art collage

Thursdays	
9.00– 10.30am	Relaxing
10.45– 11.15am	Individual physiotherapy

Figure 2: Example of care offer for a patient

Conclusions: A significant improvement in quality of life on three different domains in FND patients following a personalized care program in the first French outpatient FND multidisciplinary day hospital. Such innovative FND multidisciplinary care management is needed to better help FND patients dealing with their symptoms' burden. These results are encouraging, although further long-term prospective studies are needed to strengthen the outcome robustness. More therapeutic interventions will be developed in the future [Figure 1], depending on the increasing patient's recruitment.

References:

Schmidt T, Ebersbach G, Oelsner H, Sprock A, R. König I, Bäumer T, Münchau A, Weissbach A. Evaluation of Individualized Multi-Disciplinary Inpatient Treatment for Functional Movement Disorders. Movement disorders clinical practice 2021; 8(6): 911–918.

Jacob A, Kaelin D, Roach A, Ziegler C, LaFaver K. Motor Retraining (MoRe) for Functional Movement Disorders: Outcomes From a 1-Week Multidisciplinary Rehabilitation Program. PMR 2018; 10(11): 1164-1172.

SPEECH AND LANGUAGE THERAPY: A TREATMENT CASE-SERIES OF 18 PATIENTS WITH FUNCTIONAL NEUROLOGICAL DISORDER – SPEECH/COMMUNICATION SUBTYPE

Sara Paredes-Echeverri (Massachusetts General Hospital, sparedesecheverri@mgh.harvard.edu*), Alexa Goldstein, Sara Finkelstein, Andrew Guthrie, David Perez, Jennifer Freeburn*

Objective: To retrospectively describe the treatment outcomes of patients with Functional Neurological Disorder (FND) – Speech/Communication subtype that attended outpatient Speech and Language Therapy (SLT) at a tertiary care outpatient FND clinical program.

Background: At the Massachusetts General Hospital, an interdisciplinary and multidisciplinary team-based approach is used to treat FND, including SLT when appropriate based on clinical phenotype.

Methods: In this retrospective case-series, consecutive FND patients were included with functional speech symptoms that attended outpatient SLT at the Massachusetts General Hospital between January 1, 2017, and June 30, 2021. Patients who had not yet completed their treatment course were excluded. A.N.G. reviewed the medical charts, and S.P.E. cross checked data; questions or entry discrepancies were arbitrated by group discussion across all co-authors. Information about demographics, medical and psychiatric co-morbidities, baseline functional neurological symptoms, and treatment interventions was collected. Given the modest sample size, only descriptive statistics were used.

Results: The sample (n=18) had a mean age of 51±17.3 years, 72% female and half were on/applying for disability. 89% had lifetime anxiety, 72% lifetime depression, 39% a prior head trauma, and 61% endorsed at least one adverse life experience. At presentation, other functional symptoms were frequent: 15 (83%) hyperkinetic motor, nine (50%) weakness, three (16%) seizures, and 11 (61%) had other somatic symptoms; only one individual was participating in isolated SLT. After a median of 11 sessions (across a median of 15 weeks), three participants who had dysfluency or stutter were asymptomatic at discharge. Additionally, 12 improved per clinician report after a median of seven sessions (across a median of 18 weeks), with eight reaching conversation level of fluency.

Conclusion: This case series lends support to an outpatient multidisciplinary model of care for FND, with a role for SLT in the assessment and management of individuals with functional speech difficulties. Additional research is needed to investigate baseline predictors of treatment response, as well as explore novel interventions for those that fail to improve following consensus guideline informed SLT for FND.

References:

Baker, J., Barnett, C., Cavalli, L., Dietrich, M., Dixon, L., Duffy, J. R., Elias, A., Fraser, D. E., Freeburn, J. L., Gregory, C., McKenzie, K., Miller, N., Patterson, J., Roth, C., Roy, N., Short, J., Utianski, R., van Mersbergen, M., Vertigan, A., Carson, A., … McWhirter, L. (2021). Management of functional communication, swallowing, cough and related disorders: consensus recommendations for speech and language therapy. Journal of Neurology, Neurosurgery, and Psychiatry, 92(10), 1112–1125. https://doi.org/10.1136/jnnp-2021-326767

Freeburn, J. (2022). Speech Therapy: Being Understood Clearly. In K. LaFaver, C. W. Maurer, T. R. Nicholson, D. L. Perez (Eds.), Functional Movement Disorder: An Interdisciplinary Case-Based Approach (pp. 341–325). Springer International Publishing. https://doi.org/10.1007/978-3-030-86495-8

PRESENTATIONS OF FUNCTIONAL NEUROLOGICAL DISORDER IN THE ACUTE SETTING

Neil Ramsay (NHS Greater Glasgow and Clyde/University of Glasgow, neil.ramsay@ggc.scot.nhs.uk*), Jon Stone, Mariella Baxter, Ingrid Hoeritzauer*

Objective: To assess what proportion of inpatient neurological reviews are diagnosed as functional neurological disorders (FND).

Background: FND is a common cause of acute presentation to hospital[1] accounting for 9% of inpatient neurology admissions.[2] It is unknown what proportion of patients with acute neurology presentation have FND, this may impact on training and service provision.

Methods: Prospectively collected data from local neurology trainees at the largest tertiary neurology centre in Scotland who manage inpatient ward reviews from April to September 2021. To assess healthcare utilisation, data on hospital admission and investigations were reviewed for patients with a new or previous diagnosis of FND, epilepsy or a neuroinflammatory disorder (multiple sclerosis, neuromyelitis optica or clinically isolated syndrome) over the preceding 12 months.

Results: There were 187 inpatient reviews completed for 183 patients. 42 (22%) had diagnosis of FND, the largest single disease group. 19 (10%) had a diagnosis of epilepsy, 18 (10%) had a diagnosis of a neuroinflammatory condition, 19 (10%) had an uncertain diagnosis. In the 12 months preceding review the FND and neuroinflammatory group had a similar mean number of neurology admissions both 1.3 (p= 0.71) the epilepsy group was higher at 2.2 (p= 0.004). The FND group had a mean of 16 bed days not significantly lower than epilepsy patients (35 days, p= 0.47) and the neuroinflammatory group (27 days, p= 0.39). The FND, the neuroinflammatory group and epilepsy patients had a similar number of imaging studies (2.5 vs 2.8 vs 3.5, p=0.62).

Conclusions: FND is the most common single diagnosis seen in acute neurology. Patients with FND require similar acute health resources such as bed days and neuroimaging compared to other common neurological disorders. FND is about to be one of the ten core areas for the UK neurology training curriculum. This data supports this new development. We aim to merge datasets from other neurology centres in Scotland to improve quality of the data.

References:

1. Espay AJ, Aybek S, Carson A, et al. Current Concepts in Diagnosis and Treatment of Functional Neurological Disorders. JAMA Neurol. 2018;75:1132-1141

2. Beharry J, Palmer D, Wu T, Wilson D, Le Heron C, Mason D, Reimers J, Fink J, Mulder R, Duncan R. Functional neurological disorders presenting as emergencies to secondary care. Eur J Neurol. 2021;28:1441-1445.

THE EXPERIENCE OF PSYCHODYNAMIC FORMULATION IN FND

Myles Gutkin (University of Melbourne, gutkinm@tcd.ie*), Richard Kanaan, Loyola McLean, Jodi Cartoon, Richard Brown*

Objective: To capture patient experiences and provide insight into the mechanisms of change of Shared Individual Formulation Therapy (SIFT) [1] and to identify potentially transferable insights relevant to the existing evidence for psychotherapy in FND. [2]

Background: SIFT is a brief psychodynamic therapy designed to generate a tailored individual formulation for each patient. This mixed methods analysis from an embedded exit interview allows further evaluation of the intervention and population of the pilot study.

Methods: All participants were asked a single question (by an interviewer who was not their therapist) about their experience and evaluation of the intervention, followed by standardised prompts for up to 30 minutes. Their responses were interrogated using inductive and deductive thematic analysis from a critical realist perspective, with the aim of appraising the intervention and its potential mechanisms of action.

Results: The majority (22 of 29) of therapy participants completed the exit interview. Most reported benefitting, linking it to improved agency and function, while a minority found it unhelpful. Most commented that treatment was challenging, with the majority linking this challenge to insight and change. A minority linked challenging aspects to distress and dissatisfaction. Triangulation with quantitative measures of therapy acceptability and clinical change corroborated these findings.

Conclusions: Most participants experienced SIFT as beneficial, but also as challenging, with challenge being linked to insight and change in most, but with distress and deterioration in a minority. The association of insight and change with challenge in the majority may support the value of supportive discussion of confronting material as part of psychodynamic formulation in this population. While the specificity of the sample may limit transferability, this study has the potential to provide insights into the experience of SIFT, and perhaps psychodynamic formulation in general, for adults with FND.

References:

1. Gutkin M, Brown RJ, McLean L, Streimer J and Kanaan RA. Shared Individual Formulation Therapy (SIFT): an open-label trial of a new therapy accommodating patient heterogeneity in functional neurological disorder. Journal of neurology 2021.

2. Gutkin M, McLean L, Brown R and Kanaan RA. Systematic review of psychotherapy for adults with functional neurological disorder. Journal of Neurology, Neurosurgery & Psychiatry 2021;92:36-44.

EXPLORING ANTIDEPRESSANTS’ ROLE IN TREATMENT OF PNES

Myrto Sklivanioti (Karolinska Institutet, Stockholm, myrto.sklivanioti@ki.se*)*

Objective: To explore how different psychiatric treatment strategies, such as pharmacological and psychotherapeutic approaches, can affect Psychogenic non-epileptic seizures (PNES) given modern integrated models describing functional neurological disorders.

Background: Dysfunctional emotional regulation characterized primarily by emotional inhibition and a tendency to interpret affective states mainly as physical experiences has been identified as an important vulnerability factor for PNES (Brown & Reuber, 2016).

Methods: To compare the effects of SSRI (without prior expectations about their effect) and cognitive reappraisal on two emotions, fear and disgust. Non-clinical individuals were asked to either passively view or actively down-regulate, using reappraisal, pictures from International Affective Picture System (IAPS) tailored and tested to induce these two emotions, before and after ingesting Escitalopram 10mg or Placebo in a doubled blind, placebo-controlled cross-over design. The participants were subsequently asked to rate the emotion intensity that each image induced.

Results: Comparison of the effects of acute administration of SSRI on emotion induction and emotion regulation showed that escitalopram had a significant but weaker effect on reducing emotion induction than effortful and voluntary cognitive reappraisal (17 vs 43%). However, although our pharmacological intervention reduced the passive emotion perception it did not have a significant effect on effectiveness of willed emotion regulation using cognitive reappraisal.

Conclusions: Results support the findings of previous studies (LaFrance et al., 2014) that SSRI are not an effective treatment for PNES in patients with no clinical depression. Indeed, they might even be contra-productive by leading to flattened affect which could promote tendency to represent affective states as physical experiences. For these patients, psychotherapy enabling the individual to accept the emotional components of their experience and develop adaptive emotion regulation strategies, is likely a more promising treatment strategy. However, antidepressants might have a role to play in the treatment of PNES patients with comorbid depression, as the latter is associated with deficits of executive function and compromised secondary attentional system (SAS) (Brown & Reuber, 2016), that these drugs can help restore.

References:

Brown, R. J., & Reuber, M. (2016). Towards an integrative theory of psychogenic non-epileptic seizures (PNES). Clin Psychol Rev, 47, 55-70. doi:10.1016/j.cpr.2016.06.003

LaFrance, W. C., Jr., Baird, G. L., Barry, J. J., Blum, A. S., Frank Webb, A., Keitner, G. I., . . . Szaflarski, J. P. (2014). Multicenter pilot treatment trial for psychogenic nonepileptic seizures: a randomized clinical trial. JAMA Psychiatry, 71(9), 997-1005. doi:10.1001/jamapsychiatry.2014.817

FUNCTIONAL NEUROLOGICAL DISORDER AND PREGNANCY

Alexandra Lodge (St George's, University of London, m2001144@sgul.ac.uk*), Jan Coebergh, Mark Edwards, Marianne Novak*

Objective: To investigate the interaction between functional neurological disorder (FND) and pregnancy; looking at the effect of FND on the ability to have a normal pregnancy and delivery, and any effect pregnancy may have on the severity of FND symptoms.

Background: FND is most prevalent in women, many of whom are of childbearing age.[1] There is currently no literature on the interaction between FND and pregnancy, thus a study on this is pertinent.

Methods: Cases were found to investigate the relationship between pregnancy and FND. The cases were found by searching letters of patients known to the St George's Hospital functional neurological disorder clinic to identify patients with known FND who had become pregnant. Information about the pregnancies and deliveries were then found by looking at further letters, hospital records, and conversations with the patients. A case was also kindly shared by a colleague at Kingston Hospital. Cases were selected to illustrate different aspects of the interaction between pregnancy and FND.

Results: Four cases have been selected to represent the relationship between pregnancy and FND; two where no change in FND symptoms were experienced during pregnancy, one who experienced an easing of symptoms in pregnancy, followed by a relapse post-delivery, and one who has only experienced functional symptoms during pregnancy.

Conclusions: The cases presented show that pregnancy and FND can interact in different ways. Stress is a risk factor for FND and in the case of the woman who has only experienced FND in pregnancy, the stress of the pregnancy may be the precipitant for her symptoms. However, the other three cases show that pregnancy is not a definite exacerbator of FND and in some cases may lead to alleviation of symptoms. Reassuringly the cases show that a diagnosis of FND does not preclude one from having a normal pregnancy or delivery.

These cases are a preliminary presentation of the interaction between pregnancy and FND, many more cases are needed to identify trends and definitively describe phenomenology and further work will be needed to give possible mechanisms.

References:

1. K. Bennett, C. Diamond, I. Hoeritzauer, "A practical review of functional neurological disorder (FND) for the general physician", Clin Med (Lond), 21(1): 28–36, (2021).

FUNCTIONAL NEUROLOGICAL DISORDER WITH COGNITIVE SYMPTOMS: PSYCHOTHERAPEUTIC INSIGHTS LINKING EMOTION AND COGNITION

Daniel Millstein (Massachusetts General Hospital, dmillstein@partners.org*), John Langfitt, David Perez, Kelly Nye, William Watson*

Objectives: To aid understanding of the treatment of cognitive symptoms in FND. To include highlighting a psychotherapy case study, whereby attendees will better understand potential relationships between cognitive symptoms and emotional processing.

Background: Cognitive symptoms are a common feature of FND. These can include problems with memory, attention, and concentration. To date, little is known about the role of psychotherapy in this patient population.

Methods: Content came from three outpatient emotion-focused psychotherapy sessions conducted in 2020 for a 59-year-old woman referred for outpatient care at the University of Rochester Medical Center Neurology Department. Chart was retrospectively reviewed and the patient was contacted post-treatment in 2022 to reflect on her psychotherapy journey. Notably, patient previously had a mixed FND presentation with balance, gait and cognitive symptoms; following successful completion of physiotherapy - only cognitive symptoms persisted at the time of psychotherapy initiation. She did not have a history psychiatric comorbidities, psychotropic medication use or prior psychotherapy; she also did not endorse a history of childhood maltreatment.

Results: Therapy began with an emotion-focused interview, including exploring the potential role of emotions in her cognitive symptoms. Session 2 involved further exploration and linking of symptoms, emotions, and life stressors while consolidating gains in symptom relief. Specifically, we examined an instance of cognitive symptoms – and we performed a central dynamic sequence (chain analysis) to experientially process emotions surrounding challenging family dynamics – leading to self-reported clinical improvement. Session 3 reviewed the patient's progress and discussed relapse presentation. At 18-months post treatment, she reflected on the benefits of this psychotherapy – including underscoring the role of emotional insights (2min 15 s video).

Conclusions: This case report is notable in presenting an individual with FND and persistent cognitive symptoms that remitted through a short course of emotion-focused psychotherapy. Along with more standard cognitive and behavioral psychotherapeutic skillsets (e.g. psychoeducation, self-monitoring), an active focus on affective processing may be a useful addition for treatment providers. More research is needed to investigate the potential utility of a range of psychotherapeutic approaches to the management of cognitive symptoms in patients with FND.

References:

Abbass A, Lumley MA, Town J, Holmes H, Luyten P, Cooper A, Russell L, Schubiner H, De Meulemeester C, Kisely S.J. (2021) Short-term psychodynamic psychotherapy for functional somatic disorders: A systematic review and meta-analysis of within-treatment effects. Psychosom Res. Jun;145:110473

McWhirter, L., Ritchie, C., Stone, J., & Carson, A. (2020). Functional cognitive disorders: a systematic review. The Lancet Psychiatry, 7(2), 191-207.

HETEROGENEITY OF PATIENTS WITH FUNCTIONAL/DISSOCIATIVE SEIZURES: THREE MULTIDIMENSIONAL PROFILES

Coraline Hingray (CHRU Nancy, coralinehingray@gmail.com*), Markus Reuber*

Objective: To identify profiles of distinct FDS subtypes by cluster analysis of a multidimensional dataset without any a priori hypothesis.

Background: Current concepts highlight the neurological and psychological heterogeneity of functional/dissociative seizures (FDS). However, it remains uncertain whether it is possible to distinguish between a limited number of subtypes of FDS disorders.

Methods: Conducted an exploratory, prospective multicenter study of 169 patients with FDS. Collected biographical, trauma (childhood and adulthood traumatic experiences), semiological (seizure characteristics) and psychopathological data (psychiatric comorbidities, dissociation, and alexithymia) through psychiatric interviews and standardized scales. Clusters were identified by the Partitioning Around Medoids method. The similarity of patients was computed using Gower's distance. The clusters were compared using ANOVA, chi-squared or Fisher's exact tests.

Results: Three patient clusters were identified in this exploratory, hypothesis-generating study and named on the basis of their most prominent characteristics.

A full description of our cohort with its three subgroups is presented in two separate tables focusing on biographical and seizure characteristics [Table 1], trauma variables and history [Table 3], and psychopathological characteristics [Table 2]. A synthetic description of the most distinctive characteristics distinguishing these three patient groups TTable 3].

1. A "No/single trauma" group (31.4%) with more male patients, intellectual disabilities, non-hyperkinetic seizures, and a low level of psychopathology.
2. A "Cumulative lifetime traumas" group (42.6%) with clear female predominance, hyperkinetic seizures, relatively common comorbid epilepsy and high level of psychopathology.
3. A "Childhood traumas" group (26%) commonly with comorbid epilepsy, history of childhood sexual abuse (75%), and post-traumatic stress disorder, but high level of anxiety and dissociation.

Table 1. Biographical and Seizures Characteristics

	Total **n=169**	**Group 1** ***No/single trauma*** **n=53**	**Group 2** ***Cumulative Lifetime traumas*** **n=72**	**Group 3** ***Childhood traumas*** **n=44**	**p-value**	**Association η^2 or Cramér's V***
Biographic data						
Women, %	81.1	62.3	91.7	86.4	**<0.001**	0.329
Age, years (SD)	34.5 (12.4)	36.81 (13.1)	35.95 (12.2)	29.35 (10.6)	**0.005**	0.061
Education						

Entry-level vocational diploma, %	44.9	45.1	34.7	61.4	**0.02**	0.152
High school diploma, %	37.7	31.4	50.0	25.0	**0.01**	0.159
Learning disability, %	23.4	33.3	12.5	29.5	**0.01**	0.159
Seizure history						
Age at FDS onset, mean (SD)	27.18 (13.0)	30.87 (12.9)	28.27 (13.2)	20.96 (10.8)	**<0.001**	0.088
Associated epilepsy, %	34.1	43.4	16.7	52.4	**<0.001**	0.231
Anti-seizure medicine						
Unwarranted anti-seizure treatment, %	19.5	15.1	27.8	11.4	0.06	0.183
Triggering factors						
No trigger factor identified, %	26.0	52.8	13.9	13.6	**<0.001**	0.413
Frustration influencing seizure, %	40.8	35.8	50.0	31.8	0.10	0.164
Anxiety influencing seizure, %	64.5	30.2	77.8	84.1	**<0.001**	0.488
Seizure type						
Non-hyperkinetic seizures (psuedosyncope +paucikinetic), %	51.0	64.4	42.4	50.0	0.07	0.124
Hyperkinetic seizures, %	49.0	35.6	57.6	50.0	0.23	

*SD: Standard Deviation; FDS: Functional/Dissociative Seizures; *eta square ranges from -1 to +1, with zero being no effect (0-0.38: small effect size; 0.39-0.55: medium effect size; 0.56–1: large effect size)*

Table 2. Trauma and Psychopathological Characteristics

Lifetime Traumas (life event checklist & CTQ)						
Current PTSD, %	32.5	1.9	33.3	63.6	<0.001	0.485
At least one trauma in life, %	78.1	34.0	98.6	97.7	<0.001	0.509
Multiple traumas (at least one in childhood, one in adulthood), %	39.6	0	70.0	41.9	<0.001	0.423
Childhood traumas (CTQ)						
At least one trauma, %	65.7	15.1	83.3	97.7	<0.001	0.535
Sexual trauma, %	38.2	3.8	41.4	74.4	<0.001	0.398
Emotional trauma, %	50.6	5.7	72.2	69.8	<0.001	0.448

Physical trauma, %	31.5	9.4	43.1	39.5	<0.001	0.243
Multiple traumas, %	40.8	1.9	54.2	65.9	<0.001	0.402
Adulthood traumas (life event checklist)						
At least one trauma, %	49.7	19.2	81.4	34.9	<0.001	0.19
Sexual trauma, %	17.6	3.8	32.9	9.3	<0.001	0.244
Emotional trauma, %	36.4	13.5	58.6	27.9	<0.001	0.297
General Psychopathology						
Number of current psychiatric pathologies, mean (SD)	1.95 (1.7)	0.87 (1.0)	1.97 (1.5)	3.20 (1.9)	<0.001	0.271
Depression						
MADRS, mean (SD)	14.8 (9.9)	9.84 (7.3)	16.01 (9.9)	18.44 (10.6)	<0.001	0.099
Anxiety						
Hamilton, mean (SD)	18.96 (9.9)	14.49 (9.2)	18.86 (9.8)	24.21 (8.7)	<0.001	0.134
Dissociation						
Total DES score, mean (SD)	24.05 (16.8)	16.77 (15.0)	25.12 (16.0)	30.54 (17.2)	<0.001	0.129
Alexithymia						
TAS, mean (SD)	58.12 (11.7)	52.08 (13.2)	58.76 (10.3)	63.91 (8.5)	<0.001	0.146

*SD: Standard Deviation; MADRS: Montgomery and Asberg Depression Scale; MDE: Major Depressive Episode; DES: Dissociative Experience Scale; TAS: Toronto Alexitymia Scale; *eta square ranges from -1 to +1, with zero being no effect (0-0.38: small effect size; 0.39-0.55: medium effect size; 0.56–1: large effect size)*

Table 3. Biological, seizure, psychological and trauma charactersitics of the various FDS profiles.

	Group 1 ***No/single trauma*** **31.4%**	**Group 2** ***Cumulative lifetime traumas*** **42.6%**	**Group 3** ***Childhood traumas*** **26%**
Biographic	Higher ratio of men Low education level (with exceptions)	Very high ratio of women High education level	High ratio of women Intermediate education level
Seizures	Triggering factor not well identified + 40% epilepsy Majority of non-hyperkinetic seizures	Low rate of comorbid epilepsy but with a high rate of unjustified ASM treatment High ratio of hyperkinetic seizures	Early FDS onset (<20 years old) One out of two has comorbid epilepsy
Trauma	Low rate of trauma (0% experienced multiple lifetime trauma) No PTSD	Multiple lifetime traumas Childhood emotional abuse (72%) Adulthood sexual abuse (32.9%)	Childhood trauma: 75% sexual abuse 70% emotional abuse
Psychopathology	The least disturbed psychopathology profile (number and intensity) No dissociation Modarete alexithymia	High psychopathology Most likely to be treated High levels of depression	Most disturbed psychopathological profile Low psychotropic treatment rate High rates of anxiety disorder Very high dissociative tendencies and high rates of alexithymia
ASM: anti-seizures medicine: FDS: Functional/Dissociative Seizures			

Conclusion: While our cluster analysis was undertaken without any a priori hypothesis, the nature of the trauma history emerged as the most important differentiator between three common FDS disorder subtypes. A better understanding of these entities may allow us to develop more specific clinical, diagnostic, and most importantly therapeutic approaches. These subpopulations differ in terms of their treatment needs. They may also differ in their response to treatment. Indeed, the development of a therapeutic program addressing each profile may represent a better way forward than a one size fits all approach.

References:

Ertan D, Aybek S, W Curt LaFrance J, Kanemoto K, Tarrada A, Maillard L, et al. Functional (psychogenic non-epileptic/dissociative) seizures: why and how? J Neurol Neurosurg Psychiatry. 2022;93(2):144–57

Hingray C, Maillard L, Hubsch C, Vignal J-P, Bourgognon F, Laprevote V, et al. Psychogenic nonepileptic seizures: characterization of two distinct patient profiles on the basis of trauma history. Epilepsy Behav. 2011 ;22(3):532–6.

PHENOTYPIC CHANGES OVER DISEASE COURSE IN FUNCTIONAL MOTOR DISORDERS

Tommaso Ercoli (University of Cagliari, ercolitommaso@me.com*), Michele Tinazzi, Christian Geroin, Enrico Marcuzzo, Roberto Erro, Sofia Cuoco, Roberto Ceravolo, Sonia Mazzucchi, Andrea Pilotto, Alessandro Padovani, Luigi Michele Romito, Roberto Eleopra, Mario Zappia, Alessandra Nicoletti, Carlo Dallocchio, Carla Arbasino, Francesco Bono, Giorgio Spano, Benedetta Demartini, Orsola Gambini, Nicola Modugno, Enrica Olivola, Laura Bonanni, Alberto Albanese, Gina Ferrazzano, Alessandro Tessitore, Leonardo Lopiano, Giovanna Calandra-Buonaura, Martina Petracca, Francesca Morgante, Marcello Esposito, Antonio Pisani, Paolo Manganotti, Lucia Tesolin, Francesco Teatini, Fabrizio Stocchi, Giovanni Defazio*

Objective: To assess changes in the body distribution of functional motor disorder (FMD); focusing on FMD patients with only one affected body part at onset included in the Italian Registry of Functional Motor Disorders (IRFMD).[1]

Background: FMD pattern may change over time in terms of body distribution and semiology of core functional motor symptoms. These changes may contribute to an apparently unpredictable clinical heterogeneity that may render it difficult to track disease pathways.

Methods: Data was obtained from the IRFMD. Patients with a diagnosis of clinically definite FMDs based on Gupta and Lang's diagnostic criteria were included if their FMD started in a single body site. The IRFMD collected demographic/clinical information, on age, sex, phenotype, affected body region on examination, and timing of FMD appearance in each body localization. The IRFMD also provided information on potentially associated factors, like additional functional neurological disorders, neurological comorbidities, psychiatric comorbidities, and disease modeling. The relationship between FMD features and spread to other body sites was estimated by Kaplan-Meier survival curves and Cox regression analysis.

Results: Among the 410 patients included in IRFMD, we identified 201 patients (49%) who reported only one affected body part at disease onset. Over one to nine years (median, three years), the phenomenon of spread from the initial site to an additional body site was observed in 43/201 patients (21.4%). Spread occurred during the first year in about half of patients. On univariable Cox analysis and multivariable Cox analysis, the presence of other functional neurological disorders and psychiatric comorbidities were significantly associated to spread.

Conclusion: Study provides novel information about the natural history of FMD. In patient who presented with FMD starting at one body site, spread to additional body sites occurred in about 20% of cases. Spread was significantly more frequent in patients who also manifested other functional neurological disorders and psychiatric comorbidities. In conclusion, changes in FMD body distribution might be a reliable clinical marker of disease progression.

References:

1. Tinazzi M, Morgante F, Marcuzzo E, et al. Clinical Correlates of Functional Motor Disorders: An Italian Multicenter Study. Mov Disord Clin Pract. 2020;7(8):920-929.

LARGE-SCALE VALIDATION OF SENSORIMOTOR POSITIVE SIGNS IN FND: RESULTS OF AN ONGOING STUDY

Eric Morel (Inselspital, eric.morel@insel.ch*), Janine Bühler, Selma Aybek*

Objective: To validate at large-scale the most common positive signs (PS) for sensorimotor functional neurological disorders (FND).

Background: Many PS [1] have been validated to diagnose FND but in small samples and controls were usually limited to stroke. More data on the validation of sensorimotor signs are needed especially including a broader range of disorders as controls.

Methods: This study included so far 100 neurological patients in the Department of Neurology (50 functional, 50 non-functional), presenting a symptom of weakness (with or without sensory loss). All patients underwent a single clinical bedside video-taped examination of the following PS: Give-away (strength variability in the examination), Co-Contraction, Sternocleidomastoid Sign (strength asymmetry), Trapezius Elevation Test, Head Flexion Test, Drift Without Pronation, Hoover I & II, Spinal Injury Test, Arm Drop Test, Lip Pulling Sign, Midline splitting, Splitting of Vibration Sign, Expressive Behavior Sign. PS were rated binarily (present vs. absent). SPSS Statistics served for statistical analysis (χ2, Mann-Whitney, or T-test as appropriate).

Results: Diagnoses of patients are shown in Figure 1. FND patients are younger than controls (41.72 ⍰ 12.47 y.o. vs. 56.76 ⍰ 14.96 y.o.; p-value <0.001) with a female predominance (78% vs. 48%; p-value: 0.004). Frequency and positive/negative predictive values of the PS are presented in Table 1. Apart from rare signs like Lip Pulling or Arm Drop Test, all PS were significantly more frequent in the FND group. Positive predictive value was 94.1% if the patient had ≥5 PS. Negative predictive value was 94.7% if the patient had no PS. A total of 32 non-functional patients (i.e. 64% in this arm) presented ≥1 PS, among whom 10 patients had ≥2 PS.

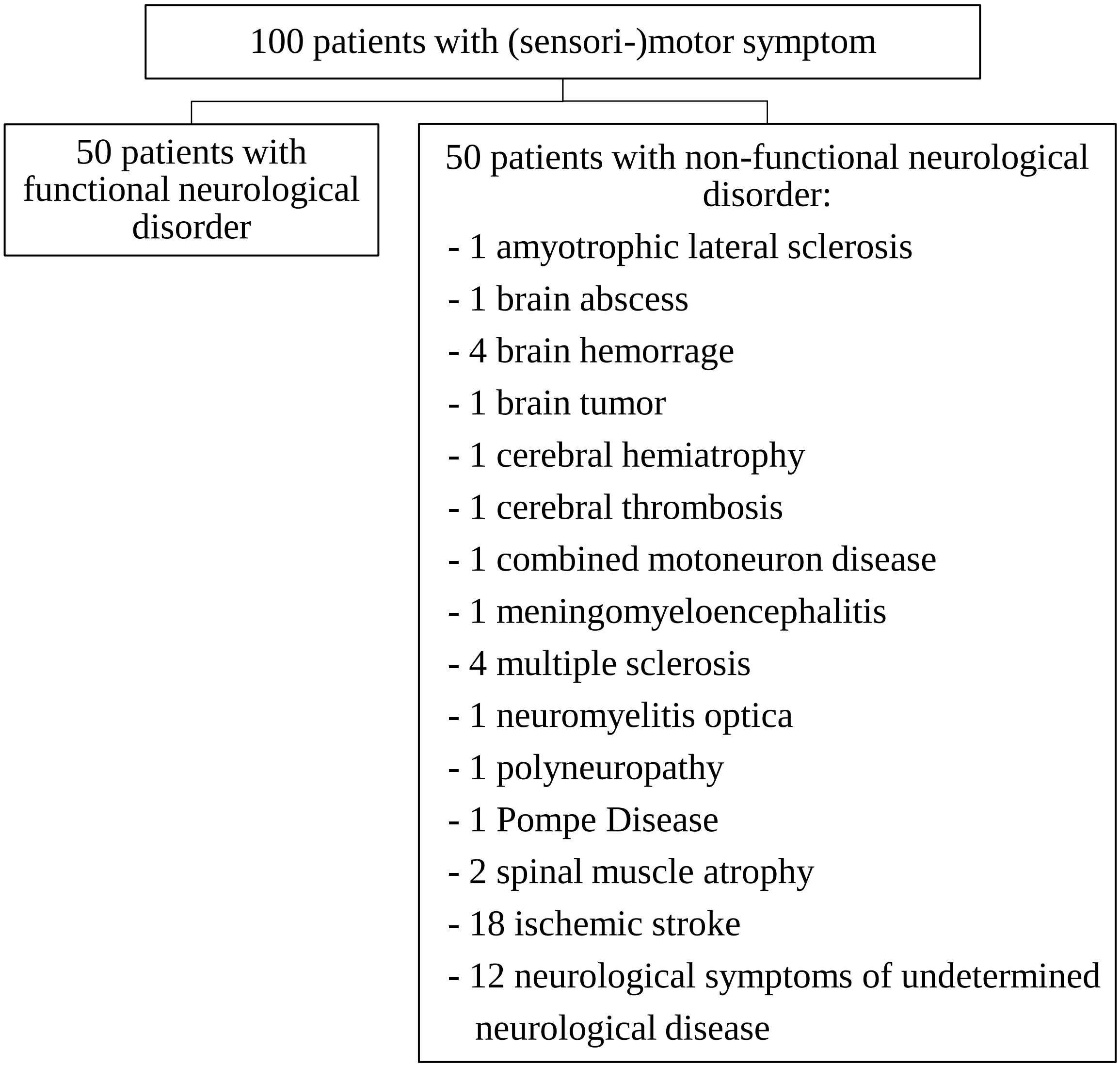


Figure 1. Diagnosis of patients.

Table 1. Frequency of positive signs in neurological patients. (Results are given in absolute numbers, unless indicated otherwise.

* Significance level was set at $p < 0.05$)

	Functional patients (n=50)	Non-functional patients (n=50)	p-value*	Positive predictive value	Negative predictive value

Give-away, n	37	8	**<0.001**	82.20%	84.00%
Co-Contraction, n	15	2	**0.001**	88.20%	61.50%
Sternocleidomastoid Sign, n	29	4	**<0.001**	87.90%	75.00%
Trapezius Elevation Test, n	26	8	**<0.001**	76.50%	71.90%
Head Flexion Test, n	27	4	**<0.001**	87.10%	72.60%
Drift Without Pronation, n	30	4	**<0.001**	88.20%	74.00%
Splitting of Vibration Sign, n	27	9	**<0.001**	75.00%	68.60%
Midline Splitting, n	30	3	**<0.001**	90.90%	71.90%
Hoover I, n	28	4	**<0.001**	87.50%	75.40%
Hoover II, n	9	2	**0.029**	81.80%	58.70%
Spinal Injury Test, n	4	3	1.000	57.10%	42.90%
Arm Drop Test, n	0	0	/	/	/
Expressive Behavior, n	9	1	**0.016**	90.00%	55.70%
Lip Pulling Sign, n	2	0	0.596	100.00%	44.60%

Conclusions: Most of the tested PS are significantly more frequent in FND. With a cut-off of five PS, there is a particularly high probability of FND (94.1%). Of note, a quite high number of patients with non-functional disorders presented at least one PS (64%). This brings two considerations: 1. There is a possibility that functional overlay was present in these non-functional disorders and 2. A diagnosis of FND should not be made on the sole presence of 1 PS: more signs are required and must be interpreted within the global clinical picture, including clues from history and course of the disease. This also highlights the fact that there is a need for more objective biomarkers /laboratory supported tests to complement clinical diagnosis.

References:

1. Gasca-Salas C, Lang AE. Neurologic diagnostic criteria for functional neurologic disorders. Handb Clin Neurol 2016;139:193–212. doi:10.1016/B978-0-12-801772-2.00017-5

FUNCTIONAL NEUROLOGICAL DISORDERS IN THE MEDICAL EDUCATION: AN URGENT NEED TO FILL THE GAPS

Astrid De Liege (APHP, astrid.de.liege@gmail.com)*, Coraline Hingray, Guilhem Carle, Alex Lenh, Béatrice Garcin*

Objective: To assess whether French junior specialists received teaching on Functional Neurological Disorder (FND) during their studies and to evaluate their knowledge and perception of the disorder.

Background: Although FND is frequent and disabling, patients suffer from stigmatisation and negative attitudes from health professionals.[1] One major reason seems to be that health professionals receive little training on FND diagnosis and management.[2]

Methods: The survey was distributed by the means of a Google form questionnaire to French neurologists, psychiatrists and physical and rehabilitation medicine (PRM) specialist registrars and young specialists with the help of resident's organizations. The questionnaire included a first section about demographic information. The second section assessed FND training, and perception about personal skills in FND management. The third section assessed knowledge and perceptions about FND, including risk factors, clinical signs, treatment, and disability recognition.

Results: There were 568 respondents from the three specialties included in the study. Most respondents (72.4%) were specialist registrars. Almost half of the respondents (45.5%) answered they never received any teaching on FND, and only 20.5% of them knew the Hoover's sign, a positive sign specific of functional weakness. A large majority of respondents felt they were not sufficiently trained in FND (87.9), and they did not have sufficient knowledge of these disorders (85.3%).

Conclusions: This survey shows that there is a gap about FND in the training programs in the medical studies and during the specialization training of young doctors in France. Better training would allow clinicians to make a diagnosis earlier, to better explain it to patients, and to limit the costs associated with diagnosis delays.[3,4] A better training of clinicians about FND would also improve the prognosis of patients, as early diagnosis and good explanation is associated with a better prognosis.[5,6] The responses and open-ended comments indicated a strong demand for training among young specialists. These findings are similar to other surveys performed in other countries which showed similar issues.[1]

References:

1. Lehn A, Bullock-Saxton J, Newcombe P, Carson A, Stone J. Survey of the perceptions of health practitioners regarding Functional Neurological Disorders in Australia. J Clin Neurosci Off J Neurosurg Soc Australas 2019;67:114–23. https://doi.org/10.1016/j.jocn.2019.06.008.

2. Aatti Y, Schwan R, Maillard L, McGonigal A, Micoulaud-Franchi J-A, de Toffol B, et al. A cross-sectional survey on French psychiatrists' knowledge and perceptions of psychogenic nonepileptic seizures. Epilepsy Behav EB 2016;60:21–6. https://doi.org/10.1016/j.yebeh.2016.04.023.

3. Stephen CD, Fung V, Lungu CI, Espay AJ. Assessment of Emergency Department and Inpatient Use and Costs in Adult and Pediatric Functional Neurological Disorders. JAMA Neurol 2021;78:88–101. https://doi.org/10.1001/jamaneurol.2020.3753.

4. McKenzie P, Oto M, Russell A, Pelosi A, Duncan R. Early outcomes and predictors in 260 patients with psychogenic nonepileptic attacks. Neurology 2010;74:64–9. https://doi.org/10.1212/WNL.0b013e3181c7da6a.

5. Gelauff JM, Dreissen YEM, Tijssen MAJ, Stone J. Treatment of functional motor disorders. Curr Treat Options Neurol 2014;16:286. https://doi.org/10.1007/s11940-014-0286-5.

6. Gelauff JM, Carson A, Ludwig L, Tijssen MAJ, Stone J. The prognosis of functional limb weakness: a 14-year case-control study. Brain 2019;142:2137–48. https://doi.org/10.1093/brain/awz138.

PSYCHOMETRIC QUALITY OF THE FUNCTIONAL NEUROLOGICAL DISORDER QUESTIONNAIRE (FNDQ): A SELF-REPORT OUTCOME MEASURE FOR FUNCTIONAL NEUROLOGICAL DISORDER

*Veerle Driessen (*HSK Expertise Center Functional Movement Disorders, veerle.driessen2@ru.nl),
Marleen Ieke Tibben, Julia Irina Birke, Amras van Opdorp, Maarten J.M. Merkx

Objective: To investigate whether the adjusted version of the FNDQ shows good validity in a new sample and whether the questionnaire is stable over time.

Background: The trials concerning FND treatment have highlighted the urgent need for a specific outcome measure for FND (Pick et al., 2020). The current study is a follow-up to Tibben et al. (2022), which pointed towards a good psychometric basis for the FNDQ.

Methods: Data of 150 patients (79% women; mean age 44 ± 16 years) with a diagnosis of FND was collected. During the intake and the first session, on average four to six weeks after the intake, the FNDQ, SF-36 and SQ-48 were electronically administered. The FNDQ is a 48-item self-report measure aimed at measuring which functional neurological symptoms are experienced during the past week and how often these are experienced. The FNDQ covers motor symptoms, sensory symptoms and psychogenic nonepileptic seizures. The total score indicates the symptom severity in a patient. Psychometric properties, including factor analysis, convergent validity, divergent validity, reliability and test-retest reliability, were analyzed using SPSS software.

Results: The FNDQ possesses a high reliability (⍰ = .950). The obtained intraclass correlation coefficient is .884 with a 95% confidence interval ranging from .828 to .921, which indicates a good to excellent test-retest reliability. Regarding the construct validity, a one structure factor model reflects the content of the questionnaire best. Comparing the total score of the FNDQ with subscales of the SQ-48 and SF-36 indicates a good convergent and divergent validity. The highest positive correlation was found between the total score of the FNDQ and the somatization subscale of the SQ-48 (⍰ = .567).

Conclusions: In line with the results of the previous study (Tibben et al., 2022) the results of the current validity study point towards a good psychometric quality of the FNDQ. Additionally, the test-retest reliability is analyzed in the current study, which indicates a good to excellent stability over time. The FNDQ is a promising outcome measure, which eventually can be implemented in clinical trials and as an outcome measure in FND treatment. Further research could investigate the ability of the questionnaire to assess treatment effect over time.

References

Pick, S., Anderson, D. G., Asadi-Pooya, A. A., Aybek, S., Baslet, G., Bloem, B. R., Bradley-Westguard, A., Brown, R. J., Carson, A. J., Chalder, T., Damianova, M., David, A. S., Edwards, M. J., Epstein, S. A., Espay, A. J., Garcin, B., Goldstein, L. H., Hallett, M., Jankovic, J., . . . Nicholson, T. R. (2020). Outcome measurement in functional neurological disorder: a systematic review and recommendations. Journal of Neurology, Neurosurgery & Psychiatry, 91(6), 638–649. https://doi.org/10.1136/jnnp-2019-322180

Tibben, M.I., Birke, J. I., van Opdorp, A., & Merkx, J. M. (2022). Validity of the Functional Neurological Disorder Questionnaire (FNDQ): a new outcome measure for functional neurological disorder. [Manuscript submitted for publication]. HSK Centre of Expertise for Functional Movement Disorders, Woerden, the Netherlands

A CASE OF PAROXYSMAL COMPLEX REGIONAL PAIN SYNDROME (CRPS)?

Claire Carstairs (King's College Hospital, Claire.carstairs@nhs.net*), Biba Stanton, Tim Nicholson*

Summary: We present the case of a 21-year-old woman with an eight-year history of episodic swelling, pain, hyperaesthesia and colour-change affecting her right arm. Episodes last for one to ten days with a frequency of about once per week. When she was still attending school there was a period of time when the episodes occurred “like clockwork” every Tuesday morning. She reports that episodes seem to be triggered by overuse. In between episodes, the appearance of the arm is normal, but there is persistent pain and limitation to activities such as carrying heavy objects and writing. More recently she has started to develop memory problems, “brain fog” and tremors.

The problem started after a painful venepuncture to the right arm at the age of 13. She went back to school after the blood test, and quite quickly noticed significant pain and swelling of the arm, which was also apparent to others. The school called her mother and they took her to hospital, where she was admitted for a week.

Extensive investigations to establish the cause of her symptoms have all been normal or negative. She had a two-week admission under paediatric Rheumatology and completed a three-week inpatient rehabilitation programme, neither of which brought any benefit.

Prior to this illness she experienced migraine from a young age, which exclusion diets did not improve. She was otherwise “super healthy,” according to her mother, and a successful javelin-thrower at school. At the age of 18, she had plastic surgery due to asymmetrical breast development. This was revised a year later to try to improve the appearance further. This resulted in scarring and she plans to undergo further surgery.

More recently, she had a hospital admission with reduced conscious level, headache, photophobia, arthralgia, nausea and urinary retention. Investigations were normal and she improved spontaneously. She has experienced more than one episode of depression and was previously treated with an SSRI, without clear benefit. She received cognitive behavioural therapy under paediatric services.

On examination during an outpatient review in January 2020, there was swelling and erythema of the right hand and forearm, but no obvious temperature difference. She held her arm hanging by her side, and was not able to move it at all during the consultation. She required assistance to take off her coat. She experienced light touch to the right hand as indistinct and very painful. The altered sensation was non-dermatomal in distribution, extending up to the shoulder. She could not tolerate any passive movement of the hand. The swelling went up to the elbow, but movement at the shoulder was also very uncomfortable.

We believe that the clinical picture is most in keeping with a functional disorder. In particular, the period of highly regularised Tuesday morning symptom flares cannot be explained by organic disease. The clinical features during each episode are like those of CRPS, but paroxysmal presentations of this condition have not been described. This case may provide insight into the shared mechanisms of CRPS and functional neurological disorder.

Why this case is of unique or special interest:

We believe this is the first reported case of functional neurological disorder presenting as a paroxysmal form of complex regional pain syndrome.

The phenotype described is very reminiscent of CRPS, and the clinical features during her episodes fulfil the Budapest diagnostic criteria.[1] She reports sensory symptoms in the form of hyperaesthesia, vasomotor features in the form of colour and temperature changes, oedema and motor features in the form of decreased range of motion and motor dysfunction, with some emergence of tremor, though no reported trophic changes. CRPS usually follows physical injury or surgery to a limb, but cases following venepuncture have been reported.[2]

The mechanisms of CRPS, and how they relate to the triggering event, are the subject of ongoing controversy. There has been a polarised debate between those who see the condition as a "genuine" medical disorder, and those who see it as "psychogenic". However, the similarities between the positive features of CRPS and functional neurological disorders (FND) are increasingly recognised. Functional "fixed" dystonia has the same characteristics as that seen in CRPS [3]; limb weakness in CRPS has a "give-way" quality [4] and sensory changes in CRPS are often in a non-dermatomal distribution.[5] Just as our understanding of FND has moved away from mind-body dualism, and towards a truly biopsychosocial model, it may be possible to reframe the "debate" about CRPS.

Popkirov and colleagues have proposed a unified framework for understanding both FND and CRPS as "a complex interplay between physiological stimulus, expectation, learning and attention.[6] They suggest that early peripheral pro-inflammatory changes in CRPS fail to abate when normal adaptations of movement to pain become entrenched and outside conscious control. In this model, hypervigilance, kinesiophobia, avoidance and disuse all contribute to a potentially reversible deregulation of brain function.

An episodic or paroxysmal disease course has not previously been documented in CRPS (although fluctuating and episodic symptoms are very common in FND). The episodic nature of our case suggests that prolonged disuse is not always critical to the vasomotor changes and oedema seen in CRPS.

Learning Points:

1. This case illustrates the overlap between FND and CRPS. The clinical features during her episodes would meet criteria for CRPS but episodic forms of this disorder have not been described. She could also be said to meet DSM-V-TR criteria for conversion (functional neurological symptoms) disorder. The clinical findings (including the pattern of sensory loss, and the regular occurrence of episodes on Tuesday mornings) provide evidence of incompatibility with recognised neurological or medical conditions. It also seems likely that her recent presentation with unexplained coma was due to FND.
2. Current models of the mechanisms of CRPS often emphasise the importance of disuse and "bottom-up" processes. If episodic forms of the condition occur, this may suggest that "top-down" mechanisms (including expectation, attention, kinesiophobia and disuse) can drive vasomotor symptoms and oedema as well as pain and weakness.
3. The shared mechanisms of FND and CRPS illustrate the limitations of dualistic models of mind and brain. Better understanding of these mechanisms will inform the development of more effective treatment approaches.

The photographs [Figures 1, 2, 3, 4, 5, & 6] will illustrate the examination findings, showing the swelling and erythema of the right arm up to the elbow, which occurs episodically.

Figure 1.

Figure 2.

Figure 3.

Figure 4.

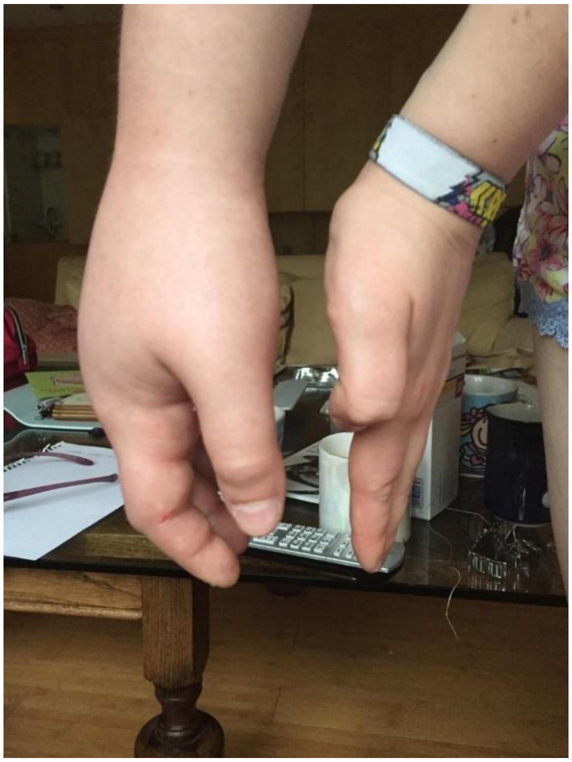


Figure 5.


Figure 6.

References:

1. Harden NR, Bruehl S, Perez RSGM et al. (2010). Validation of proposed diagnostic criteria (the "Budapest Criteria") for Complex Regional Pain Syndrome. Pain. 150(2):268-274.

2. Elahi F, Reddy CG. (2014). Venepuncture-induced complex regional pain syndrome: a case report and review of the literature. Case Rep Med. Available at [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4156992/] Accessed 11th March 2015

3. Schrag A, Trimble M, Bhatia K. (2004). The Syndrome of Fixed Dystonia: an evaluation of 103 patients. Brain. 127(pt 10):2360-72.

4. Berklein F, Riedl B, Sieweke N, Weber M, Neundorfer B. (2000). Neurological findings in complex regional pain syndromes – analysis of 145 cases. Acta Neurologica Scand. 101:262-269.

5. Rommel O, Gehling M, Dertwinkel R, Witscher K, Zenz M, Malin J P, Janig W. (1999). Hemisensory impairment in patients with complex regional pain syndrome. Pain. 80(1-2):95-101.

6. Popkirov S, Hoeritzauer I, Colvin L, Carson AJ, Stone J. (2018). Complex regional pain syndrome and functional neurological disorders: time for reconciliation. Journal of Neurology, Neurosurgery and Neuropsychiatry. Availanle at [https://doi.org/10.1136/jnnp-2018-318298]. Accessed 11th March 2022.

A FIXED-LENGTH INTEGRATED MULTIDISCIPLINARY TREATMENT IMPROVES QUALITY OF LIFE, SOCIAL PARTICIPATION, AND WORKFORCE PARTICIPATION IN PEOPLE WITH MOTOR FUNCTIONAL NEUROLOGICAL DISORDER

David Palmer (Capital and Coast District Health Board, david.palmer3@health.qld.gov.au*), Mary Gamble, Matt Higgins, Jenny Maley, Eloise Watson*

Objective: To investigate whether an integrated multidisciplinary intervention for motor FND improves quality of life, social participation, and workforce participation.

Background: Most current evidence-based treatments for motor FND are best suited to centres treating large numbers of patients. We aimed to assess the efficacy of a treatment model [Figure 1] which is better suited to small centres treating fewer patients with FND.

Methods: A clinic was set up where adults with motor FND were seen simultaneously in the same room by a neurology doctor, neurophysiotherapist, and clinical psychologist and/or psychiatrist fortnightly for a total of six 45-minute sessions. A symptom-focused approach focusing on the effect of attention and distraction on the symptoms was used. None of the treating team had previous specialist experience in treating FND.

Questionnaires for the Short Form-36 (SF-36), Work and Social Adjustment Scale (WSAS), ability to work, Patient Global Impresion of Change (PGI-C), as well as self-rated understanding of and agreement with the diagnosis of FND were administered before and after the treatment course.

Results: Data are available for 11 out of 13 patients treated in the clinic over its first year. Statistically significant improvements were seen in seven out of eight domains of the SF-36, with increases in mean score ranging from 20 to 39 points [Figure 1]. A statistically significant decrease (improvement) in WSAS score was seen, with mean score falling from 26 to 13 (worst possible score 40) [Figure 2].

At the beginning of treatment, 6/11 people were not working at all because of symptoms of FND and four of the remaining five were working reduced hours. Over the course of treatment, one person went from not working to working, and two people went from working reduced hours to working full time.

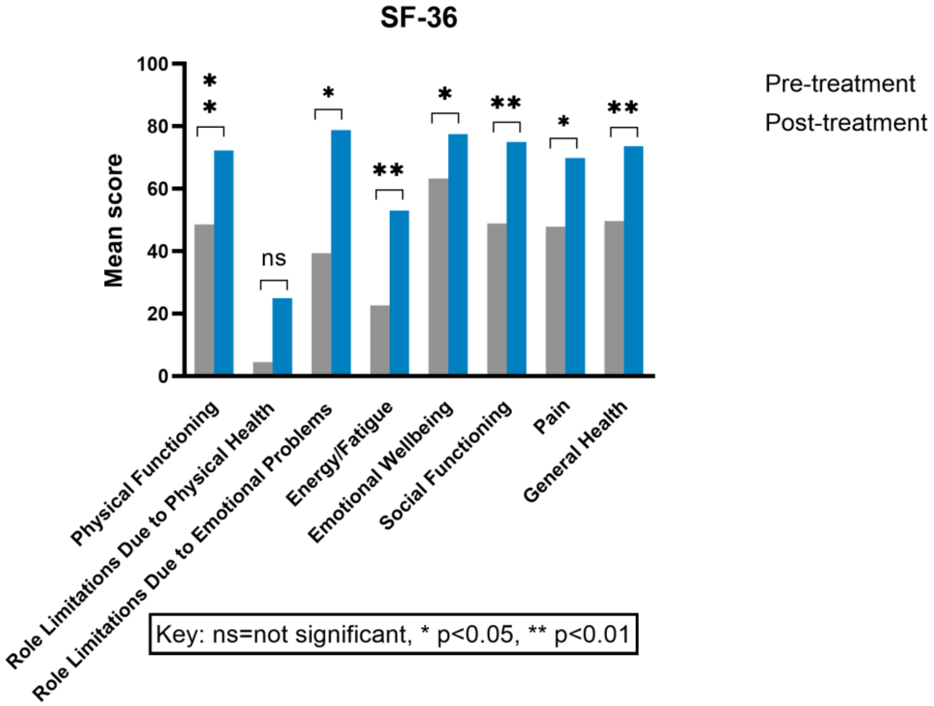

SF-36
Mean score
100
80
60
40
20
0
**
ns
*
**
*
**
*
**
Physical Functioning
Role Limitations Due to Physical Health
Role Limitations Due to Emotional Problems
Energy/Fatigue
Emotional Wellbeing
Social Functioning
Pain
General Health
Pre-treatment
Post-treatment
Key: ns=not significant, * p<0.05, ** p<0.01

Figure 1.

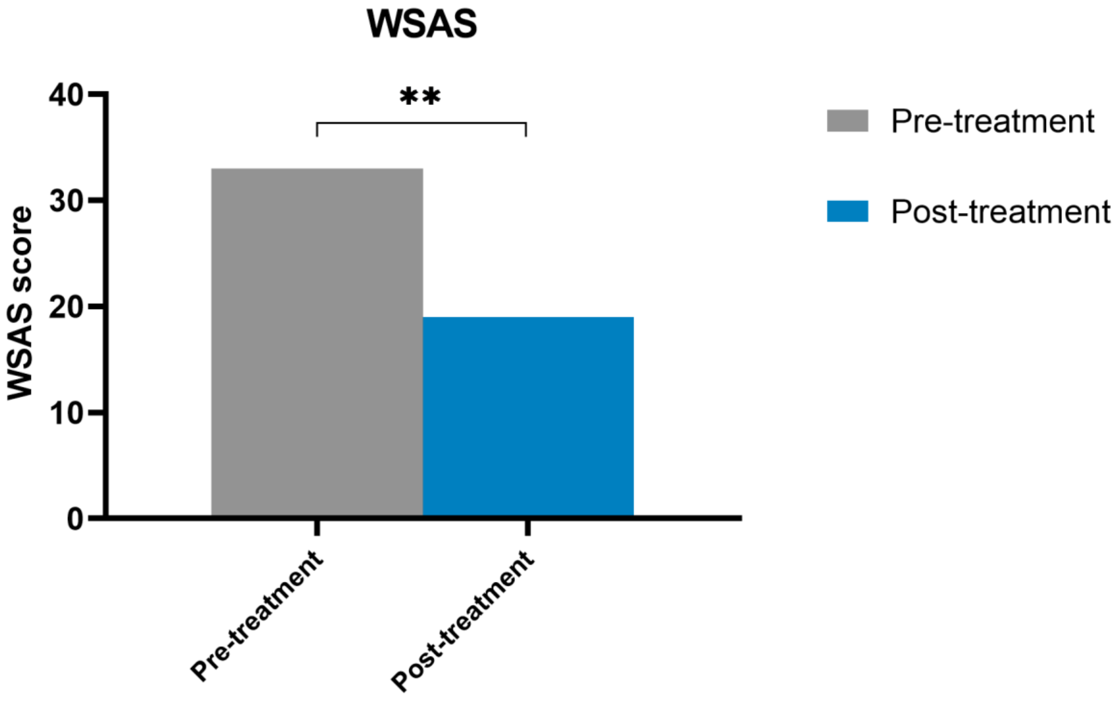

WSAS
WSAS score
40
30
20
10
0
**
Pre-treatment
Post-treatment
Pre-treatment
Post-treatment

Figure 2.

Conclusions: This study met its primary endpoint for efficacy (improvement in SF-36 score). Improvements were seen in all metrics examined, demonstrating that the intervention improved quality of life, social participation, and workforce participation. It is believed that the clinic model used is generalisable to other smaller centres where other evidence-based treatments are difficult to implement.

References:

Lidstone SC, MacGillivray L, Lang AE. Integrated Therapy for Functional Movement Disorders: Time for a Change. Mov Disord Clin Pract. 2020;7(2):169–74.

FUNCTIONAL CAMPTOCORMIA – A PHYSIOTHERAPY CASE STUDY

Esther Mountain (St George's University of London, esther.mountain@gmail.com*), Mark Edwards, Glenn Nielsen*

Objective: To present the case of a man who was referred to Physiotherapy with a diagnosis of probable functional camptocormia.

Background: The "functional bent back" syndrome dates back to 1837, while Souques first used the term "camptocormia" on observation of WW1 soldiers. Recognised neurological causes include PD and atypical parkinsonian disorders, myopathies and neuropathies.

Method: A 54-year-old man presented with a forward flexed posture without evidence of parkinsonism or axial weakness, and which completely resolved in a supine position. A diagnosis of FND was given following assessment by a neurosurgeon, a neuro-muscular specialist, and two neurologists with an expertise in movement disorders. Treatment spanned a seven-month period, was informed by the consensus recommendations for PT, and aimed to elicit automatic spinal extensor muscle activity. Video analysis helped the patient improve his postural awareness, recognise maladaptive movement strategies, and begin to replace ballistic action with selective muscle control. PT treatment addressed ergonomic concerns, as well as building confidence to walk unaided.

Results: The patient reported a lack of significant change at his neurology review, however, at the end of PT treatment he rated his symptoms as "4: Improved", on a 5-point Likert scale. The quality of his gait and posture changed, as indicated by the photographs in the body of the text. [Figure 1] [Figure 2] See Table1 for moderate changes in his gait parameters, and his ability to maintain an upright standing position. Subjectively, the patient reported the capacity to stand upright for a 10-15 minutes, compared to one to two minutes initially. He walked unaided, having previously used two elbow crutches, and had increased his level of physical activity. He was provided with an ergonomically suitable chair by his employer, and took regular breaks from his sedentary work.

Figure 1.

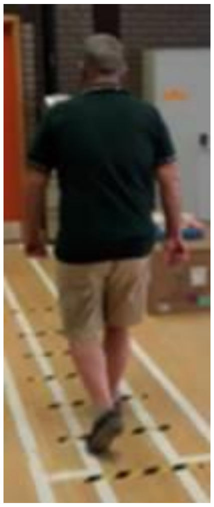


Figure 2.

	05/07/21	*28/09/21*	*07/01/22*
10m timed walk	24 steps, 10.95 seconds	24 steps, 13.33 seconds	16 steps, 10.01 seconds
Gait pattern	Downward head posture with visual fixation; reduced step and stride length; reduced interaction of forefoot/toes with ground R>L leg; brief intermittent instances of reduction in camptocormia	Intermittent ability to maintain head posture, with reduced visual fixation; ability to maintain lesser degree of camptocormia over a distance of 5m	Consistent upright head posture; increased gait velocity; increased step and stride length; symmetrical arm swing; no evidence of camptocormia over a distance of 10m; appearance of reduced effort to walk
'TRAGUS' (over 2.5minute period)	6.3cm increase in horizontal distance from wall	2cm increase in horizontal distance from wall	Horizontal distance from wall unchanged

Table 1. Patient standing, heels and pelvis/low back in contact with wall behind him. Distance between ear tragus and wall measured in cm, at beginning and end of 2.5minute period; may indicate a level of 'fatigue' resulting in a progressive degree of trunk flexion

Conclusions: The positive diagnostic sign suggesting a functional aetiology was the clinical history, i.e. an abrupt onset of symptoms in the absence of other neurological signs. The patient did not have a positive Hoover's sign or any of the multiple coexisting symptoms (e.g. fatigue, pain and cognitive fog) common to FND. In the first author's experience, FND patients often show signs of improvement early on, related to symptom variability and distractibility. This man changed moderately and gradually. Strategies to divert attention – frequently used when treating patients with FND - were not effective during sessions. One may hypothesise that functional camptocormia benefits from a treatment approach that is distinct to that of other FND phenotypes.

EVALUATING EFFECTIVENESS OF INTERDISCIPLINARY TREATMENT FOR CHILDREN WITH FUNCTIONAL NEUROLOGICAL DISORDER IN A GENERAL REHABILITATION SETTING

Sabine Hennel (Monash Children's Hospital, sabine.hennel@monashhealth.org*), Kelly Thompson, Ella Barry, Laura Finn, James Ang*

Background: Functional neurological disorder (FND) in children and youth have significant impacts on school attendance, mental health, and quality of life. There is emerging evidence on effectiveness of an interdisciplinary rehabilitation model for treatment of FND in children. This study aims to evaluate the effectiveness of the interdisciplinary treatment implemented by a general paediatric rehabilitation inpatient unit.

Method: Retrospective chart review of children with FND who were treated by our paediatric rehabilitation unit from June 2011-2021. Data was extracted from the electronic records of our health service. Admission data included: demographic data, age of FND onset, diagnosis of FND, follow-up duration, acceptance of FND diagnosis by family, psychiatric history of anxiety, depression, autism spectrum disorder or attention deficit hyperactivity disorder (ADHD) and school attendance with symptom onset.

Outcome data included: WeeFIM (The WeeFIM II® System, a paediatric version of the Functional Independence Measure System) scores for cognition, mobility and self-care on admission and at discharge. Post-discharge outcomes included return to school and exacerbation/recurrence of FND symptoms.

Results: A total of 24 patients with 19 females and five males, constituting 32 admissions, were included. Mean age of onset of FND was 12+/- 2.4 years. Fifteen patients had mixed sensorimotor impairment, 6 had only motor symptoms, 3 had only sensory symptoms. Mean duration of admission was 11.5 9.0 days. Improvements in WeeFIM mobility (Median difference: 9 (95%CI: 2-13, p<0.0001)) and WeeFIM self-care (Median difference: 5 (95%CI: 2-10, p<0.0001)) at discharge were both statistically significant. A successful return to school was achieved by 19 of 20 patients. Following discharge from rehabilitation , there were five presentations to the ED and five readmissions for FND symptoms while 15 did not experience any functional decline or exacerbation of FND symptoms. Risk factors for recurrence were significant mental health comorbidities.

Conclusions: Patients discharged from the inpatient unit showed favourable functional scores, school attendance, and post-discharge outcomes. This suggests that interdisciplinary treatment approach in a general paediatric rehabilitation setting is potentially effective for management of children with FND. Including a relapse management plan, particularly if significant comorbid mental health concerns are present may be of benefit.

References:

Kozlowska K, Gray N, Scher S, Savage B. Psychologically informed physiotherapy as part of amultidisciplinary rehabilitation program for children and adolescents with functional neurological disorder: Physical and mental health outcomes. Journal of Paediatrics and Child Health. 2020;57(1):73-9.

ATTENUATED HEART-BRAIN INTEGRATION PREDICTS FUNCTIONAL NON-EPILEPTIC SEIZURES

Samia Elkommos (King's College, samia.elkommos@kcl.ac.uk*), David Martin-Lopez, Akihiro Koreki, Claire Jolliffe, Marco Mula, Hugo Critchley, Mark Edwards, Sarah Garfinkel, Mark P. Richardson, Mahinda Yogarajah*

Objective: To assess whether alterations in interoceptive processing indexed by the heartbeat-evoked potential (HEP) occur prior to functional seizures (FS), and compare this with epileptic seizures (ES).

Background: Patients with FS experience depersonalisation before seizures. Depersonalisation encompasses disembodiment, caused by reduced afferent visceral mapping, that is, changes in interoceptive processing. The HEP is a marker of interoception.

Methods: Utilised the HEP as an electroencephalographic (EEG) index of synchronised neural responses to individual heartbeats, and a marker of interoceptive representation. HEP amplitudes were calculated from EEG during video-EEG monitoring in 25 patients with FS and 19 patients with ES, and compared between interictal and preictal states. HEP amplitudes were calculated at frontal and central EEG electrodes. HEP amplitude difference was calculated as a composite measure of preictal HEP amplitude minus interictal HEP amplitude.

A Receiver Operating Characteristic (ROC) curve analysis was later used to evaluate the diagnostic performance of the HEP amplitude difference measure in discriminating functional cases from epilepsy cases.

Results: The FS group demonstrated a significant reduction in HEP amplitude between interictal and preictal states at F8 (effect size rB=0.612, p=0.006) and C4 (rB=0.600, p=0.007)[Figure1]. No differences in HEP amplitude were found between states in the ES group. Between diagnostic groups, HEP amplitude difference was significantly different between the FS and ES group at C4 (rB=0.457, p=0.009) and F8 (rB=0.423, p=0.017)[Figure2]. Findings were not related to heart rate, mean ECG or QRS amplitudes, which did not differ between interictal/preictal states or groups.
Using HEP amplitude difference at frontal-central electrodes and sex, the ROC curve demonstrated an area under the curve of 0.893, with sensitivity=0.840 and specificity=0.842 [Figure3].

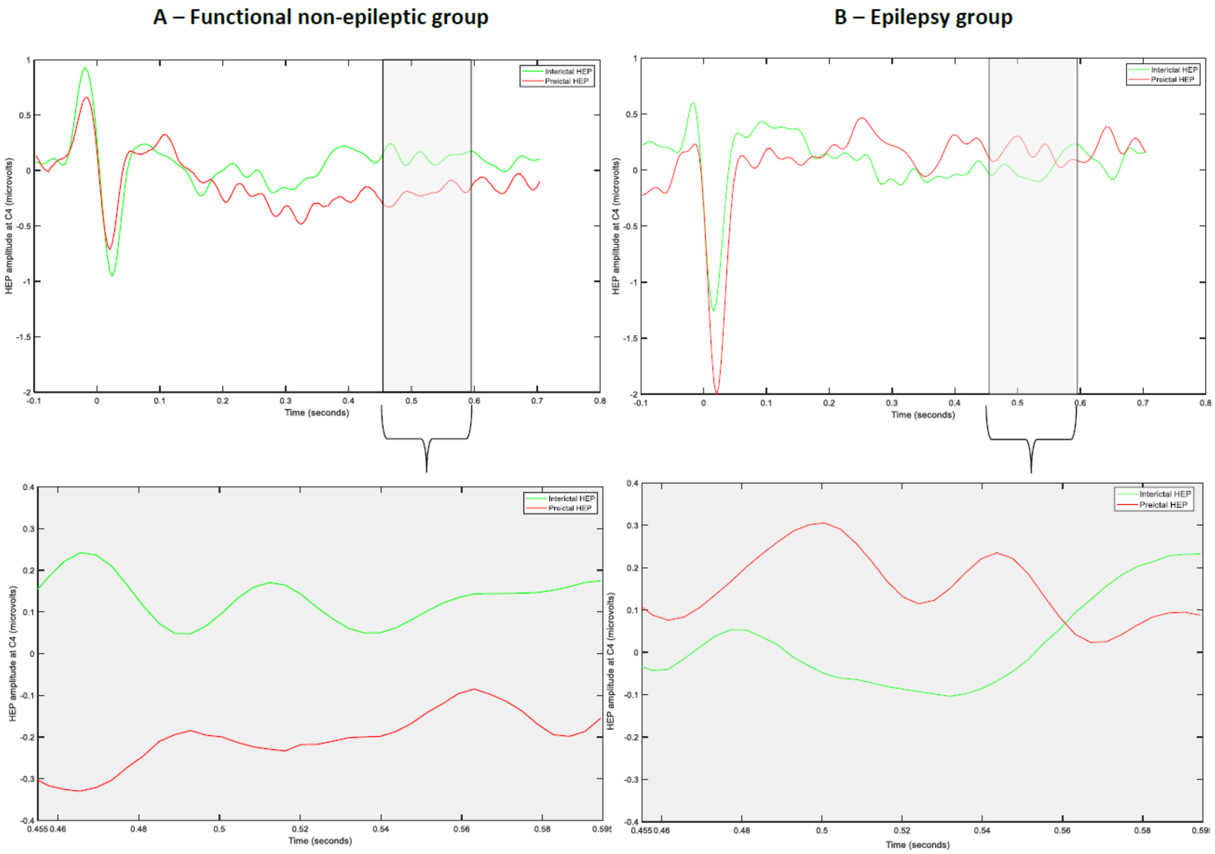


Figure 1. HEP waveforms at C4 electrode in functional non-epileptic group (A) and epilepsy group (B). Mean HEP amplitude was extracted between 455 milliseconds (0.455 seconds) and 595 milliseconds (0.595 seconds) after an R wave (shaded grey bar). Interictal HEP amplitude is indicated by green line, and preictal HEP amplitude by the red line. Lower images show the HEP waveforms in more detail between the window of interest (0.455 seconds to 0.595 seconds). There was a statistically significant reduction in HEP amplitude between the interictal state (green line) and preictal state (red line) in the functional non-epileptic group (A), but not in the epilepsy group (B).
HEP = Heartbeat Evoked Potential

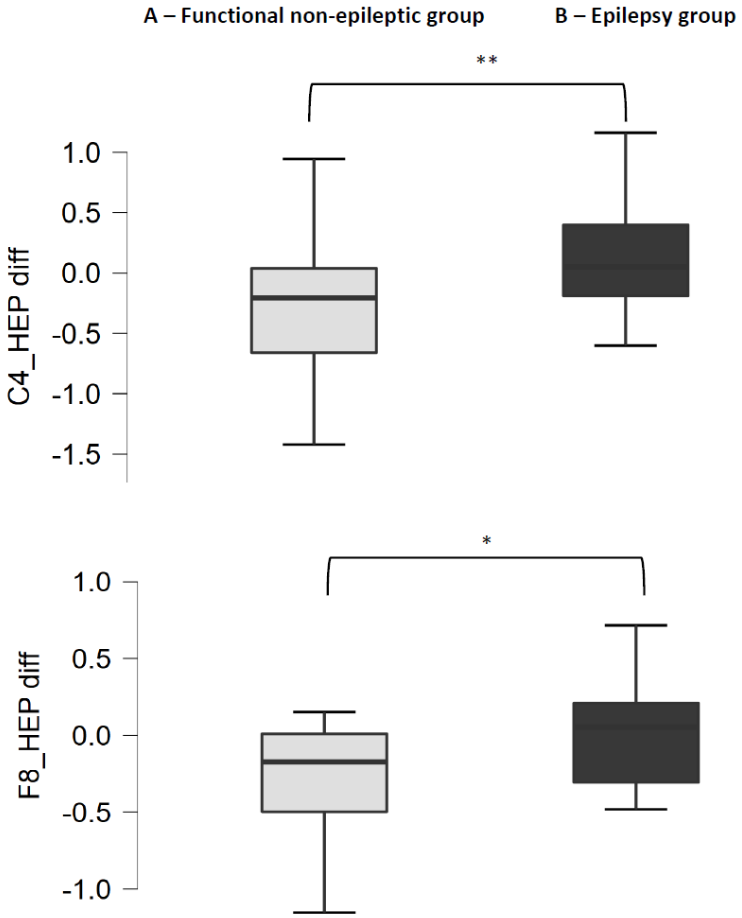


Figure 2. Box plot showing HEP amplitude difference at C4 (top chart) and F8 (lower chart) for functional non-epileptic group (A – light grey box plots) and epilepsy group (B – dark grey box plots). HEP amplitude difference was calculated by subtracting interictal HEP amplitude from preictal HEP amplitude (HEP amplitude difference = preictal HEP – interictal HEP). There was a statistically significant difference in HEP amplitude difference between the two groups at C4 and F8.
HEP = Heartbeat Evoked Potential, *p < 0.05 or below, **p < 0.01 or below

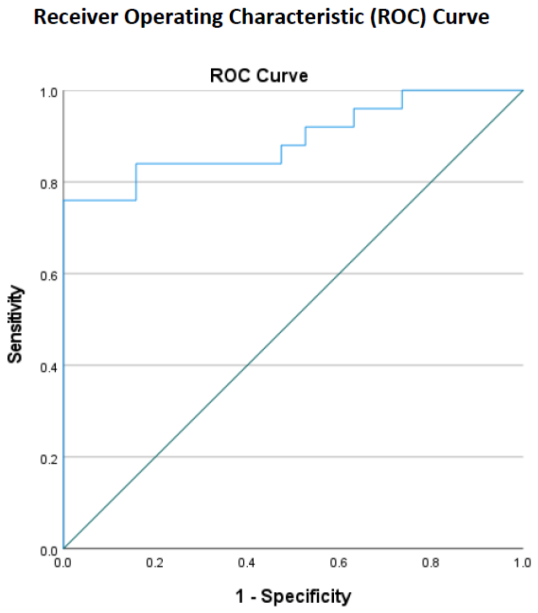


Figure 3. ROC curve using HEP amplitude difference at frontal-central electrodes and sex as variables, to evaluate the diagnostic performance of this in discriminating functional from epilepsy cases.
Performance metrics: Area Under the Curve (AUC) = 0.893, sensitivity = 0.840, specificity = 0.842, p = 0.000

Conclusions: Data supports the notion that aberrant interoception underpins disembodiment which manifests as depersonalisation prior to FS. Changes in HEP amplitude may therefore reflect a neurophysiological biomarker of FS. This study demonstrates that dynamic changes in HEP amplitude occur between interictal and preictal states in those with FS, thus shedding light on potential new mechanisms which may underly the occurrence of FS. Although requiring replication in larger samples, HEP amplitude difference at frontal and central electrodes between interictal and preictal states plus sex may have diagnostic utility in differentiating FS and ES.

FUNCTIONAL NEUROLOGICAL SYMPTOM DISORDER (FNSD): OUTPATIENT INTERDISCIPLINARY TEAM (IDT) FOLLOW UP OF PSYCHOGENIC NON-EPILEPTIC SEIZURES (PNES) AFTER NEUROLOGICAL DIAGNOSIS - A ROUTINELY COLLECTED SOUTH AFRICAN SAMPLE

Laila Paruk (Oxford Healthcare Centre, drparuk@psychiatryvillagemed.co.za*), Gregory Wayne Jonsson, Joanna Taylor, David Anderson*

Objective: To track patients diagnosed with FNSD from the original referral point, neurology, through the referral pathway to all members of the interdisciplinary team, and to describe any trends that emerged.

Background: The most successful treatment regimens for FNSD are those at specialized interdisciplinary centres.[1] South African centres face limited access to medical resources.[2] The centre provides an initial structured diagnosis by a neurologist, followed by ongoing care by a full IDT.

Methods: A retrospective record review was conducted of patients with FNSD, who were referred within an interdisciplinary team between October 2017 and October 2019. All patients diagnosed with PNES were included and data about referral pathways and clinical characteristics were extracted.. A standardised data sheet was used to capture information on demographics, neurological diagnosis, psychiatric diagnosis and number of consultations with various team members. Ethics approval was obtained from the University of Witwatersrand Human Rights Ethics Committee.

Results: There were 443 admissions recorded in the study with a median age of 35 years old (IQR 23-47y; range 5.4-88y), 61% of whom were female. 39% (n=173) were diagnosed with PNES (with or without epilepsy), and referred to IDT clinicians. 58.4% resulted in at least one IDT consultation. The majority of these were single (55%) and employed (53%). 88% had a psychiatric comorbidity, where 73% were formally diagnosed with FNSD, 52% had an anxiety disorder, 50% a mood disorder, and 21% had a history of a substance use disorder. Those who had at least one IDT consultation did so mostly with a psychologist (76%) or a psychiatrist (61%). Only 17% had at least one consultation with a neuro-physiotherapist. Patients who had at least one IDT consultation had a median of 14 consultations overall in the study period (IQR 5-27).

Conclusion: Within an established interdisciplinary clinic, referral to an IDT is adequately accepted after a structured diagnosis is given, considering that this patient population is self-funded and not a study population. Once patients attended an initial consultation with a member of the team, the trend was to stay in treatment. This is promising in terms of treatment retention, as 88% of patients were diagnosed with a psychiatric co-morbidity. Referrals within a collaborative team encourage sustained use of services, in a population that is difficult to retain.

References:

1. Baslet G, Prensky E. Initial treatment retention in psychogenic non-epileptic seizures. J Neuropsychiatry Clin Neurosci. 2013;25(1):63–7.

2. Taylor J, Jonsson G, Paruk L, Philippides A. A South African review of routinely-collected health data of psychogenic nonepileptic seizure patients referred to psychiatrists in Johannesburg. Epilepsy Behav. 2021 Jan;114:107578.

DISTRIBUTION OF CARE FOR HOSPITALIZED PATIENTS WITH FND IN SWEDEN

Carl Sjöström (Rehabilitation Medicine, Region Gävleborg, Sweden, callesjostrom@gmail.com)

Objective: To describe representation of different types of health care facilities reporting the diagnoses F44.0-9 after inpatient care in Sweden during 1998-2017.

Background: Since the symptoms in FND may vary, patients are referred to different medical settings. No previous studies on the distribution of care in Sweden for FND has been made.

Methods: Data from hospital discharges with a primary diagnosis in the ICD-10 F44 group was retrieved from the Swedish National Patient Register (NPR), available from the Swedish National Board of Health and Welfare open database in September 2019. Additional data regarding F 44.0-9 subgroups and types of care givers was retrieved in a separate file from the Swedish National Board of Health and Welfare. Data was available for 1998-2017.

The NPR collects data from public and private specialized care in Sweden with a coverage of more than 99% of hospital discharges in Sweden (Forsberg L 2009, Ludvigsson, Andersson et al. 2011). Since the NPR contains aggregated anonymous data, no individuals could be identified.

Results: During the study period the NPR reported a total of 5265 patients with a primary diagnosis of F44.0-.9, making a total of 6755 hospital stays or an average of 338 hospital stays a year [Figure 1]. Somatic care facilities reported 66% of the hospital stays, psychiatric care facilities 34%. For distribution in different care settings [Table 1].

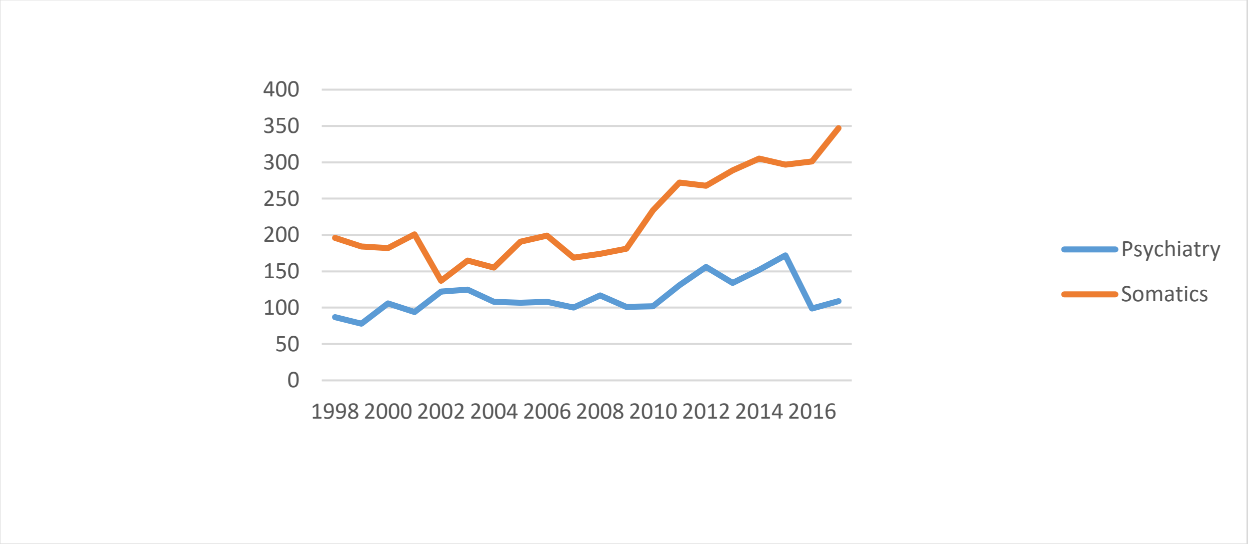


Figure 1. Number of hospital stays per year F 44.0-F44.9 1998-2017: Distribution psychiatric/somatic care (all ages, both sexes)

Table 1. Distribution of hospital stays in different settings, % of total (n=6755)

	1998-2017
Psychiatry	**34,2%**
General adult psychiatry	28,7
Child- and adolescents psychiatry	4,3
Other psychiatry	1,2
Somatics	**65,8%**
Internal medicine	28,2
Neurology	26,5
Child- and adolescents medicine	3,9
Rehabilitation medicine	1,5
Geriatrics	1,4
Stroke unit	1,4
Emergency unit	0,7
Neurosurgery	0,7
Other somatics	1,5
	100%

Conclusions: The majority of diagnoses of FND is reported from somatic care inpatient facilities in Sweden. Internal medicine and Neurology inpatient clinics report most of cases in somatic settings, but also other somatic settings report a smaller amount. This implies that educational efforts regarding FND need to be directed to a broad spectrum of health care facilities in Sweden, and not only neurology and psychiatry. This is not a study of incidence or prevalence of FND in Sweden, but merely a report of cases with any of the primary diagnoses F44.0-9 to the NPR. Further studies to describe the consumption of care for FND patients in Sweden are needed, and the NPR can be a useful source.

References:

Forsberg L, R. H., Jacobsson A, Nyqvist K, Heurgren M (2009). Kvalitet och innehåll i patientregistret. Utskrivningar från slutenvård 1964-2006 och besök i öppenvård (exklusive primärvårdsbesök) 1997-2006 (Quality and content of the Patient Register). Stockholm, Socialstyrelsen/Swedish Welfare board.

STUDY PROTOCOL: INTENSIVE SHORT-TERM DYNAMIC PSYCHOTHERAPY (ISTDP) FOR PATIENTS WITH FUNCTIONAL NEUROLOGICAL DISORDERS (FND) WITHIN A CONSULT-LIAISON PSYCHIATRIC UNIT IN STOCKHOLM, SWEDEN

Malin Ljungdahl (Psychiatry Southwest, Sweden, malin.ljungdahl@regionstockholm.se*), Marie Bendix, Myrto Sklivanioti, Niklas Lanbeck, Ivan Bernholm*

Objectives: To investigate whether ISTDP can reduce physical symptoms and health care costs and improve mental wellbeing in patients with FND and to investigate how patients experience the treatment.

Background: FND is a common condition that can lead to great suffering, significant disability, and high health care costs. Not all patients respond to psychoeducation, supportive contact or CBT. ISTDP can be helpful for this cohort, but evidence is still weak.

Methods: The study protocol was intensive short-term dynamic psychotherapy (ISTDP) for patients with functional neurological disorders (FND) within a consult-liaison psychiatric unit in Stockholm, Sweden. Patients with FND who have not been helped by at least a step one intervention [Figure 1] were recruited. After assessment and inclusion, the patient is followed with weekly self-ratings of symptom intensity and interference (numeric rating scale (NRS) Rief et al, 2017) until a stable baseline has been established. Therapy consists of weekly sessions for approximately 20-40 weeks with an ISTDP therapist. Follow-up is performed every three months during treatment, at the end of treatment and at six and 12 months. The primary outcome measure is change in NRS. Data will be analyzed in a single-case design with multiple baselines. Health economic data will be collected from registries. To investigate patient experience an interview was held.

Results: At Karolinska University Hospital Huddinge patients with FND are routinely assessed by a multidisciplinary team and offered step 1 or 2 interventions [Figure 1] by physiotherapists, occupational therapists and/or psychiatrists. As not all patients recover, more advanced treatment is needed. Short-term psychodynamic therapy has shown equal or better outcome compared to care as usual that persist over time in functional somatic conditions (Abbass et al, 2020). Currently, four patients have been recruited (out of the estimated 25 patients) and based on preliminary data, many patients with more complex FND seem to accept ISTDP.

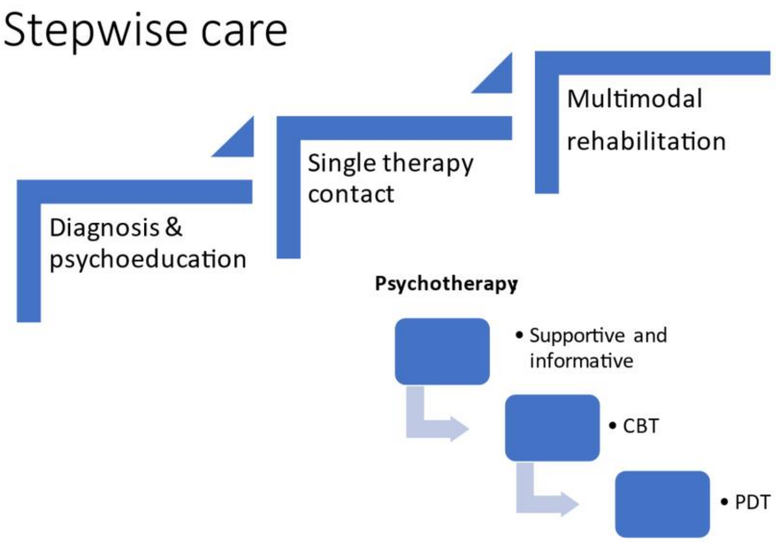


Figure 1. Stepwise Care

Conclusion: The psychodynamic model of FND used by ISTDP understands the functional symptoms as either an expression of a high unconscious level of anxiety in the body or as a defense (in the form of bodily symptoms) against a psychological conflict or unprocessed emotions and anxiety. [Figure 2] During treatment with ISTDP, the patient learns to notice different defenses and learns different strategies to regulate anxiety, which usually lead to gradually increasing contact with emotional experiences. Thus, patients gain an experiential understanding of functional connections between emotions, anxiety and defense. [Figure 3] ISTDP is a promising treatment option for patients with FND that do not respond to care as usual.

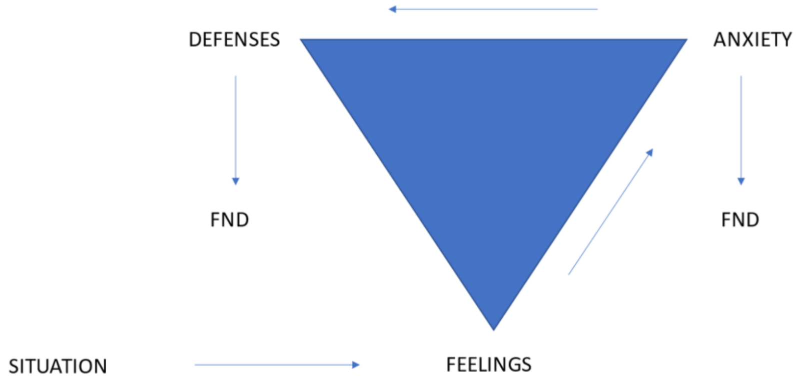


Figure 2.

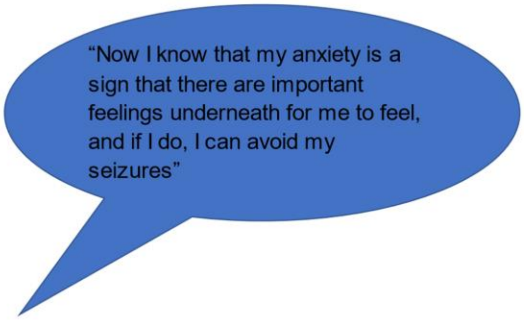


Figure 3.

References:

Abbass, A., Town, J., Holmes, H., Luyten, P., Cooper, A., Russell, L-, Lumley, M., A., Schubiner, H., Allison, J., Bernier, D., De Meulemeester, C., Kroenke, K. &Kisley, S., (2020) Short-Term Psychodynamic

Psychotherapy for Functional Somatic Disorders: A Meta-Analysis of Randomized Controlled Trials. Psychotherapy and Psychosomatics, DOI: 10.1159/000507738

Rief, Winfried PhD; Burton, Chris MD; Frostholm, Lisbeth PhD; Henningsen, Peter MD; Kleinstäuber, Maria PhD; Kop, Willem J. PhD; Löwe, Bernd MD; Martin, Alexandra PhD; Malt, Ulrik MD; Rosmalen, Judith PhD; Schröder, Andreas MD, PhD; Shedden-Mora, Meike PhD; Toussaint, Anne PhD; van der Feltz-Cornelis, Christina MD, PhD; on behalf of the EURONET-SOMA Group Core Outcome Domains for Clinical Trials on Somatic Symptom Disorder, Bodily Distress Disorder, and Functional Somatic Syndromes: European Network on Somatic Symptom Disorders Recommendations, Psychosomatic Medicine: 11/12 2017 - Volume 79 - Issue 9 - p 1008-1015 doi: 10.1097/PSY.0000000000000502

A ONE-SESSION, BRIEF ACCEPTANCE AND COMMITMENT THERAPY WORKSHOP FOR CHRONIC PAIN PATIENTS: A ONE-SAMPLE PRETEST-POSTTEST PROSPECTIVE EXPLORATORY STUDY

Kelly Nye (University of Rochester Medical Center, kelly_nye@urmc.rochester.edu*), Richard Gross, Lisa Platt, Jeffery Daniels, Edward Baker*

Objective: To develop and test a brief one-session ACT workshop to improve rural chronic pain patients' pain acceptance and pain catastrophizing.

Background: Approximately 50 million Americans suffer from chronic pain. Acceptance and commitment therapy (ACT) for chronic pain is a novel treatment approach that focuses on variables such as acceptance, mindfulness, and commitment to future behavior change. Additionally, literature on one-session workshops for chronic pain patients is sparse.

Methods: In this one-sample, pretest-posttest prospective exploratory study, nineteen participants with chronic pain were recruited over a six-month timespan. All participants completed pre- and four-week post-workshop questionnaires after participating in a one-hour ACT session. This study explored differences in (1) pain acceptance, (2) activity engagement, (3) pain willingness, and (4) pain catastrophizing. A series of paired-samples t-tests were conducted to analyze the hypotheses of this study.

Results: Those who attended the workshop reported improvement in pain acceptance and pain willingness. There were no significant results for pain catastrophizing and activity engagement. Most of the participants who attended the ACT workshop and completed the follow-up questionnaires reported satisfaction with the group and would refer their family and friends to a similar workshop.
Conclusion: The results of this study have promise in providing health professionals and chronic pain patients with an efficient, non-pharmacological treatment for chronic pain.

Conclusion: The results of this study have promise in providing health professionals and chronic pain patients with an efficient, non-pharmacological treatment for chronic pain.

THE BODY KNOWS THE WAY

Deborah Mason (North Bristol NHS Trust, UK, deborah.mason@nbt.nhs.uk*)*

Objective: To present three cases that illustrate how exploring the client's somatic experience was used in the successful treatment of chronic FND. To explain the concept of Positive Intention (the function of a symptom) which has been useful in treatment. One client explains the Positive Intention of her FND.

Background: A Biopsychosocial framework is often used to understand FND. Symptomatic treatment is often advocated but Baker (2017) asserts:
"...for true resolution predisposing, precipitating and perpetuating psycho-emotional or psycho-social issues will need to be... addressed".

Method: Clinician hypothesis:
- Assumption of Positive Intention: what if the symptom is serving a purpose, trying to do something important, even critical for the patient?
-Clinician's belief that the patient's somatic presentation and unconscious mind hold vital information.
Patients were guided to access this information using principles from Mindfulness and Hypnotherapy:
- Work on breathing / tension levels
- Cultivation of mindfulness skills, e .g. body scan, allowing and welcoming of sensation and emotion, self-compassion
- Accessing of calm states - activating the Parasympathetic nervous system
- Somatic experiencing of symptom (both kinaesthetics and imagery)
- Parts exploration - dialoguing with the unconscious mind to explore what is needed
- Belief change, e.g. from "control freak" to "acceptance of limitations".

Results: As well as significant improvements to symptoms, clients demonstrated considerable psychological and behavioural changes and left therapy with the tools to prevent relapse.
- Two clients who had been unable to work returned to work
- One avoided costly inpatient neuropsychiatric assessment
- Symptomatic therapy was unhelpful for two clients and not undertaken for the third as symptoms morphed from week to week
- The holistic approach meant that all FND symptoms improved for two clients (rather than a sole symptom improving in isolation). All clients understood the Positive Intention of their symptoms and one client said of FND "I want it on my terms, helps me see stuff I don't see". "FND is all about me ... I am valid, worthy". She described it as breaking her tendency to prioritize the needs of others.

Conclusions: These clients have been able to access somatic and information from the unconscious mind which has led to an understanding of what they need to change.
Positive Intention has been a useful concept with these and other clients with chronic FND. It is an idea that resonates with clinicians when I have presented it.
Consideration of Positive Intention fosters willingness to listen to what is needed, chiming with O'Sullivan's (2015) assertion "sometimes you just have to find out what purpose the illness serves".
Given the heterogeneity of FND patients, it is likely this approach is most suited to those patients with what would have been labelled a psychogenic component to their FND.
"When medicine is not curious about the inner system and its burdens, would-be healers run the risk of missing the message because they are trying to kill the messenger" (Schwartz, 2020).

References:

Baker J (2017) Psychosocial Perspectives on the Management of Voice Disorders. Braunton: Compton Publishing Ltd.

O'Sullivan (2015) It's All in your Head. London: Chatto and Windus.

RHYTHMIC AUDITORY STIMULATION FOR FUNCTIONAL GAIT DISORDER

Ginger Polich (Spaulding Rehabilitation Hospital / Brigham and Women's Hospital, ginger.polich@mgh.harvard.edu*), Andrea Christoforou, Caitlin Hebb, Diana Cortes*

Objective: To evaluate Rhythmic Auditory Stimulation (RAS), a standardized form of neurologic music therapy (NMT), in the treatment of chronic functional gait disorder (FGD) persisting despite prior treatment with physical therapy (PT).

Background: RAS has been shown to facilitate intrinsically rhythmic movements such as walking in a variety of organic neurologic conditions, including stroke, traumatic brain injury, and Parkinson's disease

Methods: In this case series, patients with FGD underwent an eight-session RAS intervention [Table 1] co-administered by a NMT and PT team approximately twice weekly for four weeks. External rhythmic cuing was provided through use of a metronome, or metronome enhanced pre-recorded or live music. Pre- and post-functional assessments included the 10-meter walk test (10MWT, comfortable and fast), six-minute walk test (6MWT), and Timed Up and Go (TUG). Improvements were also qualitatively rated by the participants and clinicians on the Patient Global Impression of Change (PGIC) scale and Clinical Global Impressions - Improvement Scale (CGI-I), respectively.

Table 1. Standardized Rhythmic Auditory Stimulation (RAS) Protocol (Thaut and Rice 2014)

Step 1: Assess baseline gait
Step 2: Match baseline cadence with rhythmic stimulus to achieve resonant frequency entrainment
Step 3: Modulate rhythmic frequency by 5-10% increments and monitor for normalization of gait parameters
Step 4: Simulate real-world ambulation conditions (starting, stopping, weaving around objects) for advanced gait exercises
Step 5: Gauge carryover of intervention by fading rhythmic stimuli

Results: Three adult females with chronic FGD (>1 year) participated. [Table 2] Functional gait features included dystonic, antalgic and bradykinetic phenotypes (Nonnekes et al. 2020). In general, participants' cadence and time spent walking progressed with RAS within and between sessions, with participants consistently walking at higher levels of intensity over time (>60-80% heart rate max). On the whole, improvements in gait measurements met threshold values for minimal clinically important change as reported for other neurologic populations. [Figure1] On the PGIC, participants rated improvements as minimally (n=2) and very much (n=1) improved, while on the CGI-I, they were rated as minimally (n=1), much (n=1) and very much (n=1) improved.

Table 2. Participant Demographics and Clinical History (Abbreviations: FND, functional neurological disorder. *based on Nonnekes et al., 2020 phenotyping of clinical functional gait signs.)

	Participant 1	**Participant 2**	**Participant 3**

Age / Sex	53 / Female	40 / Female	31 / Female
Race	Caucasian	Caucasian	Caucasian
Employment status	Employed	Unemployed	Employed
Relevant medical history	Parkinson's disease, lumbar stenosis L5-S1 decompression and fusion, hip pain	Plantar Fasciitis, hip pain	Cobalamin deficiency
Mental health history	Denies	Anxiety	Anxiety
Functional gait signs (primary in bold)*	**Dystonia**, weakness	**Antalgic**, weakness	**Bradykinesia,** ataxia
Symptom duration	>3 years	1-3 years	1-3 years
FND precipitant	None	Physical injury	Medical illness
Trigger	Fatigue, hip pain, fear of hip pain, situational stress	Stress, fatigue, pain, social anxiety	Fatigue, fear of falling

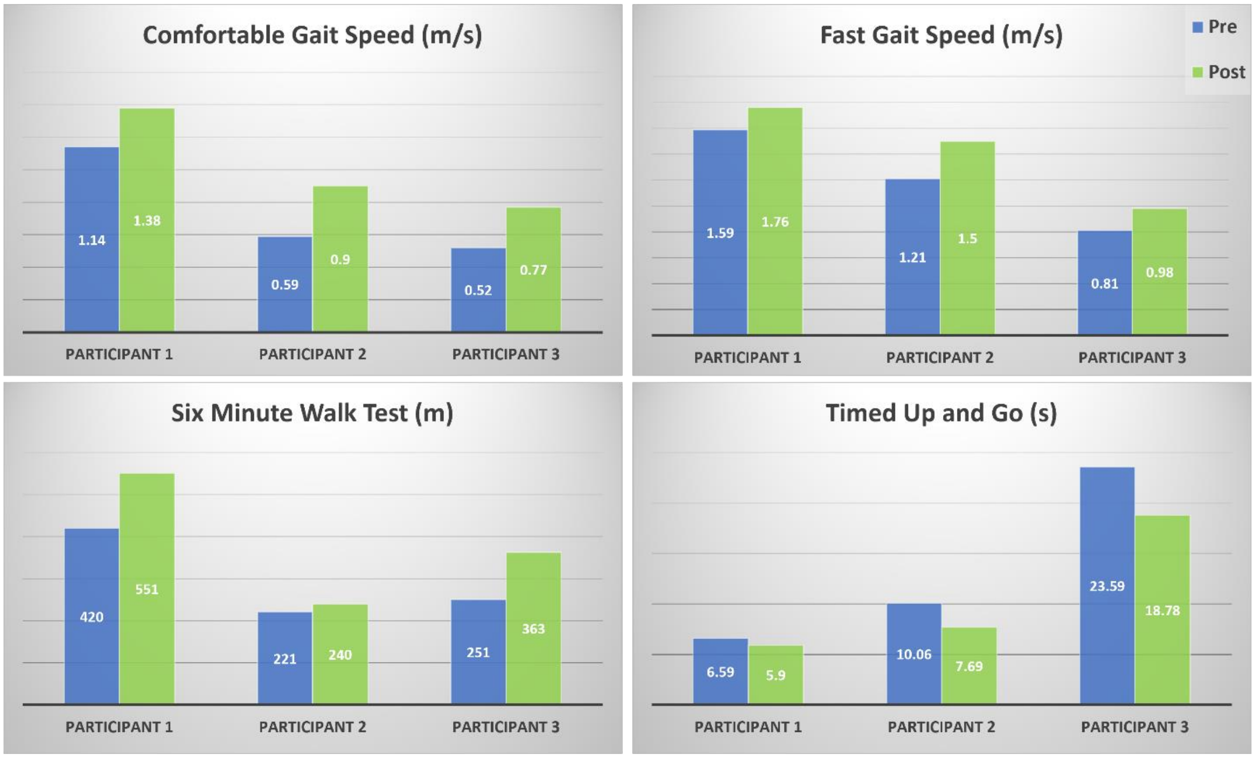


Figure 1. RAS Outcome Assessment (pre versus post) (Abbreviations: RAS, Rhythmic Auditory Stimulation; m, meters; s, seconds.)

Conclusions: A relatively brief RAS intervention facilitated improved walking capacity and functional mobility in three subjects whose FGDs persisted despite PT. The active ingredients in this intervention remain unclear. Benefits may have derived from NMT-specific mechanisms of entrainment and frequency modulation, acoustic biofeedback, or socioemotional changes evoked by music. Alternatively, RAS may have functioned as an elaborated distraction intervention and/or auditory cue eliciting high intensity step training. In the future, kinematic data may help elucidate the extent of compensation versus recovery in these improved gait outcomes. Further research into the effectiveness of RAS for FGD and its underlying mechanisms is warranted.

References:

Nonnekes, Jorik, Evžen Růžička, Tereza Serranová, Stephen G. Reich, Bastiaan R. Bloem, and Mark Hallett. 2020. “Functional Gait Disorders: A Sign-Based Approach.” Neurology 94(24):1093–99.

Thaut, C.P. & Rice, R. (2014). Rhythmic auditory stimulation (RAS). In M. Thaut & V. Hoemberg (Eds.), Handbook of neurologic music therapy (pp. 94-105). Oxford.

USE OF NEUROPHYSIOLOGICAL EVALUATIONS FOR THE DIAGNOSIS OF FUNCTIONAL MOVEMENT DISORDERS

Talyta Cortez Grippe (University of Health Network, Talyta.CortezGrippe@uhnresearch.ca*), Robert Chen*

Objective: To retrospectively evaluate the use of neurophysiological study to diagnose functional movement disorder (FMD) by comparing the agreement between the suspected and the final diagnoses in patients from a specialized movement disorders center.

Background: The neurophysiological methods used as an aid in the diagnosis of FMD include EMG, EEG, and accelerometer recordings. The protocols are well defined for studies of tremor and myoclonus but can also be applied to other movements.

Methods: Studies performed from 2003 to 11/2021 were reviewed. Patients with suspected diagnosis that included FMD were classified according to predominant phenomenology as dystonia, jerky movement, tremor, stiff person syndrome, orthostatic tremor, and undefined FMD. Patients with final diagnosis that included FMD were categorized as functional when only FMD was present, functional overlay when another movement disorder has been diagnosed, or functional and organic when features of both movements were present. The final diagnosis of FMD agreed with the initial diagnosis if FMD was included in the initial diagnosis. The agreement was divided into complete (only FMD), partial (FMD + organic), or absent (only organic).

Results: Suspected FMD was the reason referral in 170 patients (mean age of 54, 54% women). The main clinical phenomena were jerky movement (80, 47%), tremors (69, 41%), others (12, 7%) and undefined (8, 5%). The agreement with the suspected and final diagnosis was 72%. In 14%, there was an organic cause, six percent had organic and functional features, and eight percent were inconclusive. The final diagnosis was FMD in 192 patients (mean age 52, 53% women). FMD was the only diagnosis in 168 (88%) patients, six (3%) had a functional overlay with a previously known movement disorder and 18 (nine percent) had a combination of functional and organic movements. Finally, 57 (30%) of the 192 patients with FMD diagnosis did not agree with the initial suspected diagnosis.

Conclusions: The neurophysiological evaluation was mostly frequently requested for evaluation of jerky movements which included atypical jerky tremor, myoclonus, and tic disorders. While suspected diagnosis of FMD agreed with the final diagnosis in most cases, the 13% disagreement is significant and shows that electrophysiological studies can change the presumed diagnosis, and therefore the prognosis and therapeutic approach. Moreover, in 30% of studies with FMD as the diagnosis, FMD was not the suspected diagnosis, which highlights the importance of neurophysiological evaluation in cases with challenging clinical phenomenology. Therefore, neurophysiological evaluation plays an important role in the diagnosis of FMD.

References:

Espay AJ, Aybek S, Carson A, Edwards MJ, Goldstein LH, Hallett M, LaFaver K, LaFrance WC Jr, Lang AE, Nicholson T, Nielsen G, Reuber M, Voon V, Stone J, Morgante F. Current Concepts in Diagnosis and Treatment of Functional Neurological Disorders. JAMA Neurol. 2018 Sep 1;75(9):1132-1141.

Thenganatt MA, Jankovic J. Psychogenic (Functional) Movement Disorders. Continuum (Minneap Minn). 2019 Aug;25(4):1121-1140.

COGNITIVE BEHAVIORAL THERAPY FOR PATIENTS WITH FUNCTIONAL NEUROLOGICAL DISORDERS AND INSOMNIA: A CASE STUDY APPROACH TO TREATMENT

Dodie Gillett (Stony Brook Medicine, dodie.gillett@stonybrookmedicine.edu*), Jenna Palladino*

Background: Patients with FND are often referred for CBT to manage unhelpful thoughts and behaviors that maintain functional symptoms. Despite CBT-I as an empirically validated form of treatment for insomnia, limited research is available on the use of CBT-I for patients with co-morbid FND and insomnia.

Methods: Case reports for two patients with FND, evaluated through the Department of Neurology and referred for CBT with a clinical psychologist (CBT-I certified) in the Department of Psychiatry and Behavioral Health at Stony Brook Medicine are detailed. Both patients indicated sleep problems associated with functional movements and received a course of CBT and CBT-I. Treatment notes and therapist reflections were utilized to highlight treatment strategies. Sleep logs and sleep efficiency scores were gathered throughout treatment. Insomnia Severity Index, PHQ-9 and GAD-7 scores were collected at intake and termination to assess insomnia, depressive, and anxious symptoms pre and post treatment. All sessions for Patient A were conducted using an in person psychotherapy model. Patient B's sessions were all conducted via Telehealth.

Results: Both Patient A (received 35 weekly sessions) and Patient B (22 weekly sessions) engaged in CBT/CBT-I strategies. Insomnia Severity Index scores for both patients show improvement in sleep over the course of treatment. Sleep efficiency scores increased for both patients demonstrating improved quality and quantity of sleep. Verbal reports of improved mood and functioning supported use of altering sleep thoughts and behaviors as well as challenging negative cognitions in relation to functional movements. Patient A demonstrated a reduction in unhelpful sleep thoughts associated with functional movements as well as a reduction in anxious and depressive symptoms as indicated by GAD-7 and PHQ-9 scores. Patient B entered treatment with lower PHQ-9 and GAD-7 scores; however, also demonstrated a reduction in anxious and depressive symptoms in addition to unhelpful sleep thoughts.

Conclusions: Results of these case studies suggest that sleep problems associated with functional movements can be improved using CBT and CBT-I strategies. Clinical narratives gathered from both patients and reduction in sleep inventory scores support the use of CBT-I for patients with FND. Both patients received psychiatric medications during the course of treatment, which likely also contributed to the reduction in symptoms. Information herein suggests evaluation sleep issues for patients with FND is warranted. Clinical data detailed in these case reports provides an important contribution for further exploration of CBT/CBT-I strategies for patients with FND.

References:

Lin, A., & Espay, A. J. (2021). Remote delivery of cognitive behavioral therapy to patients with functional neurological disorders: Promise and challenges. Epilepsy & Behavior Reports, 16, 100469.
Loveless, J. P., Russo, J. M., & Andersen, V. C. (2020). The successful treatment of insomnia in a patient with a complex neurological history. Clinical Case Studies, 19(2), 101-114.

PSYCHOGENIC NON-EPILEPTIC SEIZURES: A TRANSATLANTIC COMPARISON OF PATIENT POPULATIONS AND PRESCRIBING PRACTICES IN SOUTHAMPTON, ENGLAND AND KINGSTON, CANADA.

Elvina Chu (Queen's University, e.chu@queensu.ca*), David Carlone, Amanda Richer, Katherine Dichard-Head, Anne-Mary Abe*

Background: This study compared two patient populations with PNES or non-epileptic attacks (NEAs) in England and Canada, exploring similarities in patient demographics and differences in treatment approaches. (ch=196)

Methods: Appropriate study approval was sought locally. Due to similar population demographics, both Southampton and Kingston sites were deemed to be comparable. Medical records were searched to identify patients presenting to their tertiary hospital due to any seizure episode within a consecutive 12-month period. In patients where a diagnosis of PNES/ NEA was recorded, a retrospective chart review was conducted, with collection of demographic and clinical data including comorbid psychiatric and epilepsy diagnoses. Different treatment approaches were compared, including psychotherapy, types of medications and prescribing rates of antiepileptic drugs (AEDs) between both sites. (ch=673)

Results: There were 162 subjects from Southampton, 79.6% female, average age 35(+/-15)yrs and 34 subjects from Kingston, 79.4% female, average age 32.5 (+/-15)yrs. Groups were similar for age (p=0.61) and sex (p=0.98). At both sites approximately 35% had comorbid PNES and epilepsy. Between 1 and 4 AEDs were being prescribed to 42% of patients. There was no difference in number of AEDs prescribed at either site (p=0.76). Those with PNES and epilepsy were more likely to have AEDs prescribed than those with PNES alone. Treatment approaches were significantly different between sites (p<0.0001) with 47.5% of Southampton patients not on any treatment at the point of data collection and 52.9% of Kingston patients prescribed psychotropics +/- AEDs. (ch=738)

Conclusions: PNES populations are predominantly composed of younger females in both Southampton and Kingston. The much smaller Kingston sample size may suggest a lower rate of PNES/ NEA identification. A similar rate of AEDs were being prescribed at both sites, this suggests some PNES patients are prescribed medication that is not clinically indicated, which may even result in iatrogenic harm. Most Southampton patients were neither on medication or psychotherapy, suggesting either a lack of treatment acceptance or a difference in treatment approaches in comparison to Kingston patients. Our study provides a better understanding of patient demographics and clinical treatments currently offered to PNES patients in two different healthcare settings. (ch=743)

References:

Goldstein, Laura H., et al. "Cognitive behavioural therapy for adults with dissociative seizures (CODES): a pragmatic, multicentre, randomised controlled trial." The Lancet Psychiatry 7.6 (2020): 491-505.

Asadi-Pooya, Ali A., and Michael R. Sperling. "Epidemiology of psychogenic nonepileptic seizures." Epilepsy & Behavior 46 (2015): 60-65.

MYOCLONUS AND FUNCTIONAL TREMOR OVERLAY: ELECTROPHYSIOLOGICAL DIAGNOSIS

Talyta Cortez Grippe (University of Health Network, Talyta.CortezGrippe@uhnresearch.ca*), Susan Fox, Robert Chen*

Objective: To illustrate a case with subcortical myoclonus associated with functional tremor diagnosed with the support of electrophysiological study and highlight the importance of discriminating both etiologies for prognosis and treatment.

Background: Up to 27% of the functional movement disorders (FMD) had a coexistent organic neurological disease.[1] If the organic disease is also a movement disorder, it is challenging to distinguish them. The electrophysiology has a key role in these cases.

Methods: Review of the patient's medical records and recording of electrophysiological tests. Surface EMG with eight independent channels and one triaxial accelerometer were used to characterize the movements while at rest, standing, walking in place and performing different fine motor tasks and distracting maneuvers in the upper limbs. Electrical stimulation of the index finger using the intensity of three times the sensory threshold was used to evaluate trigger by sensory stimulation. The unexpected sound of clapping while the patient had eyes closed was used to evaluate sound sensitivity.

Results: A 49-year-old woman reported a "jelly" sensation in her legs for 20 years. There was slow progression of her symptom with mild interference in her balance and gait. Alcohol intake slightly improved the symptoms. In 2009, she developed a symmetric hand tremor. She was diagnosed with orthostatic tremor in another clinic and was started on clonazepam. She had a remarkable initial benefit, but side effects prevented dose increase. The electrophysiological test revealed probable subcortical myoclonus in upper and lower extremities (< 50 ms EMG burst duration, no stimulus sensitivity with electrical/noise stimuli) [Figure 1], together with a distractible tremor in her arms which fulfills the criteria for functional tremor. [2] [Figure 2]

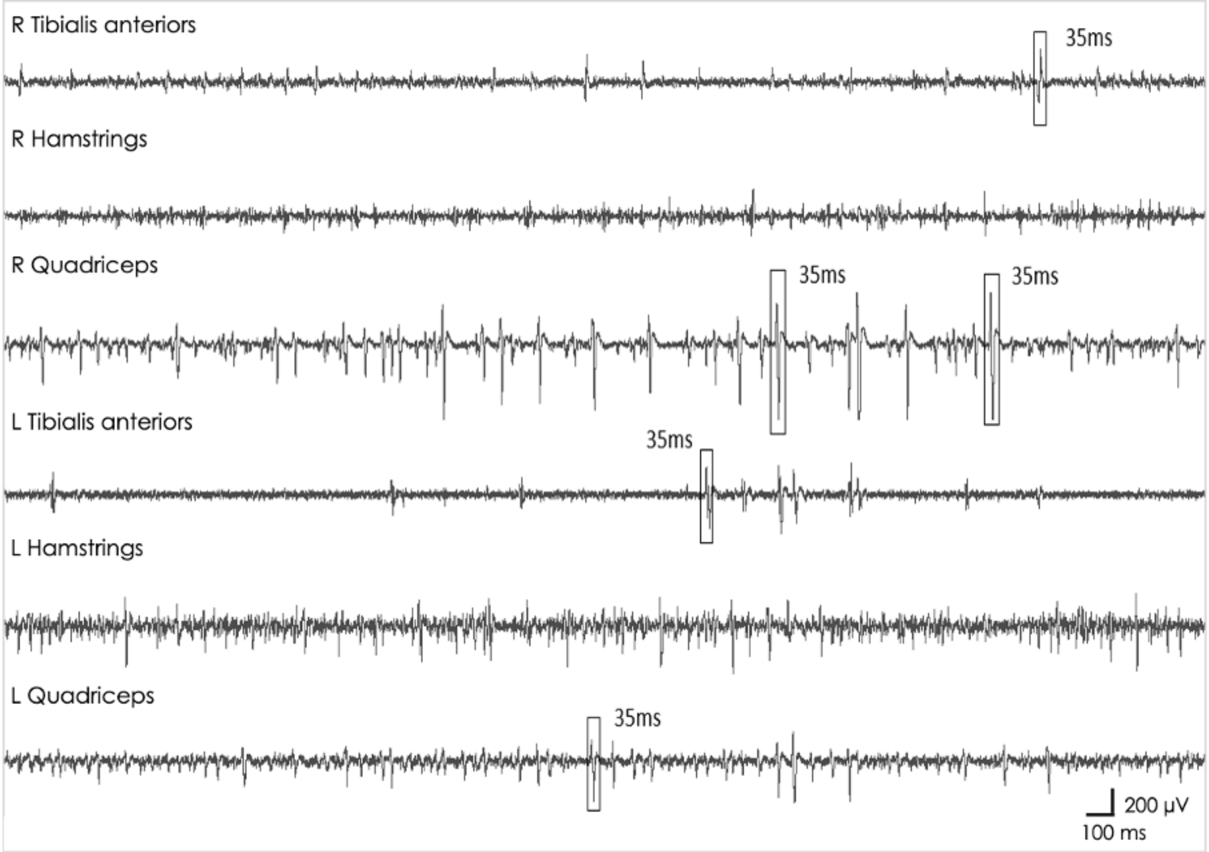


Figure 1.

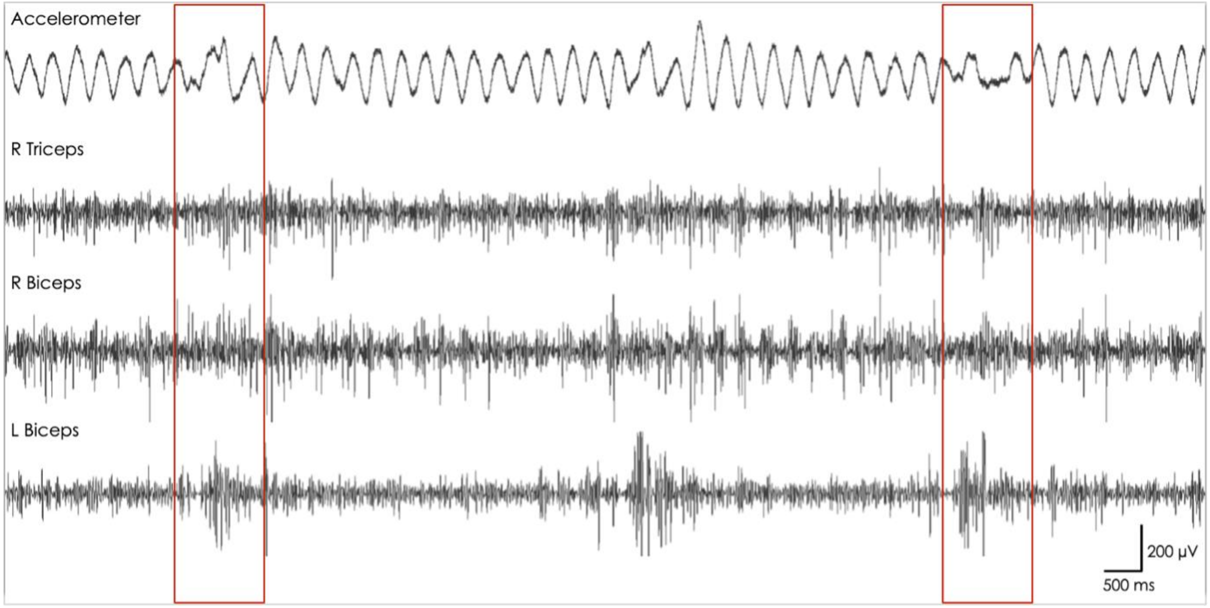


Figure 2.

Conclusions: FMD can begin before or after the onset of an organic neurological disease, with functional tremor being the most common associated FMD[1]. It is important to highlight the possibility of co-existing FMD and organic neurological disorder, since the diagnosis of FMD can lead to the wrong assumption that other disease manifestations are also functional and leading to inadequate investigation and treatment for both conditions. The pathophysiology of functional overlay is still obscure, but network abnormalities together with abnormal overweighting of prior expectancies of symptoms may distort sensory perception and contribute to development of comorbid-FMD[1]. Electrophysiological study can be useful in the evaluation of this group of patients.

References:

1. Tinazzi M, Geroin C, Erro R et al. Functional motor disorders associated with other neurological diseases: Beyond the boundaries of "organic" neurology. Eur J Neurol. 2021 May;28(5):1752-1758.

2. Schwingenschuh P, Saifee TA, Katschnig-Winter P et al. Validation of "laboratory-supported" criteria for functional (psychogenic) tremor. Mov Disord. 2016 Apr;31(4):555-62.

HOW ARE PATIENTS WITH FUNCTIONAL NEUROLOGICAL DISORDER MANAGED IN AUSTRALIAN HOSPITALS? AN OBSERVATIONAL MULTI-SITE STUDY

Dharsha Petrie (Queensland Health, dharshas_email_account@hotmail.com*), Alexander Lehn, Amy Hughes, Elise Gane*

Objective: To observe clinical management of patients with FND during hospital admission, specifically communication of diagnosis, accessibility to a multidisciplinary team, and health service utilization e.g. length of stay (LOS), ED presentations.

Background: FND is commonly misdiagnosed resulting in poor outcomes based on inappropriate treatments. Successful management requires multidisciplinary involvement providing a definitive diagnosis. There is no Australian inpatient data published to date.

Methods: A prospective observational study conducted over six public hospitals in Australia. Participants were sourced across inpatient wards over a 4-month period during the Covid-19 pandemic.

Through usual ward practices, ward Physiotherapists identified whether a patient was managed as having FND, as determined by the treating medical officer. This information was shared to a local Physiotherapy Representative for this study who completed a chart review using a data collection tool to record extracted data.

Data collected included patient demographics, alternative diagnostic synonyms, communication of the diagnosis of FND, access to the multidisciplinary team in hospital, hospital LOS and ED presentations ≤ 28 days of hospital.

Results: A total of 131 patients (mean age 45 (SD 18) y, n=96 female (73%)) were included. Median LOS 15 (IQR 3-14) days. Forty three (30%) presented to ED with 11 (7%) presenting two or more times after hospital discharge. Total inpatient cost was AUD$4.9million.

Inpatient referrals were made to Neurology (95, 65%), Psychology (33, 23%), Psychiatry (38, 27%), and Physiotherapy (120, 85%). 45 (51%) were managed as having FND but not told of the diagnosis. 26 (18%) did not have their diagnosis of FND documented in their medical record. A new diagnosis of FND was given to 87 (62%) patients. Of those not reviewed by Neurology, 17 (85%) did not receive a diagnosis and 9 (45%) did not have it documented. The term "functional" was documented for 119 (85%) patients.

Conclusions: This study has highlighting current gaps in service provision to people with FND during inpatient hospital admissions in Australia. This includes low rates of communication of a diagnosis of FND, limited and variable access to inpatient multidisciplinary teams, and limited referral to community services to support patients after hospital discharge. Study limitations include inability to capture all interventions including medical imaging, and data collection challenges through the Covid-19 pandemic. Consequently, health utilization costs are likely to be much higher.

It is recommend targeted pathways to improve education, communication, and health outcomes whilst reducing stigma and healthcare system costs for people with FND be created.

References:

Lehn A, Gelauff J, Hoeritzauer I, Ludwig L, McWhirter L, Williams S,et al. Functional neurological disorders: mechanisms and treatment. J Neurol 2016; 263(3): 611-620. https://doi:10.1007/s00415-015-7893-2

Espay, Aybek, S., Carson, A., Edwards, M. J., Goldstein, L. H., Hallett, M., LaFaver, K., LaFrance, W. C., Lang, A. E., Nicholson, T., Nielsen, G., Reuber, M., Voon, V., Stone, J., & Morgante, F. (2018). Current Concepts in Diagnosis and Treatment of Functional Neurological Disorders. JAMA Neurology, 75(9), 1132–1141. https://doi.org/10.1001/jamaneurol.2018.1264

THE MULTIVARIATE RELATIONSHIP OF EMOTIONAL TRAUMA AND THE CORTISOL AWAKENING RESPONSE IN FUNCTIONAL NEUROLOGICAL DISORDERS

Samantha Weber (Bern University Hospital, samantha.weber@students.unibe.ch*), Janine Bühler, Giorgio Vanini, Serafeim Loukas, Rupert Bruckmaier, Selma Aybek*

Objectives: To shed light on the underlying neurobiological mechanisms of functional neurological disorders (FND), and to analyze the relationship between emotional trauma and a potential dysregulation of the Hypothalamic-Pituitary-Adrenal (HPA) axis.

Background: FND patients experience neurological symptoms in the absence of a classical neurological disease. Early life psychological stress is a well-known risk factor. However, only little is known about stress regulation in FND patients.

Methods: Trauma subtype, relationship to the perpetrator, and duration of traumatic life events, as well as childhood trauma, were compared in 86 FND patients and 75 age-and gender-matched healthy controls. In parallel, potential alterations in the HPA axis in a broad range of cortisol indices, including the dynamic cortisol awakening response (CAR), as well as post-awakening cortisol concentration (PACC, AUCG), and diurnal cortisol secretion (DCS, AUCG) were examined. Salivary cortisol was collected nine times throughout one day. To evaluate the relevance of experienced trauma on the cortisol measures (CAR, PACC, and DCS), a partial least squares correlation including trauma subtypes, chronicity, and the relationship to the perpetrator was conducted.

Results: Overall, FND patients reported more emotional neglect ($p < 0.001$) lasting in average 4.5 years longer ($p < 0.01$) as compared to healthy controls. Moreover, FND patients had a significantly flatter CAR ($p < 0.001$), and lower AUCG measures (i.e., PACC, DCS) as compared to healthy controls ($p < 0.008$). A history of childhood emotional neglect in FND appears to lower the CAR even more. [$p = 0.03$, Figure 1] Using a partial least squares correlation, we found that particularly in FND patients, trauma subtype (i.e., emotional trauma), as well as the chronicity (i.e., prolonged exposure) and relationship to the perpetrator, might play an important role in the multivariate pattern between emotional trauma history and HPA axis dysfunction. [Figure 1]

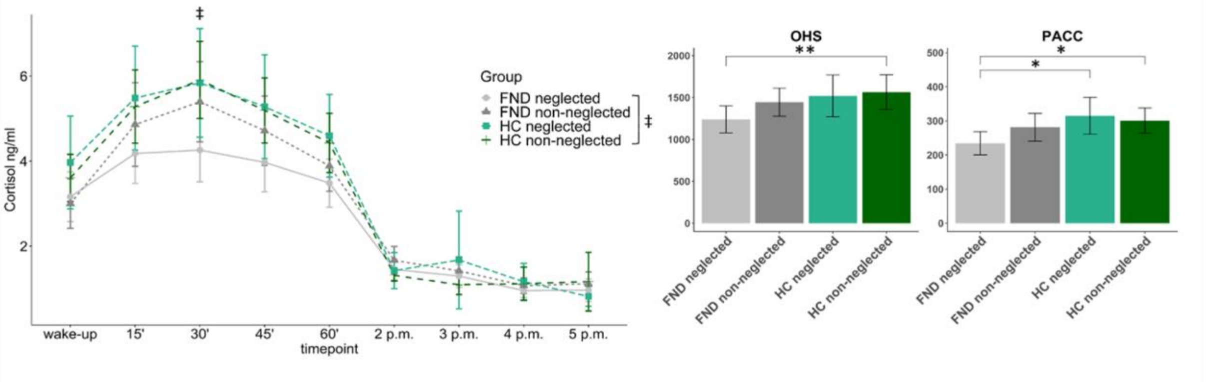


Figure 1. Cortisol Profile of FND patients and healthy controls stratified into emotionally neglected and non-neglected. Overall hormonal secretion (OHS) and post-awakening cortisol concentration (PACC) represent AUC_G measures across the whole day (OHS) and the morning (PACC), respectively. Significance codes: *** < 0.001, ** < 0.01, * < 0.05.

Conclusions: This study supports a stress-diathesis model of FND highlighting the role of emotional trauma. Considering an HPA-axis sensitization or “maladaptive habituation” to stressful life events might contribute to a better understanding of the pathophysiological mechanisms of FND. Therefore, the dampened CAR might suggest a long-term process. As such, the development of FND might be attributed to predisposing factors such as trauma type and duration. However, a causal relationship between trauma subtype, HPA axis dysfunction, and corresponding functional changes in the brain as a function of stress maladaptation remains to be discovered.

TRANSCRANIAL MAGNETIC STIMULATION (TMS) AND SENSE OF AGENCY (SOA) IN FUNCTIONAL NEUROLOGICAL DISORDER (FND); PRELIMINARY DATA

Janine Bühler (Bern University Hospital, janine.buehler@extern.insel.ch*), Samantha Weber, Serafeim Loukas, Sebastian Walther, Selma Aybek*

Objective: To investigate the effect of transcranial magnetic stimulation (TMS) over the right temporoparietal junction (rTPJ) on the sense of agency (SOA) in patients with functional neurological disorder (FND) compared to healthy controls.

Background: In FND, a disrupted SOA is assumed to be involved in sensorimotor symptom development.[1] The rTPJ, a key node of the agency network, has been shown to be a suitable target for neuromodulation of the SOA[2].

Methods: In a randomized, cross-over, single-blinded trial with active control condition, 23 FND patients and 19 healthy controls were included. In three sessions, every participant underwent excitatory, inhibitory or sham TMS over the rTPJ (MNI [62 -34 30]). Before and after stimulation, participants played a game targeting the SOA during functional magnetic resonance imaging. The game consisted of two phases: one with normal SoA (baseline) and one with artificially decreased SoA (turbulence). Reduction of SoA was implemented by adding random turbulence to the cursor in 25% of the button clicks. A subjective judgment regarding the performance and the perceived control was assessed after each game trial.

Results: Preliminary results of whole brain analysis revealed significantly different brain activity in FND patients compared to controls during game phases with decreased SoA (turbulence) versus baseline, involving regions associated with the agency network ($F(2,40)= 19.94$, FWE-corrected, $p < 0.05$; rTPJ, $p > 0.001$ [62 -36 28]; right inferior frontal gyrus, $p > 0.001$ [58 14 10]; left anterior insula, $p > 0.001$ [-40 12 -2]). In order to address anatomical inter-subject variability, a volume of interest (VOI) of 8mm surrounding the subjects' peak activation within a sphere of 15mm around the rTPJ [62 -34 30] was defined and showed a lower activation in FND patients compared to controls during turbulence compared to baseline ($t(40) = -1.87$, $p = 0.034$).

Conclusion: In line with previously published literature, FND patients seem to show aberrant processing of an induced loss of sense of agency, involving several regions associated with the agency network. The rTPJ, a well-known key region of this network, showed a reduced activation in FND patients compared to controls, indicating a disturbed identification of reduced agency. Further ongoing analyses will determine whether TMS (inhibitory or excitatory) has an effect on this hypoactivation found in patients as well as on behavioural data. Targeting this question might open new insights into potential future treatment options for FND patients using neurostimulation.

References:

1. Maurer, C. W., LaFaver, K., Ameli, R., Epstein, S. A., Hallett, M., & Horovitz, S. G. (2016). Impaired self-agency in functional movement disorders: A resting-state fMRI study. Neurology, 87(6), 564–570.

2. Zito, G. A., Anderegg, L. B., Apazoglou, K., Müri, R. M., Wiest, R., Holtforth, M. G., & Aybek, S. (2020). Transcranial magnetic stimulation over the right temporoparietal junction influences the sense of agency in healthy humans. Journal of psychiatry & neuroscience : JPN, 45(4), 271–278.

DISSOCIATION AND ITS BIOLOGICAL AND CLINICAL CORRELATES IN FUNCTIONAL NEUROLOGICAL DISORDER: A SYSTEMATIC REVIEW AND META-ANALYSIS

Malcolm Campbell (King's College London, malcolmcampbell93@hotmail.com*), Abigail Smakowski, Susannah Pick, Etzel Cardeña, Laura Goldstein, Maya Rojas Aguiluz, Simone Reinders, Tim Nicholson*

Objectives: To systematically review the current evidence describing dissociative symptoms and disorders in functional neurological disorder (FND); additionally sought to conduct a meta-analysis of dissociative symptom severity in FND.

Background: Dissociation is a potential mechanism in FND. Scientific studies report elevated rates of dissociative symptoms in FND; however, a systematic assessment of the biological and clinical correlates of dissociation in FND is lacking.

Methods: Systematically searched Embase, PsycINFO, and Medline, combining terms for FND and dissociation. Studies were eligible for inclusion if reporting on dissociative symptom scale scores or rates of dissociative disorder in FND samples. Studies were appraised for methodological quality using modified Newcastle-Ottawa criteria. Findings pertaining to dissociative symptoms and/or their biological and clinical correlates in FND samples were synthesised qualitatively. Dissociative symptom scores were included in a meta-analysis using random and mixed effects models.

Results: Seventy-nine studies were included in the final review. The meta-analysis demonstrated a significant elevation in dissociation in FND samples relative to neurological and healthy controls, but not psychiatric controls. Dissociative disorders were frequently co-morbid in FND samples. Psychoform (cognitive) dissociation was more prominent in FND-seizures, whereas somatoform (physical) dissociation tended to be more prominent in FND-motor symptom samples. Dissociation correlated with FND symptom severity and reduced quality of life. Biological correlates of elevated dissociation included structural and functional brain alterations in regions that have previously been implicated in FND, such as the anterior cingulate cortex.

Conclusions: Dissociative symptoms and disorders are common in FND, and different FND subgroups appear to endorse varying degrees of psychoform or somatoform dissociation. Presence of dissociative symptoms in FND is associated with adverse clinical features; there is therefore a clinical need to assess patients with FND for dissociative symptomatology and to address these symptoms during treatment. Future research should examine dissociation further in different FND subgroups, using measures that distinguish between different types of dissociation, alongside measures of underlying pathophysiology.

INTEROCEPTION-BASED NEURAL ACTIVITY AND ITS ASSOCIATIONS WITH INTEROCEPTIVE ACCURACY AND TRAIT PREDICTION ERROR: AN FMRI STUDY IN FUNCTIONAL NEUROLOGICAL DISORDER

Petr Sojka (Charles University in Prague, sojka5tr@gmail.com*), Martin Lamoš, Martin Bareš, David Perez, Ibai Diez*

Objective: To assess neural activity differences during interoception in patients with functional neurological disorder (FND), and to investigate activation profiles associated with interoceptive accuracy (IA) and interoceptive trait prediction error (ITPE).

Background: Interoception is a process through which the nervous system senses the internal state of the body. Interoceptive dysfunction is thought to play a role in FND, but brain mechanisms underlying interoception in FND are not yet known.

Methods: Thirty-eight adults with clinically-established FND (21 functional seizure (FND-seiz) and 17 functional movement disorder (FND-movt)) and 38 age, gender and education matched healthy controls (HCs) performed heartbeat tracking task (HTT) during fMRI. In between-group analyses, neural activity during heartbeat tracking (interoception) was compared to tone counting (exteroception) or resting conditions. For within-group fMRI analyses, IA and ITPE scores were calculated from heartbeat tracking performance and the awareness subscale of Body Perception Questionnaire. Across between-group and within-group findings, secondary analyses adjusted results for levels of depression, trait anxiety or antidepressant medication use.

Results: In FND-seiz vs HCs, increased ventral attention network (vAN) activity was observed, with the right ventrolateral prefrontal cortex significant adjusting for depression/anxiety or antidepressants. Hyperactivation was also observed in the ventromedial prefrontal cortex in the interoception>exteroception contrast, remaining significant adjusting for depression/anxiety or antidepressants. There were no robust activation clusters in FND-movt. Across the FND cohort, individual differences in IA negatively correlated with activity in posterior aspects of the vAN, the insula and the dorsomedial prefrontal cortex; ITPE correlations showed positive correlations; findings remained significant adjusting for depression/anxiety or antidepressant use.

Conclusion: This fMRI study identified increased ventral attention network activation during heartbeat tracking in patients with FND-seiz compared to controls. Across the complete FND cohort, individual differences in IA and ITPE scores correlated with activation profiles in the posterior aspects of the vAN, insula and the dorsomedial prefrontal cortex. More research is needed to contextualize the results of this study with neurobiological markers of symptom severity, phenotype and disease risk.

HYPERMOBILE SPECTRUM DISORDERS SYMPTOMS IN PATIENTS WITH FUNCTIONAL NEUROLOGICAL DISORDERS AND AUTISM SPECTRUM DISORDERS: A PRELIMINARY STUDY

Veronica Nisticò (University of Milan-Bicocca, veronica.nistico@unimi.it*), Adriano Iacono, Diana Goeta, Roberta Tedesco, Barbara Giordano, Raffaella Faggioli, Alberto Priori, Orsola Gambini, Benedetta Demartini*

Objectives: To compare the prevalence of hypermobile Ehlers-Danlos Syndrome and Hypermobile Spectrum Disorders (hEDS/HSD) in patients with Functional Neurological Disorders (FND) and individuals with High-Functioning Autism Spectrum Disorders (HF-ASD).

Background: ASD and FND share some common features in terms of alexithymia, sensory sensitivity and interoceptive issues1. Recent evidence shows that both present symptoms compatible with hEDS/HSD, a heterogeneous group of heritable connective tissue disorders.

Methods: Twenty patients with FND and twenty-seven individuals with HF-ASD were recruited at the tertiary level outpatient clinic of ASST Santi Paolo e Carlo, Presidio San Paolo in Milan, Italy; diagnosis of FNDs was made according to DSM-5 diagnostic criteria by a neurologist and a psychiatrist. Twenty-six neurotypical healthy controls (HN) were recruited amongst hospital staff and acquaintances. They completed the Self-reported screening questionnaire for the assessment of Joint Hypermobility Syndrome (SQ-CH)2, a seven-item instrument including the Hakim and Grahame's five criteria and two additional ones. Correlation between the instrument and the widely used Beighton's criteria is high ($r = 0.9$; $p < 0.001$).

Results: Fifty-five percent of the patients with FNDs, 44.4% of the individuals with ASDs and 30.8% of HN scored above the cut-off at the SQ-CH. SQ-CH scores of both FNDs and ASDs groups were significantly higher than the HN group ($p = 0.039$ and $p = 0.043$ respectively); no difference emerged between FNDs and ASDs ($p > 0.05$).

Conclusions: Both individuals with ASD and patients with FND present hEDS/HSD-related symptoms in a higher number than the general population. Imputable mechanisms include[1] overwhelming of executive functions with consequent motor competence impairment for ASD patients, and [2] exacerbation of FND symptoms by physical injury and chronic pain due to abnormal range of joint mobility. Moreover, it is postulated that the Amygdala and the Anterior Cingulate Cortex circuitry are responsible for the imbalances at the proprioceptive, interoceptive, and emotional levels.

References:

1. Nisticò, V., Goeta, D., Iacono, A., Tedesco, R., Giordano, B., Faggioli, R., Priori, A., Gambini O., Demartini, B. Clinical overlap between Functional Neurological Disorders and Autism Spectrum Disorders: a preliminary study. In press on Neurological Sciences.

2. Bulbena, A., Mallorquí-Bagué, N., Pailhez, G., Rosado, S., González, I, Blanch-Rubió,, J., Carbonell., J. (2014) Self-reported screening questionnaire for the assessment of Joint Hypermobility Syndrome (SQ-CH), a collagen condition, in Spanish population. Eur. J. Psichiat, 28 (1), 17-26. Doi: 10.4321/S0213-61632014000100002

THE CLINICAL MANAGEMENT OF FUNCTIONAL NEUROLOGICAL DISORDER: A SCOPING REVIEW OF THE LITERATURE

Danielle Varley (University of York, danielle.varley@york.ac.uk*), Christina van der Feltz-Cornelis, Dimitris Lagos*

Objective: To provide an overview of the literature related to the clinical management of FND and summarise the experiences and perspectives of patients, caregivers and healthcare workers in the diagnosis and treatment processes.

Background: There have been no reviews bringing together evidence on the clinical management (CM) of FND and patients, carers and healthcare workers experiences. This review scoped the literature to summarise the CM of FND and the experiences of those involved.

Methods: The scoping review was informed by Arksey and O'Malley (2005) and conformed to their five-stage framework. Four databases were searched, and a consultation exercise was conducted to retrieve relevant records.

Two stages (title and abstract, then full paper) of record sifting occurred by two independent reviewers (with the second reviewer sifting 10% of the retrieved records). Data charting was conducted, which involved sifting and grouping relevant data into key themes relating to the review's aims and objectives. A sub-analysis was conducted using thematic analysis on records which explored the perspectives and experiences of the clinical management for FND (n=48).

Complete methodological information is reported in Varley et al., (2021).

Results: In total, 2756 records were retrieved, with 161 included in the review. The diagnostic methods reported are listed in Figure 1. The diagnostic methods predominantly reported included positive clinical signs, vEEG and EEG.

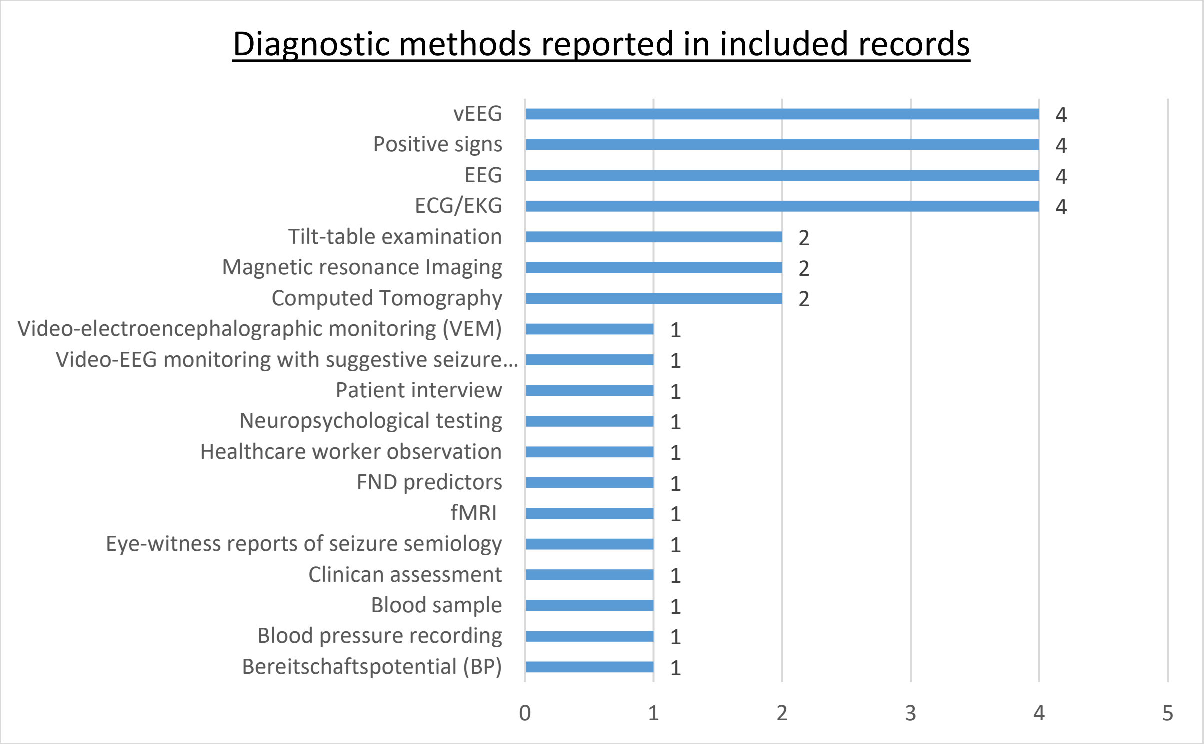


Figure 1. The diagnostic methods reported are listed in Fig. 1. The diagnostic methods predominantly reported included positive clinical signs, vEEG and EEG.

Reported treatments are listed in Figure 2. Psychological treatments and medication were the most reported. Mixed findings of the effectiveness of CBT were found. Haloperidol, MDTs, physical therapy and scripted diagnosis were found to be effective in reducing FND symptoms.

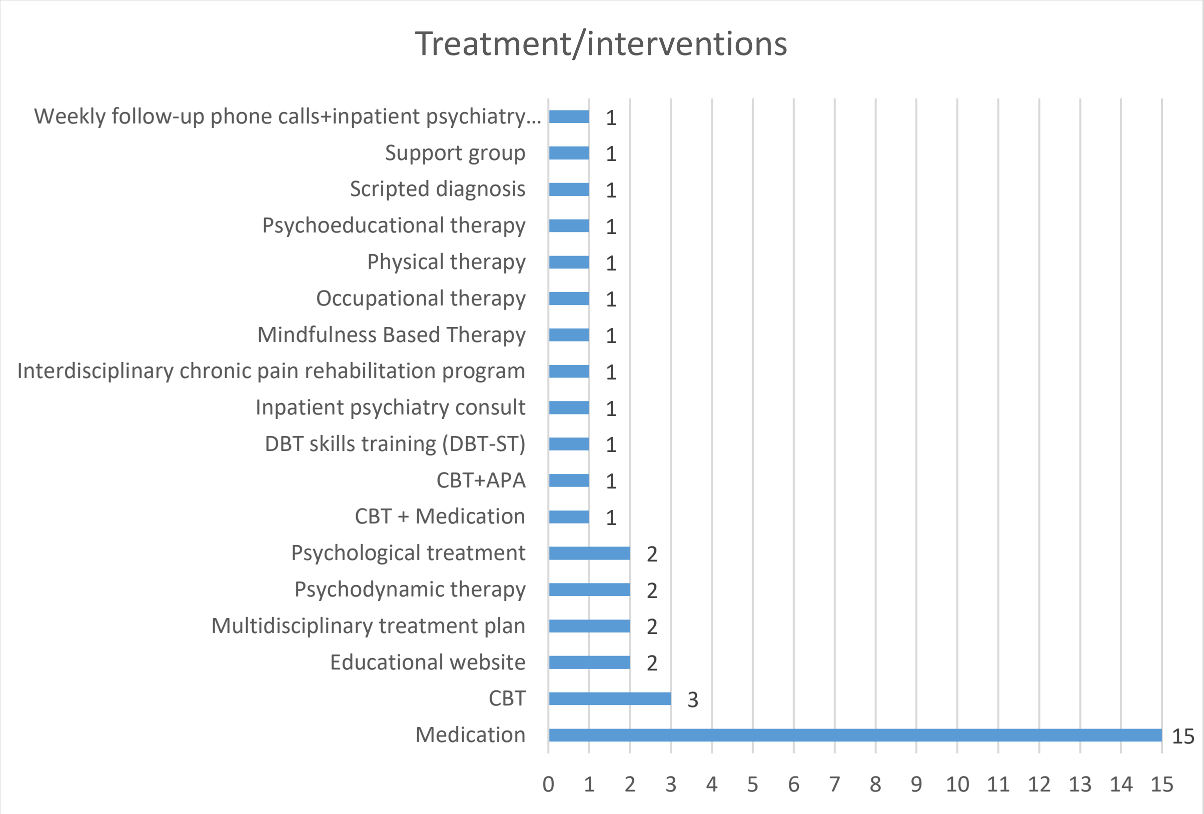


Figure 2: Reported treatments are listed in Fig. 2. Psychological treatments and medication were the most reported. Mixed findings of the effectiveness of CBT were found. Haloperidol, MDTs, physical therapy and scripted diagnosis were found to be effective in reducing FND symptoms.

Several facilitators and barriers for patients accessing treatment for FND were reported. Facilitators included attitudes and organisational support, whereas barriers included lack of interest or need for care and stigma.

Conclusions: The literature focused on the clinical management for FND has increased considerably in recent times. However, this review revealed that there is a lack of high-quality evidence and a need for more rigorous and fully powered, prospective studies examining the diagnostic methods and treatments for FND. The findings evidence that although some diagnostic methods and treatments show some effectiveness, a multidisciplinary, holistic approach may be the future of clinically managing FND.

This supports the findings from the thematic analysis (reported in the main review), where effective communication, a positive patient-doctor relationship and clinical management between clinical teams were successful in the diagnosis and treatment of FND.

References:

Arksey, H., & O'Malley, L. Scoping studies: towards a methodological framework. International Journal of Social Research Methodology. 2005;8:1, 19-32.

Varley, D., Ratcliff, J., Lagos, D., & van der Feltz-Cornelis, C. Clinical management of conversion disorder/functional neurological disorder: A scoping review of the literature. 2021.

OUTPATIENT INTEGRATED TREATMENT APPROACH IN A PATIENT WITH COMPLEX FND: A CASE REPORT

Lincoln Beal (re+active Physical Therapy & Wellness, lincoln@re-activept.com*), Lian Todd, Julie Hershberg, Chelsea Richardson*

Background: Current recommendations for standard of care treatment of functional neurological disorders (FND) emphasize the role of rehabilitation and allied health professions. Interdisciplinary treatment approaches including psychological, physical, and occupational therapies and have been shown to be effective in improving neurologic outcomes in patients with FND, primarily in the inpatient setting. Patients in these studies have varied symptom manifestations and severities, and specific interventions are often not stated. This may lead to uncertainty about how to approach the treatment of patients with complex FND, including those for whom previous trials of FND-specific treatment protocols were unsuccessful, as in this case. This case report of a 16-year-old girl with functional paralysis, sensation loss, blindness, seizures, and impaired speech illustrates a positive outcome from an integrative treatment program in an outpatient clinic.

Methods: Intervention Summary: Patient underwent 10-week program with physical therapy, occupational therapy, yoga therapy, and psychological therapy. Interventions were chosen to incorporate our patient's favorite activities - which included singing, dancing, painting and drawing, and Disney movies. Sessions were lead by providing patient autonomy and creating a supportive environment for recovery.

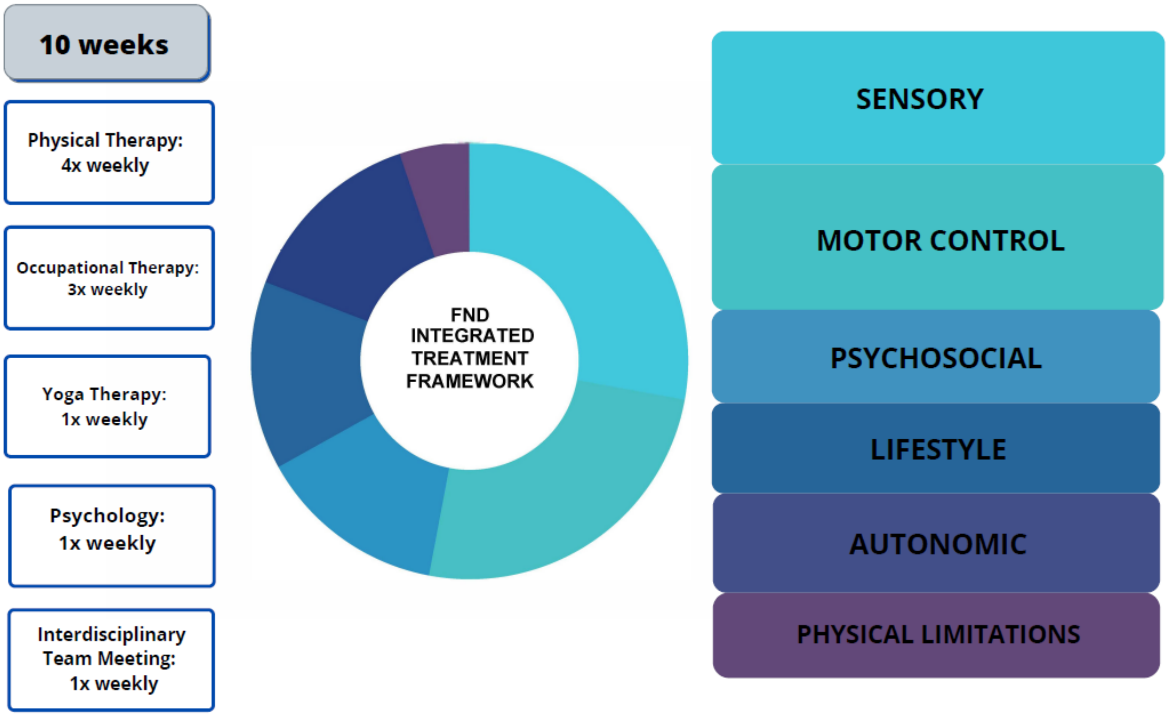
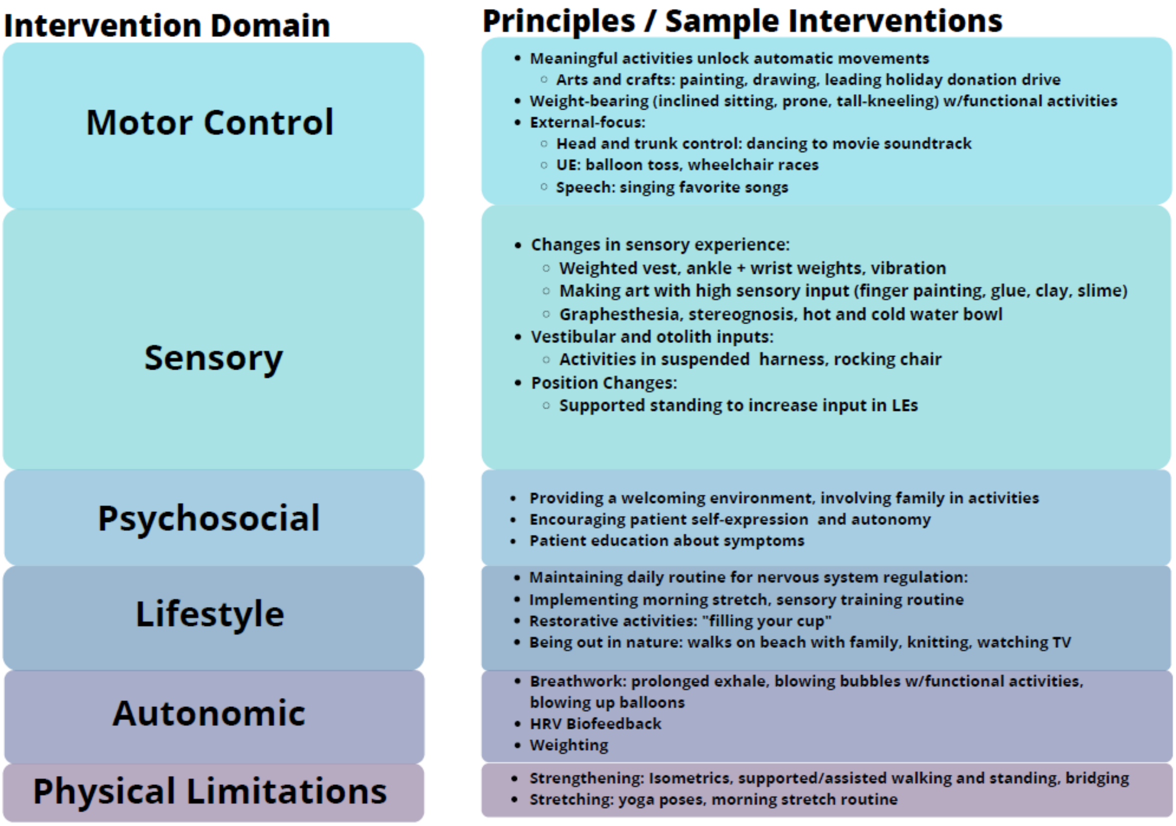


Figure 1.



Intervention Domain	Principles / Sample Interventions
Motor Control	• Meaningful activities unlock automatic movements ◦ Arts and crafts: painting, drawing, leading holiday donation drive • Weight-bearing (inclined sitting, prone, tall-kneeling) w/functional activities • External-focus: ◦ Head and trunk control: dancing to movie soundtrack ◦ UE: balloon toss, wheelchair races ◦ Speech: singing favorite songs
Sensory	• Changes in sensory experience: ◦ Weighted vest, ankle + wrist weights, vibration ◦ Making art with high sensory input (finger painting, glue, clay, slime) ◦ Graphesthesia, stereognosis, hot and cold water bowl • Vestibular and otolith inputs: ◦ Activities in suspended harness, rocking chair • Position Changes: ◦ Supported standing to increase input in LEs
Psychosocial	• Providing a welcoming environment, involving family in activities • Encouraging patient self-expression and autonomy • Patient education about symptoms
Lifestyle	• Maintaining daily routine for nervous system regulation: • Implementing morning stretch, sensory training routine • Restorative activities: "filling your cup" • Being out in nature: walks on beach with family, knitting, watching TV
Autonomic	• Breathwork: prolonged exhale, blowing bubbles w/functional activities, blowing up balloons • HRV Biofeedback • Weighting
Physical Limitations	• Strengthening: Isometrics, supported/assisted walking and standing, bridging • Stretching: yoga poses, morning stretch routine

Figure 2.

Results: Outcomes were collected at initial evaluation and at conclusion of 10-week program. The patient showed improvement in all major outcome measures including PSFS (2/40 initial, 32/40 at 10 weeks), Perceived Stress Scale (PSS) (21/40, 14/40 with higher scores indicating greater perceived stress), Shutdown Disassociation Scale (SHUT-D) (31/39, 12/39 with higher scores indicating greater dissociative symptoms). She additionally had full recovery of vision, sensation, speech, and full movement of her body, and left able to propel herself using her wheelchair, perform most daily tasks with both arms, and required minimal to moderate assist with transfers.

Conclusion: As in this case, patients with complex and severe FND including functional blindness, treated within a patient-centered integrated team framework can experience significant functional recovery. Close collaboration between professionals to identify predisposing and perpetuating factors for our patient's symptoms was important to planning treatment. An emphasis in each session on patient autonomy, meaningful and enjoyable activities, principles of neuroplasticity and motor learning, and fostering a supportive environment was a key element in her neurologic recovery.

References:

Demartini B, Batla A, Petrochilos P, Fisher L, Edwards MJ, Joyce E. Multidisciplinary treatment for functional neurological symptoms: a prospective study. J Neurol. 2014;261(12):2370-2377. doi:10.1007/s00415-014-7495-4

Schmidt T, Ebersbach G, Oelsner H, et al. Evaluation of Individualized Multi-Disciplinary Inpatient Treatment for Functional Movement Disorders. Mov Disord Clin Pract. 2021;8(6):911-918. Published 2021 Jun 24. doi:10.1002/mdc3.13268

SUMMARIZING THE EVIDENCE FOR REHABILITATION THERAPIES IN THE TREATMENT OF FUNCTIONAL NEUROLOGICAL DISORDER: A SYSTEMATIC REVIEW

Esther Choi (Vancouver Coastal Health Research Institute, choiestherr@gmail.com*), Kiarah O'Kane, Molly Cairncross, Ivan Molton, Kathrin LaFaver, Alan Carson, Rachel Aaron, Eva Keatley*

Objective: To summarize the evidence base for rehabilitation therapies in treatment of functional neurological disorders (FNDs).

Background: FND is a common and debilitating disorder. Rehabilitation therapies are often used to treat FND, but the research evidence supporting this approach has not been evaluated. This review is the first to summarize the evidence for rehabilitation-based treatments for FNDs.

Methods: A systematic search in medical and scientific databases including PubMed (MEDLINE), Embase, PsycINFO, CINAHL Plus, and Cochrane Library was conducted for clinical studies involving rehabilitation therapy for the treatment of individuals with FND. Inclusion criteria were: 1) prospective clinical study, 2) refer to core sensorimotor FND symptoms (including functional seizures and functional cognitive disorders), and 3) include participant engagement in at least one rehabilitation therapy, such as physical therapy, speech and language therapy, and/or occupational therapy. Thus, studies describing generalized non-organic somatic symptoms, such as functional somatic syndromes, were excluded. The quality of included studies was assessed using an adapted assessment tool developed by the NHLBI for pre-post intervention studies.

Results: There were 6230 relevant studies initially identified for abstract review. A total of 17 studies met inclusion criteria representing 607 participants with FND across studies. Participants were primarily female (n=471, 76%) and had an average age of 38 years (range 11-77). Most common FND symptoms reported were gait disturbance (n=141), functional seizures (n=116), speech or voice disturbance (n=109), and tremor (n=56). 15 of the studies used outcome measures of FND symptoms, 14 of which demonstrated statistically significant improvement in symptoms post-treatment. Clinically significant improvements were noted among 69% of participants post-treatment (range 52-100%) and most studies found improvements persisted at long term follow-up.

Conclusions: There is growing evidence that rehabilitation therapies, both single and multi-discipline, may be effective in treating FND symptoms. The research to date suggests rehabilitation therapies are useful across the spectrum of FND phenomenology. However, review of studies found significant limitations to the existing body of research including a lack of prospective clinical research studies, lack of consistency in outcome measures, and inconsistencies in reporting of therapeutic protocols (e.g., duration, frequency). Randomized clinical control trials are needed to bolster the research evidence for this promising treatment approach.

AN INTEGRATED 'SELF-MANAGEMENT' TREATMENT APPROACH WITH COGNITIVE BEHAVIOUR THERAPY AND COMPASSION FOCUSED THERAPY FOR FUNCTIONAL NEUROLOGICAL DISORDER IN AN OUTPATIENT NHS SERVICE OVER A SHORT PERIOD – A CASE STUDY

Vidya Rajbhoj (Hertfordshire Community Trust, NHS, vidcounsellor@gmail.com*), Jeanette Collins*

Objective: To present positive outcome from a short and concise treatment based on 'self-management' approach provided by a small team of a psychologist and occupational therapist for a functional neurological disorder (FND) with multiple symptom presentation.

Background: Hertfordshire Community Trust's newly developed specialist FND service supports patients with functional symptoms. Through the patients the team learned and grew. Current case represents multimodal approach facilitating 'self-management' with limited resources in outpatient clinic.

Methods: Usage of a self-management approach comprised of education sessions integrating methods from psychology and occupational therapy. While using biopsychosocial model recommended for functional symptoms for formulation, the treatment sessions largely included techniques from cognitive behaviour therapy (CBT) and compassion focused therapy (CFT) amongst other strategies. Self-report questionnaires GAD-7, PHQ-9, and EQ-5D-5L were used to evaluate the treatment outcome. A service feedback evaluation form was completed to obtain additional rating on the overall service in relation to the treatment.

Results: The treatment was paced over six months with a total of five sessions. Outcome measures indicated overall improvement in the patient's perceived quality of life and scores. The GAD-7 score decreased from 18 to 1, an 81% improvement, the PHQ-9 score decreased from 26 to 2, an 88.9% improvement and the EQ-5D-5L visual health score increased from 30 to 95, a 65% improvement. Within the evaluation form the patient reported having a greater understanding of FND and obtaining the tools to manage their symptoms. Patient acknowledged positive changes in self-esteem, confidence, sense of agency and motivation to apply the tools allowing them to regain joy in daily activities.
We intend to do three-month follow-up and provide the scores in the study.

Conclusions: The study suggests an effective intervention can be provided with limited resources in an outpatient NHS service with a carefully formulated treatment pathway. We reiterate the value of education in symptom management and a self-management approach to encourage 'sense of agency' helping patients maintain their progress. We emphasise on benefit of integrating strategies from numerous therapeutic modalities in a holistic approach and the benefit of combining psychology and occupational therapy in sessions. We have found CFT useful in addressing emotion disintegration and dysregulation, a struggle seen in many FND cases. We encourage clinicians to explore multimodal approach with CFT and CBT for managing functional symptoms.

References:

Gilbert, P. (2009). Introducing compassion-focused therapy. Advances in psychiatric treatment, 15(3), 199-208.

Nicholson, C., Edwards, M. J., Carson, A. J., Gardiner, P., Golder, D., Hayward, K., ... & Stone, J. (2020). Occupational therapy consensus recommendations for functional neurological disorder. Journal of Neurology, Neurosurgery & Psychiatry, 91(10), 1037-1045.

PATIENT PERCEPTIONS OF THE ROLE OF EMOTIONS IN NON-EPILEPTIC ATTACK DISORDER

Diane Gillan (RCSI, dianegillan@gmail.com*), Emer McNamara, Mathew McCauley, Norman Delanty, Sarah Clarke*

Objective: To explore emotional processing in non-epileptic attack disorder (NEAD) following provision of a biopsychosocial formulation emphasising the role of psychological factors; goal to explore the impact of this formulation on their insight into the role of emotions in NEAD.

Background: This study expands on the work of Pick et al. (2016) who explored emotional processing of individuals with NEAD prior to discussion of an individualised psychologically-based formulation. There is little research regarding how patients make meaning out of receiving a collaborative biopsychosocial formulation with a psychologist, that emphasises emotional factors in the development of NEAD and in triggering attacks.

Method: This study adopted a prospective, qualitative design in order to gain an in-depth understanding of their explanatory models of NEAD. A purposive sample of nine patients was recruited after they experienced a biopsychosocial formulation from a clinical neuropsychologist over a brief number of sessions. These patients had confirmed diagnoses of NEAD in the previous six months which was provided by a consultant neurologist, following a period of video-EEG monitoring in a epilepsy centre in a tertiary hospital in Dublin, Ireland. Semi-structured interviews were carried out with nine participants (five females, four males). Interviews were guided by two broad open-ended questions (1) How do patients with NEAD perceive their general emotional functioning? (2) Following initial psychological sessions involving a collaborative psychological formulation, to what extent can patients with NEAD reflect on and understand the possible role of emotions in the onset of the disorder and/or on-going attack generation? The participants also completed a brief demographic questionnaire. Interviews were audio recorded, transcribed and analysed using an inductive and interpretive approach informed by the principles of Interpretative Phenomenological Analysis (IPA). The content was analysed to identify representative themes.

Results: Themes which emerged included difficulty with difficulties with expressing and regulating emotions, experience of adverse life events, linking NEAs to emotions and stress, and maladaptive coping strategies. This is broadly similar to findings by Pick et al. (2016). In addition, uncertainty regarding the role of psychotherapy was identified, similar to findings of Fairclough et al. (2014). Several participants experienced resistance to the diagnosis initially and viewed a psychology referral as indicative of mental health difficulties and worried about the consequences of attending. At the same time, psychology was perceived as valuable in terms of feeling understood and validated and they experienced a reduction in a sense of shame and stigma. Some participants found that their attacks began to reduce as they gained an understanding of them. Most participants described a strong relationship between their emotional states and physical symptoms. Furthermore, most made the association between NEAs and 'switching off' from strong emotions, and that their attacks had originally been triggered by a build-up of emotional stress. Some individuals questions whether their tendency to repress or mask negative emotions had a role in the development of NEAD and attack generation.

Conclusions:

The findings showed that individuals with NEAD who had engaged with their diagnosis and psychological formulation appeared to have considerable insight into their emotional functioning, and how their life events and emotional responses might relate to ongoing event occurrence. In addition, this highlight the value of psychological input in providing a sense of validation in the context of initial resistance and sense of stigma regarding the diagnosis. The results from this qualitative study have similar themes to those of previous research that suggest that individuals with NEAD attempt to inhibit and control their emotions and perceive a lack of control in their attacks. However, following a psychological formulation, individuals expressed that they believed they had a greater understanding of their attacks and viewed their diagnosis more positively and less stigmatising as they had a better understanding as to what factors may have contributed to developing NEAD and what may be maintaining their attacks. Future studies could seek to explore individual's insights into their emotional regulation comparing those that engage in psychological treatment for NEAD at the beginning and end of their therapeutic input.

References:

Pick, S., Mellers, J. D., & Goldstein, L. H. (2016). Emotion and dissociative seizures: A phenomenological analysis of patients' perspectives. Epilepsy & behavior : E&B, 56, 5–14. https://doi.org/10.1016/j.yebeh.2015.12.010

Fairclough, G., Fox, J., Mercer, G., Reuber, M., & Brown, R. J. (2014). Understanding the perceived treatment needs of patients with psychogenic nonepileptic seizures. Epilepsy & behavior : E&B, 31, 295–303. https://doi.org/10.1016/j.yebeh.2013.10.025

DEVELOPING CONSENSUS GUIDELINES FOR NON-SURGICAL TREATMENT OF URINARY RETENTION

Sarah McRae (NHS Lothian, sarahthomson77@hotmail.co.uk*), Helen Simpson, Paraskeve (Voula) Granitsiotis, Glenn Nielsen, Béatrice Garcin, Jon Stone, Ingrid Hoeritzauer*

Objective: To assess current non-surgical options for treating chronic idiopathic urinary retention (including Fowler's syndrome), which is especially common in women with Functional Neurological Disorder (FND).

Background: Chronic idiopathic urinary retention (including Fowler's syndrome) mostly occurs in young women. Comorbid FND/pain are common. Current treatments (catheters, surgery or neurostimulation) are invasive. Other treatments are considered ineffective.

Methods: Chronic urinary retention is historically a symptom recognised as part of FND but in recent decades has not been. Studies from our group show that around 25% of women with chronic idiopathic urinary retention in cohorts in London and Edinburgh have comorbid FND suggesting mechanistic overlap. We aim to a) do a scoping review of non-surgical treatment of bladder voiding dysfunction, especially data on complete retention b) collect data on current practice from a network of interested FND, Urology and Pelvic physiotherapy health professionals in the UK and c) identify cases of spontaneous recovery of chronic urinary retention from this network, our own cohort studies, health professional networks and Fowlers UK, a patient led organisation.

Results: Our scoping review found promising evidence for treatment of voiding dysfunction with biofeedback, particularly computer game related biofeedback in younger age groups, tibial nerve stimulation, breathing exercises such as diaphragmatic breathing, managing constipation and education. However, few studies indicated whether such treatments could resolve complete retention. We will describe the literature in more detail. The results of our survey of health professionals and collection of data on cases of recovery of chronic urinary retention are in progress.

Conclusions: Chronic urinary retention is a comorbidity in some patients with FND usually managed with invasive therapies. The historical literature, treatment literature looking at voiding dysfunction and experience from a network of health professionals suggest that recovery is possible without surgery and that non-surgical options should be explored again. New studies looking at both acute and chronic urinary idiopathic retention suggest overlapping mechanisms with FND that may inform these studies. This project is a step towards developing multidisciplinary consensus treatment guidelines for non-surgical treatments for this disabling problem. We are presenting this poster partly to connect with other FND researchers interested in providing data or experience with respect to this disabling problem.

References:

Gaziev et al. Percutaneous tibial nerve stimulation (PTNS) efficacy in the treatment of lower urinary tract dysfunctions: a systematic review. BMC Urology 2013, 13:61

Hoertizauer et al. Fowlers syndrome of urinary retention. A retrospective study of co-morbidity. Neurology and urodynynamics: 2016, 35:5

PHYSIOTHERAPY IN FIXED FUNCTIONAL DYSTONIA: CAN WE FIX IT?

Cameron Moss (St George's, University of London, cameron.moss@stgeorges.nhs.uk*), Mark Edwards, Glenn Nielsen*

Objective: To highlight the role of physiotherapy in people with fixed functional dystonia (FFD), and the potential it may have to reduce the risk of iatrogenic harm.

Background: FFD is characterised by fixed postures of peripheral joints. Rehabilitation is often unsuccessful and patients may pursue invasive treatments, including amputation and other forms of surgical intervention, which often have negative outcomes.[1]

Methods: Kate is a 33-year-old woman with FFD, who is considering amputation. Physiotherapy consisted of nine sessions focussing on strategies to change the habitual postures and movement patterns presumed to maintain fixed postures via peripheral and central mechanisms. Treatment sessions included education about the mechanisms of FND using a symptom model, patient reflection, collaborative movement analysis using videos and images, sequential motor relearning, goal-setting and set-back planning.[2] A workbook was completed together during the programme to aid self-management. Co-morbid issues including functional cognitive disorders, fatigue, pain and sleep hygiene were also explored. Follow-up was at 6 months' post-treatment.

Results: Assessments of balance and gait demonstrated improvements post-treatment [Table 1]. This change correlated with the subjective measure of the patient's perception of change and was also evident in the photos and videos taken, where Kate was able to walk with equal step lengths, accessing the full kinematics and kinetics of the gait cycle.

At six months, Kate had maintained her balance gains [Table 1]. She had lost some treatment effect to her gait, however her outcome scores were for the most part improved compared to baseline. However, the EQ-5D-5L showed that Kate felt her general health had improved, but that her physical improvements were lost, as seen in patient perception of change [Table 1].

Table 1. Outcome measures

	10m timed-walk	**Functional Mobility Scale**	**Berg Balance scale (/56)**	**EQ-5D-5L**	**Patient perception of change (5-point-scale)**	**SF-36 (physical domain) /100**
Initial assessment	26 steps in 16.36 seconds (0.61m/s)	13/18	36	50%	N/A	41.67
Conclusion of programme	12 steps in 8.72 seconds (1.15m/s)	15/18	53	N/A	5: Much improved	N/A
6 months	25 steps in 12.78 seconds (0.78m/s)	15/18	53	70%	3: No change	41.67

Conclusion: Specialised physiotherapy for FND, and FFD specifically, delivered through a biopsychosocial, mechanism-based lens provides a framework from which to access automatic movement via sequential motor relearning. It is conservative, potentially cost-saving and may reduce invasive treatments that could risk iatrogenic harm. Kate was no longer considering amputation, and had greater insight into the social stressors impacting on her health. At six months, Kate was experiencing high psychological distress which appeared to prevent her from recognising the gains she had maintained post-treatment. This case highlights the complexity of FFD, the heterogeneity that exists in FND, and the need to approach treatment holistically and individually.

References:

1.Edwards, M.J. (et al (2011): ‘Limb amputations in Fixed Dystonia: A Form of Body Integrity Identity Disorder?’. Movement Disorders July; 26 (8): 1410-1414.

2.Nielsen et al, (2017): ‘Randomised feasibility study of physiotherapy for patients with functional motor symptoms.’. Journal of neurology, neurology and psychiatry 88: 484-490.

ATTITUDES AND PERCEPTIONS OF IRISH HEALTH CARE PROFESSIONALS REGARDING FUNCTIONAL NEUROLOGICAL DISORDER: A NATIONAL SURVEY

Roisin Vance (Beaumont Hospital, Roisinvance@beaumont.ie*), Diane Gillan, Sarah Clarke, Fiadhnait O'Keefe, Maria Diaz, Caoimhe Kenna, Lorna O'Sullivan, Aoife Laffan, Eric Kelleher, Cora Flynn, Sarah Duggan, Norette Walsh, Neil Austin, Ciara Murphy, Kieran Doherty, Aoife Moran, Eva Murphy, Colin Doherty*

Objectives: To survey the perceptions, experiences, support and training needs of health care professionals from a range of disciplines in Ireland who provide care to individuals with Functional Neurological Disorder (FND).

Background: There is a lack of available information regarding Irish health professionals' experiences of working with FND. Learning more about this area will help inform service development for those with FND, and identify training needs for service providers.

Methods: An anonymous questionnaire was distributed online via Qualtrics to health professionals in Ireland. This was a modified version of a survey developed by Lehn et al (2019) for health professionals in Australia. Ethical approval was obtained from Trinity College Dublin Research Ethics Committee. Participants were recruited through contact with relevant professional bodies, social media and direct emails. The survey included demographic variables, in addition to 12 Likert-scale items assessing respondents' attitudes and experiences in relation to working with FND. Descriptive and inferential statistics were employed to analyse survey results and explore relationships between key variables.

Results: There were 312 health care professionals who participated in the survey. Respondents included individuals from neurology, nursing, psychology, psychiatry, physiotherapy, medicine, occupational therapy, speech and language therapy and dietetics. Over half of the sample (64%) had worked in their respective professions for over 11 years. Seventy-five percent of respondents have clinical input with three or less individuals with FND per month. The majority (63%) do not feel they have received adequate training about FND. Additional challenges to working with FND included insufficient clinic time, lack of confidence in explaining the diagnosis, and the need for greater access to specialist support. Eighty-nine percent of respondents agreed that they would benefit from additional training in FND.

Conclusions: The survey, the first of its kind in Ireland, provides valuable information about the attitudes and experiences of a wide range of Irish health care professionals in relation to working with individuals with FND. Significant gaps in services and training are identified, in addition to a significant demand for, and interest in, additional training to upskill within this clinical area. The results will also inform much-needed service development for individuals affected by FND with the aim to significantly improve quality of care. Finally, survey results will be shared with relevant healthcare professional bodies to highlight the need for increased training opportunities for their members who are working in this important area of clinical care.

References:

The data analysis for this paper was generated using Qualtrics software, Version [February, 2022] of Qualtrics. Copyright © [2022] Qualtrics. Qualtrics and all other Qualtrics product or service names are registered trademarks or trademarks of Qualtrics, Provo, UT, USA. https://www.qualtrics.com

Lehn A, Bullock-Saxton J, Newcombe P, Carson A, Stone J. Survey of the perceptions of health practitioners regarding Functional Neurological Disorders in Australia. Journal of Clinical Neuroscience 2019; 67: 114-123

STRUCTURAL ALTERATIONS IN FUNCTIONAL MOVEMENT DISORDERS: A DIFFUSION WEIGHTED IMAGING STUDY

Silvina Horovitz (NINDS – NIH, silvina.horovitz@nih.gov*), Jacob Parker, Patrick Bedard, Carine Maurer, Mark Hallett*

Background: Functional movement disorder (FMD) patients have movements they perceive as involuntary even though the movements are generated by mechanisms similar to normal voluntary movements.[1] The integrity of the white matter tracts is poorly understood.[2]

Methods: Tissue integrity from diffusion MRI data from 44 FMD patients and 44 age- and sex-matched controls acquired at 3T with a multi-shell diffusion weighted sequence were studied. Datasets were processed using TORTOISE and tensors registered to a group template. We computed parenchymal fractional anisotropy and trace, and the percentage of parenchymal volume[2]. Each scalar map was then transformed to the group template. Group comparisons were performed with t-tests in AFNI. We used $p<0.001$ as voxel threshold, with a minimum cluster of 40 voxels, and computed the effect size of these results. Single subject values were extracted for the significant clusters and computed correlations between each of them and subjects' anxiety and depression scores.

Results: Average age was 44 +-11 years and sex in each group was F/M: 38/6. Group differences were observed for all scalar metrics and the deformation matrices. FMD patients show increased parenchymal trace in the right precentral gyrus and bilateral inferior frontal gyrus. FMD patients have a larger parenchymal volume fraction in the right postcentral gyrus. FMD patients showed increased parenchymal fractional anisotropy in the right uncinate fasciculus/inferior longitudinal fasciculus. Reported results have a Cohen's d coefficient > 0.8. None of the results were driven by anxiety or depression scores.

Conclusion: fMRI studies reported FMD abnormalities in motor and limbic areas. There are abnormalities also observed in voxel-based morphometry. Here, increased FA in white matter tracts connecting to the amygdala, together with less integrity (higher trace) in premotor and frontal areas might add to the enhanced limbic effects on motor system characteristic of FMD. While this study cannot address whether these changes are cause or consequence of the disorder, it is clear there are neurological changes present in the FMD population. These changes could reflect a greater influence of emotion on the motor system.

References:

1. Baizabal-Carvallo JF, Hallett M, Jankovic J. Pathogenesis and pathophysiology of functional (psychogenic) movement disorders. Neurobiol Dis 2019; 127:32-44.

2. This material was presented as an abstract at the International Society for Magnetic Resonance in Medicine; virtual poster 1968; 2020.

A PRELIMINARY ANALYSIS OF FNDS PATIENTS FROM THE FIRST FNDS MULTIDISCIPLINARY TEAM IN CHINA

Gang Wang (Ruijin Hospital affiliated with Shanghai Jiao Tong University School of Medicine, wgneuron@hotmail.com*), Jin-Tao Wang*

Functional neurological disorder (FND) is a disorder of the voluntary motor or sensory system including functional tremor, functional dystonia， functional weakness, functional dizziness and so on. The morbidity population is extensive and the social burden is heavy. However, the research on FND in China is still in its infancy, and many doctors and even specialists know little about it. In August 2021, Ruijin Hospital Affiliated to Shanghai Jiaotong University School of Medicine launched the first multidisciplinary consultation for FNDs patients in China. The outpatient clinic brings together experts and professors from the department of neurology, clinical psychology, functional Neurosurgery, medical radiology, and clinical rehabilitation. In the past six months, the outpatient clinic has received 24 patients. In a preliminary analysis of FNDs patients by questionnaire, it was found that FNDs patients covered 18-65 years old per year, and the visit times of outpatients reached 7.6±3.8, with the annual cost 4146.84±1316.74 RMB. The patient hospitalizations number reached 0.5±0.97 with annual cost 8833.33±17604.187 RMB costs. The annual direct medical costs reached 13640.17±9223.37 RMB, annual direct nonmedical cost reached 1022.00±931.17 RMB, and the annual indirect costs reached 776.67±1419.45 RMB. Total annual costs reached 15438.84±9223.37 RMB. After comprehensive diagnosis and treatment, the symptom relief rate according to global impression change scale reached 54.5% in follow-up statistics, which is encouraging. The establishment of this clinic provides an integrated platform for the majority of FNDs patients. It’s an important step for the research of FNDs in China.

STIGMA IN FUNCTIONAL NEUROLOGICAL DISORDER: A SYSTEMATIC REVIEW

Caoimhe McLoughlin (University of Edinburgh, c.mcloughlin@ed.ac.uk*), Laura McWhirter, Alan Carson, Jon Stone*

Objective: To systematically search and review the literature on stigma in FND focussing on; the occurrence of stigma in different contexts (patient, professional, caregiver, society), impact of stigma on patient outcomes and reduction interventions.

Background: Reports from the literature and patient organisations show a high degree of stigma experienced by patients with FND. Stigma presents an obstacle to timely diagnosis and treatment, and has been shown to impact quality of life and psychosocial health for these patients.

Methods: Relevant databases for published peer-reviewed articles in English, using synonyms for FND and terms related to stigma were searched. There was no time or age limit set, nor limit on study design. We included studies of varying methodologies if they reported on any component of the theme of stigma and FND – including discrimination, self-stigma, prejudice or deficits in FND services. Studies were included if they reported stigma themes in relation to caregivers, professionals, general public and media. Studies that addressed stigma (anti-stigma) were also included. Given the broadness of this field, a scoping narrative synthesis of findings was conducted. This study is funded by the EU H2020 Marie Skłodowska-Curie grant agreement 956673.

Results: A low number of quantitative studies demonstrate stigma is higher in FND than other neurological conditions, impacting on quality of life and psychosocial health. Qualitative studies from the patient perspective indicate themes of; uncertainty and confusion, negative experience with health professionals, doubt and dismissal. Qualitative studies from health professionals indicate; barriers to service provision, lack of clarity around role, lack of training and confidence, doubt around feigning and interpersonal concerns. Terminology, language and the general diagnostic process are central themes throughout. A limited number of studies focus on empowering and educating health professionals and patients, which have proven to be beneficial.

Conclusions: Stigma remains a common problem, partly driven by misperceptions around feigning and the degree of voluntary control held by patients. Health professionals feel unskilled and isolated in managing FND, highlighting gaps in training and inter-disciplinary collaboration. Few studies assess perceptions of students, trainees, employers, the public or online domains. Access to proper treatments for patients with FND remains poor and fragmented, leading to feelings of incompetence and inadequacy in health professionals, driving negative patient experience. Interventions to address effective communication, training, research and service provision are likely to reduce stigma for people with FND.

References:

Karakis, I., Janocko, N., Morton, M., Groover, O., Teagarden, D., Villarreal, H., Loring, D. and Drane, D., (2020). Stigma in psychogenic nonepileptic seizures. Epilepsy & Behavior, 111, p.107269

EARLY INTERVENTION IN FND - A CASE REPORT

Emily Jay (South London and Maudsley, emily.jay2@slam.nhs.uk*), Lorenza Tedesco*

Objective: The aim of the case report is to generate discussion regarding early intervention/what form it can take. The use of face to face and virtual treatment options and how symptoms can change over the course of treatment. In this example her symptoms changed from functional motor symptoms to non epileptic seizures.

INCREASED FREQUENCY OF SELF-REPORTED OBSESSIVE-COMPULSIVE SYMPTOMS IN PATIENTS WITH FUNCTIONAL MOVEMENT DISORDER

Tereza Serranova (Charles University, tereza.serranova@gmail.com*), Lucia Nováková, Jiří Anýž, Zuzana Forejtova, Tereza Rošíková, Gabriela Věchetová, Petr Sojka, Evzen Ruzicka*

Objective: To assess the frequency of obsessive-compulsive symptoms (OCS) in functional movement disorders (FMD) using the Obsessive-Compulsive Inventory – Revised (OCI-R).[1]

Background: FMD are associated with a high prevalence of psychiatric comorbidities. The frequency of OCS in FMD is unknown. OCI-R is a validated tool for assessing OCS. The cut-off score ≥21 indicates a clinically significant obsessive-compulsive disorder (OCD).

Methods: There were 167 consecutive patients with clinically definite FMD (mean age 44.4 years, SD, 12.0, 119 females) and 145 healthy controls (mean age 43.2 years, SD 11.8, 103 females) completed OCI-R. Motor symptom severity was assessed using The Simplified FMD Rating Scale (S-FMDRS). All subjects completed questionnaires for depression, anxiety, pain, fatigue, cognitive complaints, health-related quality of life, and childhood trauma. Personality traits were assessed using The Big Five questionnaire.

Results: FMD patients had higher mean OCI-R score and higher proportion of individuals with OCI-R≥21 42%, CI 95% (30.2, 54.6) vs 16%, CI 95% (8.2, 28.2) in controls (P<0.001) [Figure 1]. Patients had higher scores in three domains: checking, ordering, obsessing (P<0.001) [Figure 2]. FMD patients with OCI-R score ≥ 21 had higher depression, anxiety (P<0.001), cognitive complains (P<0.01), pain and fatigue (P<0.05), neuroticism (P<0.01), and lower quality of life (P<0.001) compared to those with score <21.

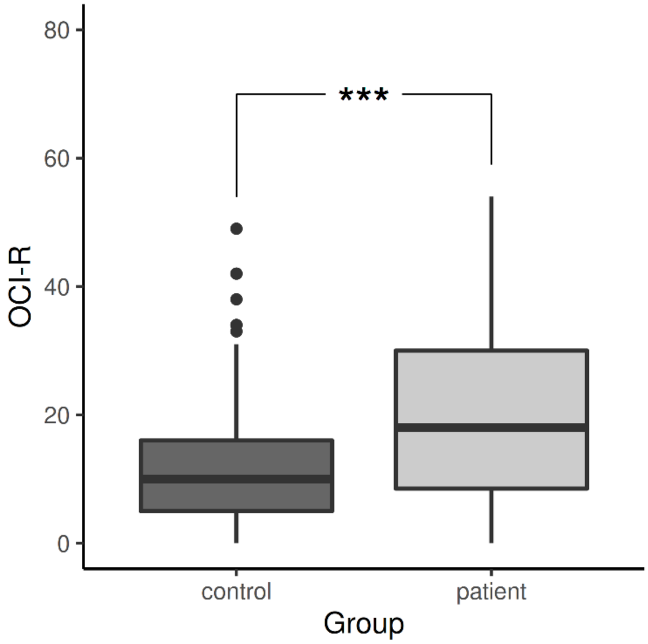


Figure 1.

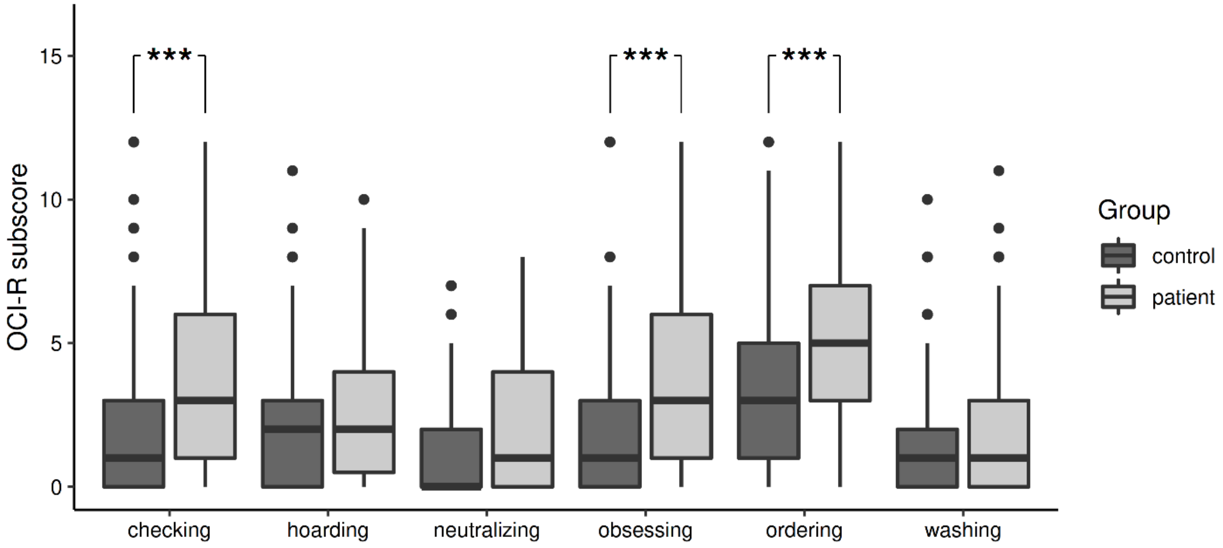


Figure 2.

Conclusions: FMD patients reported higher rates of OCS compared to controls, along with higher rates of non-motor symptoms and lower quality of life. This finding may have clinical implications and raises the possibility of shared risk factors and common pathophysiological mechanisms in FMD and OCD. Supported by the Czech Ministry of Health Project AZV NU20-04-0332.

References:

1.Foa EB, Huppert JD, Leiberg S, et al. The Obsessive-Compulsive Inventory: development and validation of a short version. Psychological Assessment. 2002 14: 485-496.

“LUCKILY I HAVEN’T HAD ONE FOR A WHILE”: CURRENT MANAGEMENT OF CLIENTS WITH FUNCTIONAL PSYCHOGENIC VOICE DISORDER BY SPEECH PATHOLOGISTS IN AUSTRALIA

Catherine Gregory (University of Technology Sydney, catherine.gregory@uts.edu.au*), Rosie Pooley-Stern, Emma Power, Jan Baker*

Objective: Speech pathologists working in Australia were surveyed to determine their confidence in managing functional (psychogenic) voice disorders.

Background: Health care professionals often report uncertainty about how to manage patients with FND[1]. Functional voice disorders encompass both psychogenic (PVD) and muscle tension (MTVD) voice disorders. Whilst MTVD are commonly treated speech pathologists in Australia, little is known about current practices and confidence in assessment and management of PVD.

Methods: The project was approved by the UTS ethics committee. An open web-based survey was used to obtain data from a cross section of speech pathologists working with clients with functional voice disorders in Australia. The survey had five main sections: demographics of participants, assessment of MTVD, treatment of MTVD, assessment of PVD and treatment of PVD. Out of 54 participants who started the survey, 48 completed demographics, 33 completed the MTVD section and 27 completed the PVD section. Data analysis employed both quantitative and qualitative methods, including descriptive statistics, theme, and content analysis.

Results: Most respondents associated the diagnostic term “functional” with MTVD and did not refer to published voice disorder classification systems for differential diagnosis of MTVD and PVD. Respondents reported that otolaryngologists frequently referred clients with a generic diagnosis such as “functional” or “non-organic”. There was a notable discrepancy in clinicians feeling confident when working with clients with MTVD versus PVD. Most clinicians reported using the same vocal exercises for MTVD when working with clients with PVD, with only 29% reporting using the consensus treatment[2] of shaping non-speech tasks to speech tasks to facilitate voicing in this population.

Conclusion: Despite differential diagnosis of PVD and MTVD disorders being essential for appropriate treatment choice, many clients with functional voice disorders are referred for voice therapy with generic terms and consensus recommendations are often not followed for treatment of PVD. Speech pathologists in Australia are often less confident working with clients with PVD and some maintain outdated views that PVD is a ‘conversion’ disorder requiring treatment by psychologists before voice therapy can commence. There is a clear need for further professional development for Australian SLPs around assessment and management of clients with PVD and a call to action to otolaryngologists to provide differential diagnosis of functional voice disorders.

References:

Barnett, C. et al., (2020) The vicious cycle of functional neurological disorders: a synthesis of healthcare professionals’ views on working with patients with functional neurological disorder. Disability and Rehabilitation DOI: 10.1080/09638288.2020.1822935

Baker, J. et al. (2021) Management of functional communication, swallowing, cough and related disorders: consensus recommendations for speech and language therapy. Journal of Neurology, Neurosurgery & Psychiatry. https://doi.org/10.1136/jnnp-2021-326767

A CASE OF FUNCTIONAL LINGUAL TREMOR-LIKE DYSKINESIA AFTER COVID-19 VACCINE

Veronica Nisticò (University of Milan-Bicocca, veronica.nistico@unimi.it*), Federico Wiedenmann, Adelaide Baccara, Luigi Romito, Alberto Priori, Orsola Gambini, Benedetta Demartini*

Objective: To describe the case of a patient who presented functional tremor-like dyskinesia of the tongue three days after the vaccination against Covid-19 (Moderna-Spikevax).

Background: Covid-19 vaccination program is currently involving billions of people worldwide and the presumed side effects of the vaccine are under the scrutiny of the scientific community. Among others, functional neurological symptoms have been reported.[1,2]

Methods: AM, a 20-year old Italian female, suddenly developed a lingual dyskinesia, then replaced by lingual tremor, increasing when she was in tension. EEG and MRI appeared without alteration; neurological examination described only a variable tremor-like movement of the tongue, partially reduced by distracting maneuvers; psychiatric examination showed initial insomnia, anxiety symptoms and depressed mood during the previous year. Final diagnosis was a functional dyskinesia of the tongue, precipitated by Covid-19 vaccine, in the context of a probable adjustment disorder with mixed anxiety and depressed mood. A follow-up in a tertiary level specialized clinic for FND, with psychiatric and psychotherapeutic input, was recommended. At the following evaluations, the lingual symptomatology appeared stabilized, but the anxiety and depressed mood persisted; hence, sertraline 50mg/die was recommended.

Conclusions: The precipitating factors for the development of FND after Covid-19 vaccination are likely to be ascribed to expectations, beliefs, arousal, and emotional processing, especially in people with biological, social, and/or psychological predisposition[1]. This issue should be dealt on two levels: primary and secondary prevention. First, it would be useful to share vaccine safety data with recipients, to allay their excessive emotional involvement and anxiety; second, prevent the misdiagnosis of FND should be a goal of scientific literature. This could be achieved by studying and acknowledging FND as a possible side effect of the Covid-19 vaccine, in order to be able to promptly recognize the nature of the symptom and to investigate it with adequate examination.

References:

1.Linden, S. C., Carson, A. J., & Wessely, S. (2021). Functional neurological disorder after vaccination: a balanced approach informed by history. The journal of the Royal College of Physicians of Edinburgh, 51(4), 330-331. Doi: 10.4997/JRCPE.2021.403

2.Ercoli, T., Lutzoni, L., Orofino, G., Muroni, A., & Defazio, G. (2021). Functional neurological disorder after COVID-19 vaccination. Neurological Sciences, 42(10), 3989-3990. Doi: 10.1007/s10072-021-05504-8

FUNCTIONAL NEUROLOGICAL DISORDER MISDIAGNOSED AS A NEURODEGENERATIVE CONDITION IN THE "NEW BRUNSWICK CLUSTER OF A NEUROLOGICAL SYNDROME OF UNKNOWN CAUSE"

Gabriela Gilmour (University of Toronto, gsgilmou@ucalgary.ca*), Sarah Lidstone, Anthony Lang*

Objective: To describe a patient with functional neurological disorder (FND) misdiagnosed as having a neurodegenerative condition as part of the “New Brunswick Cluster of a Neurological Syndrome of Unknown Cause.”

Background: The story of a mysterious neurological syndrome affecting 48 patients has received significant media attention. Investigation by Public Health New Brunswick has concluded that the patients do not have a common illness, leaving many without answers.

Results: The patient was a 20-year-old woman with a history of migraine and anxiety, referred for a second opinion for two years of fatigue, myoclonus, generalized weakness and cognitive symptoms. This began after an event where she slept for 24 hours and was then found to be acutely confused and ataxic. She then started struggling with fatigue, generalized weakness and difficulty ambulating, with symptoms progressively worsening and new symptoms accumulating. Extensive investigations were unremarkable, leading to her being added to a cluster of patients with an unknown neurological syndrome. On assessment, she had positive features of FND including Hoover sign and variability. Her diagnosis was revised to FND.

Conclusions: This case draws attention to the considerable iatrogenic harm associated with misdiagnosing other conditions in patients with FND. Our patient stopped driving and attending university, underwent countless investigations, experienced an exacerbation of her anxiety, and was told that her illness was likely fatal. Additionally, emergency medicine physicians and a neurologist failed to consider FND on the differential diagnosis during assessments. A challenge faced by our team was communicating the diagnosis of FND when alternate illness beliefs have been reinforced by other healthcare providers and the media.

FACTORS INFLUENCING TRIAGE TO REHABILITATION IN FUNCTIONAL MOVEMENT DISORDER

Gabriela Gilmour (University of Toronto, gsgilmou@ucalgary.ca*), Laura Langer, Haseel Bhatt, Keschey Marcelle, Lindsey MacGillivray, Sarah Lidstone*

Objective: To explore the clinical factors that are associated with triage to therapy in patients with functional movement disorder (FMD).

Background: FMD is a treatable, complex neuropsychiatric condition that responds best to individualized management using physical and psychological therapies. Little is known regarding treatment specificity and factors predicting eligibility for rehabilitation.

Methods: A retrospective chart review was done for patients evaluated in our FMD Rehabilitation Clinic from July 2019 to December 2021. Patients were referred following FMD diagnosis to assess suitability for rehabilitation. Eligible patients were enrolled in integrated therapy (IT)[1] or physiotherapy (PT), and ineligible patients were offered education and recommendations. All treated patients were included, with an age-matched group of untreated patients. Records reviewed included movement disorders consultation, integrated FMD assessment, videos, and intake questionnaire. Demographic and clinical factors were extracted across neurologic and psychiatric domains by a single reviewer, and verified by two additional reviewers on a case-by-case basis.

Results: Eighty-two patients were included: 44 treated and 38 untreated. Of those treated, 20 were triaged to IT and 24 to PT. Psychotherapy was recommended for 3 of the untreated patients. When comparing between treated and untreated groups, the factors significantly associated with triage to therapy included hyperarousal on examination ($p=0.008$), anxiety ($p=0.018$), readiness for change ($p<0.0001$) and a trend to lower total symptom count ($p=0.059$). Persistent diagnostic resistance was associated with treatment ineligibility ($p<0.0001$). Symptom duration, phenotype, pre-assessment diagnostic confidence and confidence in improvement with treatment were not associated with triage outcome.

Conclusions: In this preliminary analysis, the most important factors for triage to rehabilitation were hyperarousal, anxiety and “readiness for change.” Importantly, symptom duration and phenotype are not significant factors, which shows that triage outcome to some extent depends on factors not readily captured in standard assessments but that are relevant in FMD. There are multiple reasons why rehabilitation may not be suitable for a patient, most commonly persistent diagnostic resistance. Further research is required to define these concepts and determine what factors are predictive of treatment response.

References:

1. Lidstone SC, MacGillivray L, Lang AE. Integrated Therapy for Functional Movement Disorders: Time for a Change. Mov Disord Clin Pract 2020;7:169–74. doi:10.1002/mdc3.12888

FUNCTIONAL MOVEMENT DISORDER IS ASSOCIATED WITH ABNORMAL INTEROCEPTIVE ACTIVITY IN THE POSTERIOR CINGULATE CORTEX AND CAUDATE NUCLEUS: A FUNCTIONAL MRI STUDY

Primavera Spagnolo (Brigham and Women's Hospital/Harvard Medical School, pspagnolo@bwh.harvard.edu*), Jacob Parker, Sepideh Akbari Panahi, Mark Hallett, Silvina Horovitz*

Objective: This study was aimed at uncovering the neural bases of interoceptive attention processing, which refers to the conscious focus on somatic and visceral signals, and at assessing subjective levels of interoceptive bodily awareness, in subjects with Functional Movement Disorder (FMD).

Background: A developing area of research suggests that abnormal interoception - the sense of the internal state of one's body - may represent an important clinical feature of FMD. However, to date, the neural processes underlying dysfunctions in interoceptive attention have never been investigated in this population.

Methods: A well-established Interoceptive was implemented. Attention task and compared functional magnetic resonance imaging (fMRI) blood oxygenation level-dependent responses between subjects with hyperkinetic FMD (n= 13) and healthy control subjects (n = 13). During the task, subjects were required to focus on somatic and visceral interoceptive sensations, and on exteroceptive stimuli. The interoceptive attention conditions included heartbeat, stomach, and the affected limb. A whole-brain voxel-wise analysis was conducted to examine group-differences between conditions, after correcting for sex, age, and anxious and depressive symptomatology ratings. In addition to the fMRI scan, subjects completed a questionnaire to assess subjective levels of interoceptive bodily awareness.

Results: Voxel-wise analysis indicated that relative to the healthy control subjects, FMD patients exhibited increased activity bilaterally in the posterior cingulate cortex (PCC) and in the caudate nucleus (CN) during interoceptive processing versus exteroceptive processing ($p < 0.005$). Importantly, the interaction between group and interoceptive modality in both the PCC and CN was driven by group-differences during processing of sensations from the affected limb ($p < 0.005$), whereas no group-differences were observed during heart and stomach interoception. Furthermore, subjective levels of interoceptive bodily awareness did not differ between FMD and healthy controls.

Conclusion: The present study is the first to provide evidence that in FMD patients interoceptive attention to signals arising from the limb presenting abnormal movements is associated to heightened activity in the PCC, a key region regulating the focus of attention and internally-directed cognition, and the CN, which is implicated in planning the execution of movement and in motivation. Abnormal activity in these regions was not detected during heart and stomach interoception, suggesting that interoceptive attention to other somatic and visceral signals is preserved in FMD patients. In line with this observation, no differences were found in self-reported levels of interoceptive bodily awareness between FMD and healthy controls. These findings point to a unique neural substrate underlying abnormal interoceptive attention allocation to functional movements.

RETRAINING AND CONTROL THERAPY (REACT) FOR PEDIATRIC FUNCTIONAL SEIZURES: UNDERLYING EFFECTS ON SELECTIVE ATTENTION, COGNITIVE INHIBITION, AND SENSE OF CONTROL

Lindsay Stager (The University of Alabama at Birmingham, lmstager@uab.edu*), Christina Mueller, Skylar Morriss, Jerzy Szaflarski, Aaron Fobian*

Objective: To assess the underlying mechanisms of treatment response to Retraining and Control Therapy (ReACT) for pediatric functional seizures (FS).

Background: Compared to controls, children and adolescents with FS differ in 1) sense of control and 2) cognitive inhibition and selective attention to seizure-related stimuli[1]. ReACT, an effective treatment for pediatric FS, targets these mechanisms[2].

Methods: Participants with FS (N=17, Mage=15.2, 29% male, 65% White) completed eight sessions of ReACT, reporting FS frequency seven days before (PRE) and post ReACT (POST1). At PRE, POST1, and POST2 (60 days post ReACT) participants completed the Behavior Assessment System (BASC2, mood); a Stroop task with seizure words condition (i.e. "unconscious;" selective attention and inhibition); and magic and turbulence task (MAT; sense of control: magic, lag, turbulence conditions). ANCOVAs controlling for FS change from PRE to POST1 compared Stroop reaction time (RT) across all timepoints and MAT conditions between PRE and POST1. Correlations assessed relationship between change in sense of control (MAT) and FS change. T-tests assessed BASC2 change PRE to POST2.

Results: RT significantly improved for the seizure word Stroop condition at POST2 compared to PRE (p=.02), while RT in the congruent and incongruent conditions did not change across timepoints. Children with FS reported significantly increased sense of control (i.e. awareness that their control was manipulated) in the turbulence condition of the MAT at POST1 vs. PRE (p=.02). This change in sense of control positively correlated with improved FS frequency from PRE to POST1 (p<.01). No other significant outcomes were observed for the MAT. BASC2 somatization was significantly lower at POST2 vs. PRE (p=.04). No differences were observed regarding anxiety (p=.13), social stress (p=.31), or depression (p=.10).

Conclusions: Results indicate greater ability to inhibit attention to seizure symptom words and greater sense of control (i.e. awareness control is manipulated) after ReACT. Increased sense of control was related to improved FS frequency, suggesting sense of control may be a mechanism by which ReACT improves FS. Somatization significantly improved after ReACT, but not anxiety, social stress, or depression, consistent with research finding differences in somatization but not anxiety, social stress or depression in children with FS compared to matched controls. This suggests FS can be targeted directly, allowing for dissemination of brief FS interventions to expand access to treatment. Given high mood comorbidity, mood assessment is still needed.

ASSESSMENT OF OUTCOMES OF PATIENTS WITH FUNCTIONAL MOVEMENT DISORDERS (FMD) RECEIVING A PHYSIOTHERAPY DELIVERED INTERVENTION AS PART OF A CROSS SPECIALITY MULTIDISCIPLINARY TEAM APPROACH TO IMPROVED FUNCTIOINING

Kieran Doherty (Health Services Executive, Ireland, dohertykieran@gmail.com*), Liz O' Sullivan, Sinead Gallagher, Sean Crowley, Gerard Moloney, James Kinahan, Eugene Cassidy, Gerard Clarke, John Cryan, Fiona Campbell, Brian Sweeney, Eric Kellehe*

Objective: To measure functional change, mental-health outcomes and inflammatory markers in patients with functional movement disorder (FMD) pre and post a physiotherapy-delivered intervention as part of a multi-disciplinary team (MDT) approach to recovery.

Background: FMD occurs frequently in neurology services and leads to significant distress, disability and healthcare costs.[1] Possible underlying mechanisms include low grade systemic inflammation.[2] There are limited outpatient MDT services for patients in Ireland.

Methods: An MDT treatment pathway was established. Patients newly diagnosed with FMD received psychoeducation from consultants in neurology, liaison psychiatry and senior clinical physiotherapists. Following ethical approval, they were invited to participate in an individualised physiotherapy programme delivered by neurophysiotherapists with expertise in FMD for up to 8 weeks. Participants were assessed pre and post this intervention using validated tools; EQ 5D 5L Health Questionnaire, Workplace and Impairment Questionnaire, Short Form 36 Health Questionnaire and the Hospital Anxiety and Depression Scales (HADS). Serum and saliva samples were collected at each time point to analyse cortisol and inflammatory markers (cytokines).

Results: Eleven participants: five males and six females, median age 46 years completed the programme. Nine participants completed follow-up. Patients demonstrated improved outcomes at the completion of the programme as evidenced by significant improvements using the research measures (p=<0.05). There were no clinically significant change on HADS however (p=0.07). [Table 1]

Table 1. Clinical measure scores pre and post physiotherapy intervention.

Assessment measure	Pre-Mean Score N=11	Post- Mean Score N=9	p-value
EQ-5D-5L			
Improved General Health	54	73	<0.05
Short-Form 36			
Physical Functioning	43	79	<0.05
Fatigue	26	55	<0.05
Emotional Wellbeing	48	68	<0.05
Workplace & Impairment questionnaire			
Impact on clinical symptoms	5	3	<0.05
HADS	18	14	=0.07

Distance walked in m/sec	0.32	11	<0.05

There was no change in participants' salivary cortisol response. Alterations in inflammatory cytokines was suggested following the intervention e.g. IL-10, IL-4. [Figure 1]. No participants experienced relapse following the intervention.

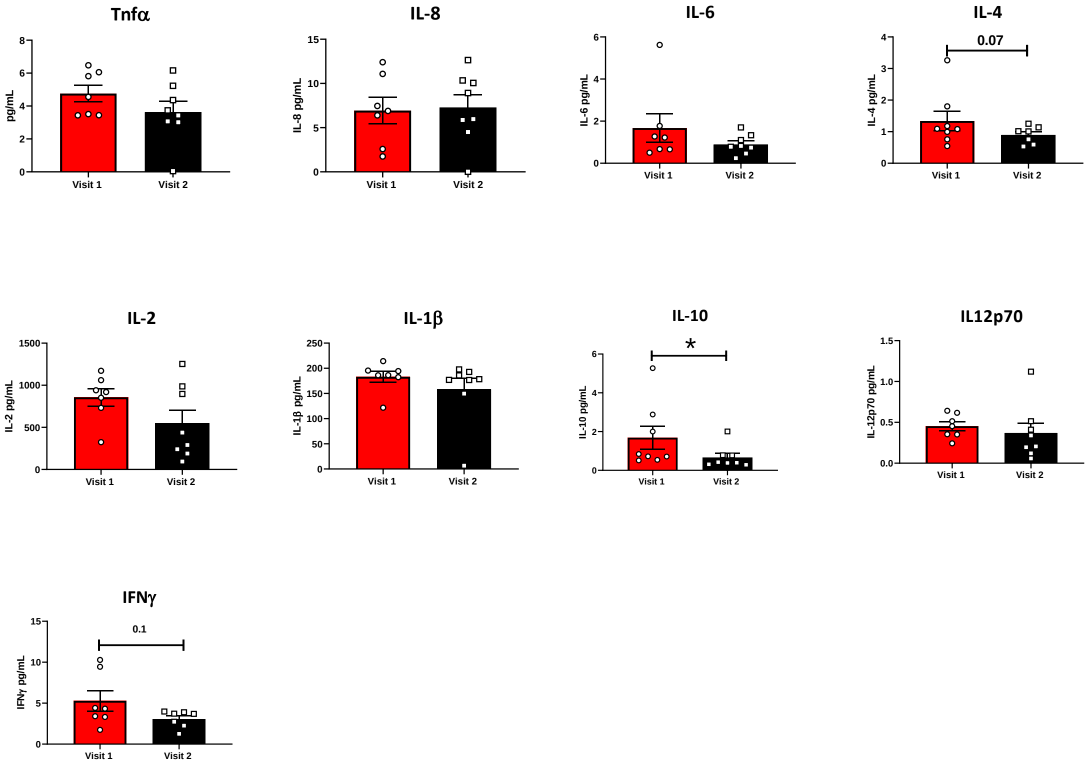


Figure 1. Inflammatory cytokines pre and post physiotherapy intervention.

Conclusion: Investment in dedicated novel specialist physiotherapy, as part of an MDT approach, resulted in functional rehabilitation of participants and cost-savings through delivery of care in an outpatient setting. This successful pilot study demonstrates the feasibility of this intervention in an Irish outpatient setting. Inflammatory cytokine changes following the intervention may suggest a role for inflammation in the mechanism of disease, although sample size was limited. This study provides support for further, larger scale research investigating the role of inflammation in FMD pathogenesis and investment in specialist outpatient neurophysiotherapist interventions as part of FMD recovery.

References:

1. Pringsheim T, Edwards M. Functional movement disorders: Five new things. Neurol Clin Pract. 2017 Apr; 7(2):141-147.

2. Rohleder N. (2014). Stimulation of systemic low-grade inflammation by psychosocial stress. Psychosom. Med. 76, 181–189.

SOCIAL DEMOGRAPHIC AND EPIDEMIOLOGICAL PROFILE OF PATIENTS TRATED AT A SPECIALIZED SOMATIC DISORDER OUTPATIENT SERVICE (SOMA) AT INSTITUTE OF PSYCHIATRY, UNIVERSITY OF SÃO PAULO - BRASIL

Eduardo Mutarelli (FMUSP, mutarelli@dfvneuro.com.br*), Bruna Bartorelli, Felipe Lessa da Fonseca*

Objective: To trace the sociodemographic and epidemiological profile of patients treated at the Somatic Symptoms Disorder Outpatient Clinic (SOMA), aiming to determine the frequency and the diagnostic variability involved in the spectrum of somatic symptoms referred to the service

Background: Literature review varies between studies of certain bodily symptoms and assessment of the prevalence of somatic symptoms diagnoses at primary care level. There is a lack of studies on the diagnostic frequencies in the spectrum of somatic symptoms in outpatient at the secondary care level

Methods: A cross-sectional study collected data from 43 patients, through structured interviews applied to 50% of the universe of patients regularly seen at the outpatient clinic. Between February and April 2020, patients were interviewed in series, composing an intentional sampling of typical cases. The observation of the clinical characteristics of each case was discussed by the interdisciplinary team to determine the diagnosis according to DSM-5 criteria. The application of a sociodemographic questionnaire ensured the collection of primary data. The present investigation is part of a broad service survey, including the application of multiple psychometric instruments, and partial results. The data received statistical treatment, considering a margin of error of two percent, although the sample size allowed a careful analysis of all cases.

Results: The majority (65%) of cases were diagnosed with FND; 18.6% with SSD and 16.28% with FD. Nine percent recorded comorbidity with Illness Anxiety Disorder. There are 81.4% of females. The majority over 50 years old, with the average age at 48.25 years old and the median at 47 years old. The self-identification was mainly as white, 51%; 25% identified as brown, and 20% as black. Altogether, 51% declared being married or having a marital life. The Christians are 69.76% (39% Catholic; 30% Evangelical); 16% of other religions and 9.3% declared no religion. About 30% are on professional medical leave and 19% retired by disability; 26% unemployed and 19% on working. Most, 65.1%, are between elementary school II (27.9%) and high school (37.2%) and only 20% have higher education. Still, 6.98% declared to have studied only up to elementary school, and another 6.98% declared to be illiterate.

Conclusions: Secondary care in a specialty outpatient clinic shows a significant number of FND cases, reflecting a spontaneous screening that must occur on the primary care. These cases pose diagnostic difficulties related to the specificity of symptoms, and require a careful case-by-case analysis to define the main diagnosis – considering comorbidities and differential diagnoses. Served population profile reflects the social prevalence; predominance of women (8:1) and middle age (average 48.25). Marital status, religious distribution and ethnic proportion reflect Brazilian demography. Just 19% are in professional activity reflecting the high disability expected. Service's epidemiology helps to refine diagnostic criteria, however, for better contrast between known prevalence and diagnostic frequency in secondary care, the studies must continue.

References:

Chander KR, Manjunatha N, Binukumar B, Kumar CN, Bada Math S, Janardhan Reddy YC. The prevalence and its correlates of somatization disorder at a quaternary mental health center. Asian J Psychiatr. 2019 Apr;42:24-27. doi: 10.1016/j.ajp.2019.03.015. Epub 2019 Mar 26. PMID: 30947092.

INTEGRATED CARE MANAGEMENT ACROSS STATE LINES OF PERSISTENT POST CONCUSSION SYMPTOMS AND FND: A CASE REPORT

Julie Hershberg (re+active Physical Therapy & Wellness, julie@re-activept.com*), Allan Wu*

Background: Persistent post concussion symptoms (PPCS) can be classified as a form of functional neurological disorder (FND), both with similar pathophysiologies.[1,2,3,4] Interdisciplinary treatment approaches including psychological, physical, and occupational therapies and have been shown to be effective in improving outcomes in patients with FND and PPCS.[5,6] The overlap of symptoms and treatment approach for FND post concussion has not been described. This case report of a 23-year-old female with functional weakness, sensory symptoms, tremor, and visual and vestibular dysfunction post concussion, illustrates the functional, physical and psychosocial outcomes of a two week integrated treatment approach that was coordinated with providers across many states in the US.

Methods:

The client is a 23-year-old female, physical therapy student and collegiate soccer player with primary symptoms of dizziness, visual sensitivity and tremors. She has a past medical history of eating disorder, thyroid and growth hormone imbalances and multiple concussions in 2019. Care was coordinated by several providers across the USA.

The client participated in a two-week intensive program with five sessions of Physical Therapy and Occupational Therapy and three sessions of Neuropsychology over a two-week period. Weekly team meetings took place to discuss presentation, approach, goals and progress. She had a telehealth follow up session four months after discharge to progress self management routine. The intervention was focused on clarifying the diagnosis, education, and providing tools for self-management. According to the client, the most impactful part of the program was integrated team meeting with PT and the movement disorder neurologist to discuss the diagnosis and confirm her functional neurologic symptoms. Preparatory communications among all sites on map preceded team meeting to balance confidence in diagnosis with challenges in making the diagnosis with sufficient confidence when neurologist delivering the diagnosis was only able to evaluate via telemedicine. Greater than half of each treatment session time included education about symptoms and the connection of symptoms to her neurologic systems, especially autonomic.

Results: The client was assessed before and after her two-week program and then four months later at a follow up. She demonstrated improvements in her function with less avoidance of activities; improved anxiety and depression; and less intensity of her concussion symptoms after two weeks. She maintained or slightly regressed in all measures at a four month follow up.

Conclusions: This case report supports an integrated team approach across state lines for a client with post-concussion related FND symptoms. The client was able to improve her mood, anxiety, decrease activity avoidance, and improve her functional symptoms through a two-week program. Emphasis on education and diagnosis was the most impactful part of her program. Functional symptoms post concussion can be complex with multiple mechanisms indicating a need for a team based approach. Addressing underlying autonomic dysfunction and providing self management tools may be successful. This client continues to have symptoms while in PT school, particularly related to visual sensitivity and will continue to benefit from ongoing treatment.

References:
1. Farrell, G., Chapple, C., Kennedy, E., Sampath, K., Gisselman, A. S., Cook, C., & Tumilty, S. (2021). Dysfunction of the stress response in individuals with persistent post-concussion symptoms: a scoping review protocol. Physical Therapy Reviews, 26(6), 467-480.

2. Biagianti, B., Stocchetti, N., Brambilla, P., & Van Vleet, T. (2020). Brain dysfunction underlying prolonged post-concussive syndrome: a systematic review. Journal of affective disorders, 262, 71-76.

3. Maurer CW, Liu VD, LaFaver K, Ameli R, Wu R, Toledo R, Epstein SA, Hallett M. (2016) Impaired resting vagal tone in patients with functional movement disorders. Parkinsonism & Related Disorders, 30, 18-22.

4. Baizabal-Carvallo, J. F., Hallett, M., & Jankovic, J. (2019). Pathogenesis and pathophysiology of functional (psychogenic) movement disorders. Neurobiology of Disease, 127, 32-44.

5. Polinder, S., Cnossen, M. C., Real, R. G., Covic, A., Gorbunova, A., Voormolen, D. C., ... & Von Steinbuechel, N. (2018). A multidimensional approach to post-concussion symptoms in mild traumatic brain injury. Frontiers in neurology, 9, 1113.

6. Hebert C, Behel JM, Pal G, Kasi R, Kompoliti K. Multidisciplinary inpatient rehabilitation for Functional Movement Disorders: A prospective study with long term follow up. Parkinsonism Relat Disord. 2021 Jan;82:50-55. doi: 10.1016/j.parkreldis.2020.11.018. Epub 2020 Nov 21. PMID: 33248393.

IDENTIFYING MISCONCEPTIONS AND KNOWLEDGE GAPS IN FUNCTIONAL NEUROLOGIC DISORDERS AMONG EMERGENCY CARE PROVIDERS

Jeryl Yu (Center for Neurological Restoration, Neurological Institute, Cleveland Clinic, jerylyu@gmail.com*), Umar Shuaib, Claire Sonneborn, Olivia Hogue, Kedar Mate, Xin Xin Yu*

Objective: To identify the current knowledge, perceptions and management of FND by ED providers.

Methods: This is a cross-sectional analysis of survey from ED providers and advanced practice providers (n=273) within the Cleveland Clinic Foundation Northeast Ohio network. Electronic surveys were created using a secure web application (REDCap) and sent to providers and data recorded anonymously. Data were collected on practice profiles of the providers, knowledge, attitudes, management of FND, and awareness of available resources for FND.

Background: Functional Neurologic Disorders (FND) are common but heterogeneous group of disabling conditions. FND are frequently misdiagnosed, receive inadequate care resulting in loss to follow-up, and dissatisfaction. Often, the Emergency Department (ED) is the first point of contact when patients with FND are faced with a crisis or exacerbation of symptoms.

Results: Sixty of 273 completed the survey (22% response rate; n= 50 ED physicians, 10 advanced care providers) with 60% (n=36) evaluating between one to five people with FND per month. 95% (n=57) reported lack of understanding about FND. For knowledge about FND, 77% (n=44) indicated slight to somewhat understanding of FND with 60% (n=36) reported using Psychogenic Nonepileptic Seizures and 58% (n=35) using stress induced/stress related disease [Figure 1]. 90% (n=53) rated their experience with managing FND patients as at least more difficult than 10% (n=6) rating no different. 85% (n=51) agreed with “rule out others” and 60% (n=36) agreed with “caused by psych stress” [Figure 2]. 87% (n=53) differentiated FND from factitious or malingering disease. Only one respondent was familiar with any FND resources and 79% (n=47) reporting the need for FND specific educational materials.

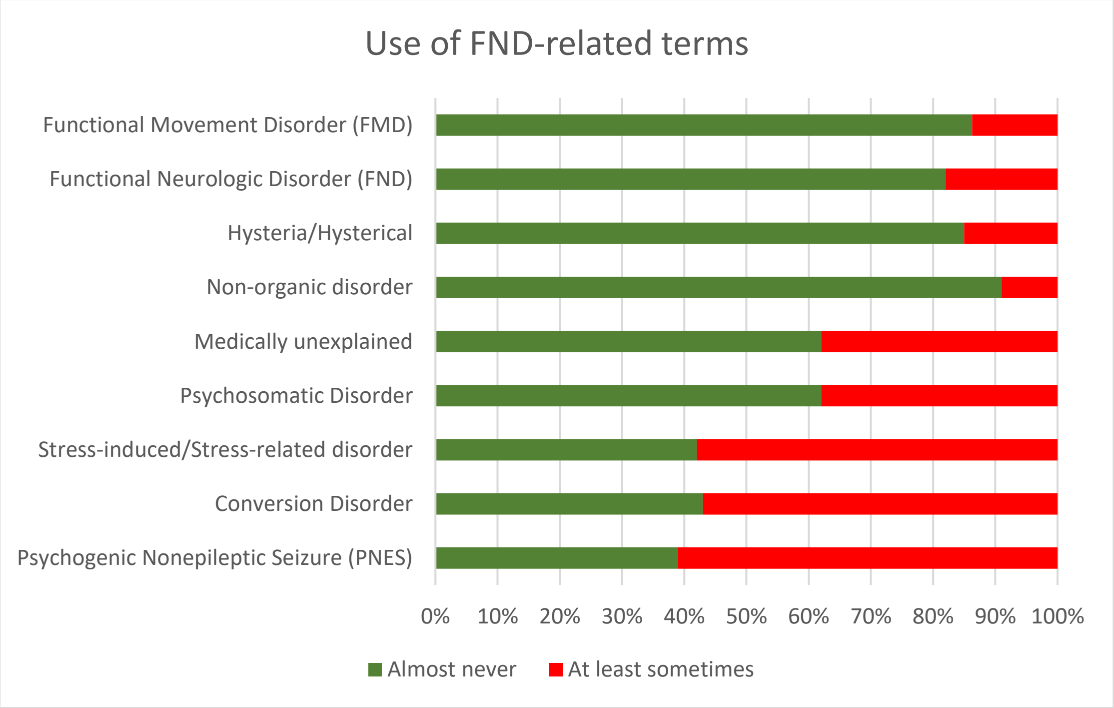


Figure 1. Use of FND-related terms

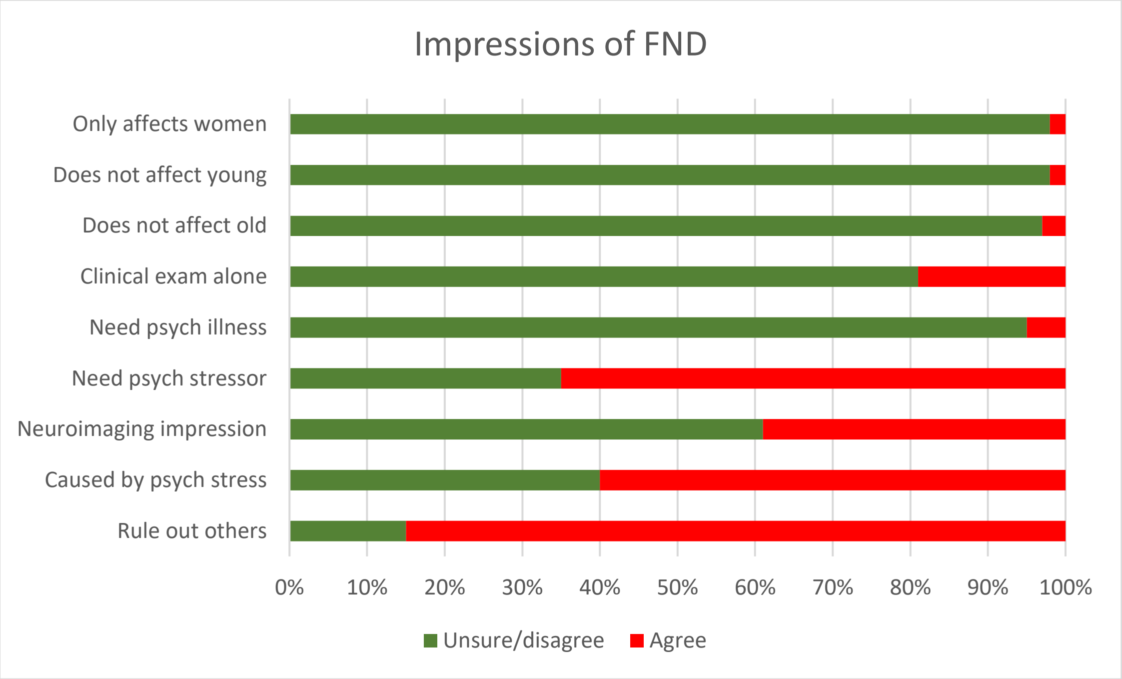


Figure 2. Impressions of FND

Conclusion: This survey revealed major gaps in knowledge, perceptions and management about FND among ED providers. The survey results provide an opportunity for education strategies about FND. A timely diagnosis and treatment of FND is crucial to avoid unnecessary testing, iatrogenic harm and in turn helps to improve patient care and likelihood of recovery.

FAMILY FUNCTIONING AS A PREDICTOR OF ADOLESCENTS' FUNCTIONAL SEIZURE FREQUENCY ONE-YEAR AFTER RETRAINING AND CONTROL THERAPY (REACT)

Caroline Watson (The University of Alabama At Birmingham, cswatson@uab.edu*), Lindsay Stager, Jerzy Szaflarski, Aaron Fobian*

Objective: To assess family functioning as a predictor of adolescents' functional seizure (FS) frequency one-year after completing Retraining and Control Therapy (ReACT) for pediatric FS.

Background: ReACT retrains FS by helping patients regain control of symptoms. In an RCT, all patients had no FS in the 1 week after ReACT, [1] and 57% had no FS 1 year after ReACT.[2] Research is needed to identify factors predicting maintenance of treatment gains.

Methods: Ten adolescents with FS (M=15.30 years, SD=2.03; 80% female, 60% White) completed eight sessions of ReACT. At baseline, parents completed a demographics questionnaire, and seven days after ReACT, children with FS completed the Family Assessment Device (FAD), which assessed family functioning on seven subscales: problem solving, communication, roles, affective responsiveness, affective involvement, behavioral control, and general functioning. One year after ReACT, adolescents reported FS frequency in the past 30 days. Bivariate correlations assessed the linear relationships between FAD subscale scores and FS frequency at one year post ReACT. Linear regressions assessed the predictive relationship between significant outcomes and FS frequency at one year.

Results: Pearson correlations indicated a significant negative association between affective responsiveness and FS frequency at one year (r(8)=-.80, p=.03). Behavioral control was also negatively correlated with FS frequency at one year (r(8)=-.82, p=.025). There were no other significant correlations. A simple linear regression revealed that post-treatment affective responsiveness and behavioral control explained 81% of the variance in FS frequency at a one year follow-up (Adjusted R2 =.810, F(2,4)=8.54, p=.04).

Conclusions: Results suggest that family functioning affects long-term maintenance of FS treatment outcomes following ReACT. Since ReACT retrains FS by providing patients with a plan for regaining control of movements,[2] adolescents in families with increased behavioral control may be better equipped to continue the treatment plan due to frequent modeling and reinforcement of behavioral control by family members. Further, families with increased affective responsiveness may be more supportive of the patient after treatment, which may contribute to treatment adherence. This suggests that targeting behavioral control and affective responsiveness within the family during treatment may be beneficial in increasing long-term maintenance of FS improvements.

References:

1. Fobian, A.D., Long, D.M., & Szaflarski, J.P. (2020). Retraining and control therapy for pediatric psychogenic non-epileptic seizures. Annals of Clinical and Translational Neurology, 7(8), 1410-1419. Doi: 10.1002/acn3.51138.

2. Stager, L., Szaflarski, J.P., Fobian, A.D. (2021). One-year follow-up of treatment outcomes and patient opinions of Retraining and Control Therapy (ReACT for pediatric functional seizures. Epilepsy and Behavior Reports, 16. Doi: 10.1016/j.ebr.2021.100503.

OUTCOMES OF VIRTUAL AND HYBRID REHABILITATION FOR FUNCTIONAL MOVEMENT DISORDER

Haseel Bhatt (University Health Network, haseel.bhatt@uhn.ca)*, Keschey Marcelle, Laura Langer, Gabriela S. Gilmour, Lindsey MacGillivray, Sarah Lidstone*

Objective: To investigate the feasibility and clinical efficacy of pilot virtual and hybrid rehabilitation programs in patients with Functional Movement Disorder (FMD).

Background: FMD can be effectively treated using physiotherapy, psychotherapy, and interdisciplinary rehabilitation. Virtual FMD therapy has not been well-explored and presents an opportunity to improve access to specialized care.

Methods: Eligible consecutive patients seen in the University Health Network's FMD rehabilitation clinic were triaged to receive either integrated therapy (IT) or physiotherapy alone (PT) in a time-limited program between March 2020 and December 2021. Patients received six to nine, 45-minute treatment sessions, delivered bi-weekly over three months. The IT intervention was delivered by a neurologist, psychiatrist and physiotherapist and all patients received hybrid therapy (four in-person and two virtual sessions). The PT intervention consisted of motor retraining alone and patients received either hybrid (PT) or completely virtual therapy (vPT). Treatment outcomes included the S-FMDRS and CGI-I scale at baseline and three months.

Results: Forty-three patients were enrolled into the program (35% male, mean age, 48.9 ± 15.3 yrs, mean symptom duration, 5.9 ± 6.3 yrs) and 37 patients were treated (IT, n=16, PT, n=13 and vPT, n= 8). Virtual (95%) and in-person (94%) visits were well-attended. The most common FMD phenotypes were gait disorder (55%), tremor (49%) and weakness (26%). All patients reported pain and fatigue. A 72% improvement in S-FMDRS was seen (11.3 ± 8.1 to 3.2 ± 4.0, $p<.0001$) and demonstrated a moderate, positive correlation with CGI-I scores (rho=0.65254, $p<.0001$). Improvements were seen across all treatment streams (IT, n=11/16, PT, n=6/13, vPT, n=7/8) based on a "much" or "very much improved" score on the CGI-I rating scale.

Conclusions: Virtual rehabilitation – either alone or in a hybrid model - is a feasible treatment option for patients with FMD and may offer additional benefits and unique challenges to traditional in-person care. Future research aims to explore these benefits and challenges, capture meaningful clinical outcomes and identify participants most appropriate for rehabilitation, both in-person and virtually.

References:

Lidstone, S., MacGillivray, L., & Lang, A. Integrated Therapy for Functional Movement Disorders: Time for a Change. Mov Disord Clin Pract 2020; 7.

Nielsen G, Stone J, Matthews A, et al. Physiotherapy for functional motor disorders: a consensus recommendation. J Neurol Neurosurg Psychiatry. 2015;86(10):1113-1119. doi:10.1136/jnnp-2014-309255

PILOT STUDY ON THE POSSIBLE USE OF AUGMENTED REALITY AND VIRTUAL REALITY TO IMPROVE MOTOR PERFORMANCE IN MOTOR FUNCTIONAL NEUROLOGICAL DISORDER

Joaquin Penalver de Andres (Bern University Hospital, jpenalverandres@gmail.com*), Samantha Weber, Nicolas Wenk, Manuela Steinauer, Karin A. Buetler, Laura Marchal-Crespo, Selma Aybek*

Objective: To test whether motor performance in FND patients suffering from upper limb motor symptoms is influenced by the visual feedback of their own arm or a virtual arm, using augmented and virtual reality techniques.

Background: It has been postulated that FND patients spent too much time looking at their affected arm which may contribute to disrupting loops of agency regulation. Manipulating the visual feedback with a virtual arm may change this and influence motor performance.

Methods: Thirteen FND patients (three suffering from bilateral and 10 suffering from unilateral upper limb motor symptoms) and thirteen age and gender-matched healthy controls (HC) completed a motor task (reaching fruits appearing in front of them) in three visualization modalities: augmented reality (AR) where they could see their own real arm, virtual reality (VR) where they could see an embodied avatar of the arm and assisted virtual reality (AVR) where the computer facilitated the movement of the avatar without the participant knowing. These were presented in random order and interleaved with a real task (touching real tangible styrofoam spheres) (RT) in a within-subject design [Figure 1]. Participants' upper-limb, head, and eye movements were recorded using the HTC Vive Pro Eye system featuring the ZedMini stereo camera to implement AR. We computed the quality of movement and the loci of visual attention.

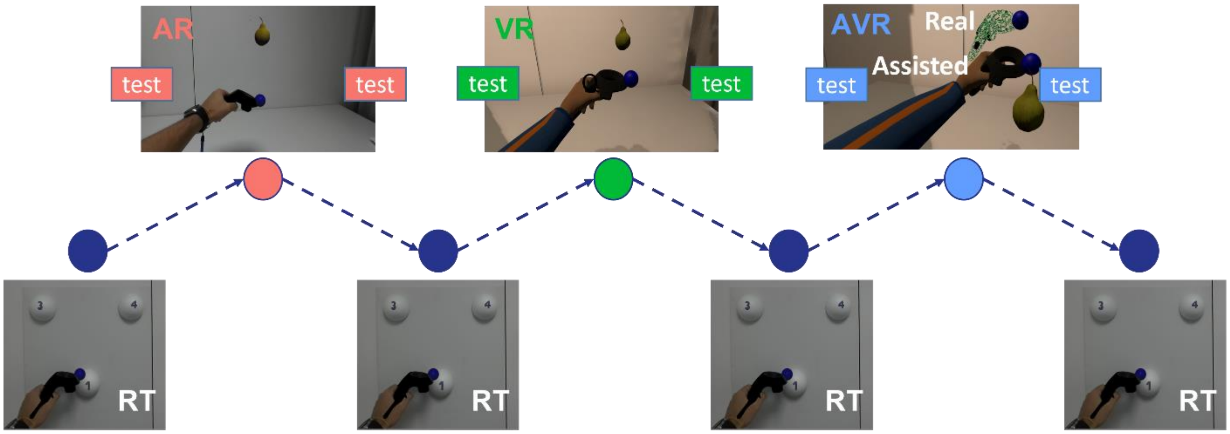


Figure 1. Study set-up. RT: Real Task; AR: Augmented Reality; VR: Virtual Reality; AVR: Assisted virtual reality displaying the assisted arm while the real arm remains unseen by participants.

Results: FND patients displayed less straight movements (p = 0.02; [Figure 2 A] and executed less smooth movements (i.e., number of velocity peaks; p = 0.04; [Figure 2 B].measured in the virtual task after practice, as compared to HC. No interaction between modality x participant type was found. Both FND patients and healthy controls looked more often at parts of their bodies while using the AR visualization than with the other modalities (p < 0.0001; [Figure 2 C].

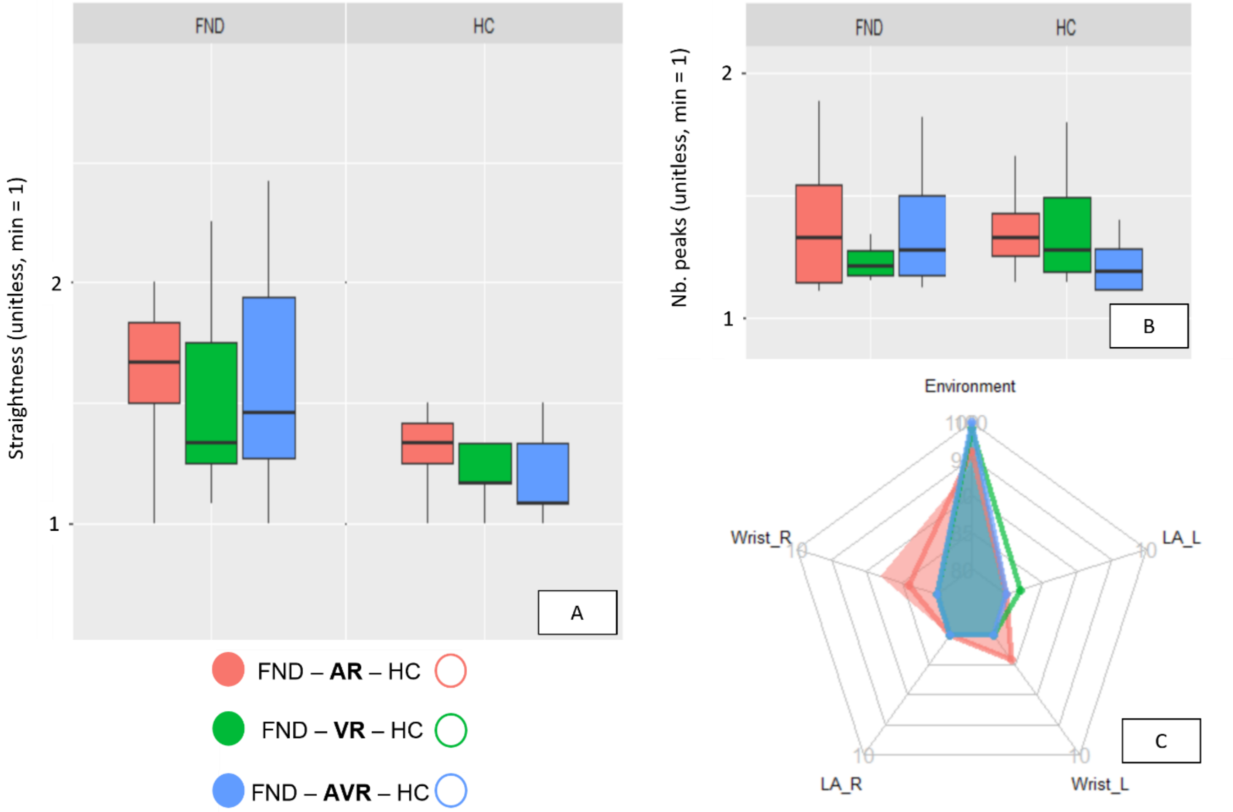


Figure 2. Straightness and number of peaks per modality and participant type. A straightness of 1 and 1 number of peak is the best possible metric value, with values increasing showing motor quality degradation. The percentage of trials on which each body part (Wrist, Lower Arm (LA) of the Right and Left arms) or rest (Environment) was observed per modality and participant type. The percentage range is 0-10% for body parts and 80-100% for Environment.

Conclusions:

So far, this pilot study has shown a group effect with FND patients demonstrating, as expected, disrupted motor performance. Patients and healthy controls displayed more visual attention to their body parts than the peripersonal space in AR. Ongoing analyses and inclusion will determine whether virtual reality has an influence on motor performance. Overall, this study protocol shows good feasibility and patients manifested acceptance of the protocol.

PHYSIOTHERAPY IN THE TREATMENT OF FUNCTIONAL SOMATIC SYMPTOMS ON A CHILDREN'S INPATIENT UNIT: A CASE REPORT

Rachel Naunton (Great Ormond Street Hospital, London, rnaunton@googlemail.com*), Sacha EVans*

Objective: To provide an overview of the physiotherapy interventions for a young person presenting with functional somatic symptoms on a children's inpatient unit.

Background: Pervasive arousal withdrawal syndrome (PAWS) can be considered a severe form of functional disorder, consisting of social withdrawal with the inability or refusal to eat, mobilise or speak.[1] Physiotherapy is a key part of the treatment.[2]

Methods: This case report involved the review of electronic patient records to summarise the physiotherapy interventions involved in the care and rehabilitation of an adolescent diagnosed with PAWS. This included review of admission documentation and exit interviews with the patient and her parents. Consent was obtained from the patient and her parents prior to submission of this case report.

Results: There were 137 physiotherapy sessions offered over 18 months including 12 sessions with psychiatry and joint sessions with other members of the team. This was in the context of a structured, therapeutic inpatient unit. The patient participated in 92 sessions and engagement improved as the admission proceeded. A variety of physical and psychological approaches were used, including psychoeducation and explanation of diagnosis (highlighting the mind-body link), validation of difficulties and severity of symptoms, graded physical rehabilitation and challenging unhelpful thoughts. Treatment included hydrotherapy sessions, home and school visits. Regular sessions were held with parents to provide feedback and an opportunity for dialogue.

Conclusions: Physiotherapy is helpful in the treatment of functional symptoms in children. This work involves a balance between supportive and validating approaches with challenges to thoughts or behaviours that may be impeding recovery (e.g. feeling too unwell to engage in sessions). Treatment requires frequent review of approach and outcomes, and close working with parents and the wider team. When the patient was unable to engage, it was helpful to involve two professionals. Regular input is important for therapeutic alliance and a flexible and varied approach to treatment is crucial to adapt to the young person's needs and preferences. Future directions for research could consider readiness to change and establish the most relevant outcome measures.

References:

1. Otasowie J, Paraiso A, Bates G. Pervasive refusal syndrome: systematic review of case reports. Eur Child Adolesc Psychiatry. 2021;30(1):41-53.

2. Nielsen G, Stone J, Matthews A, Brown M, Sparkes C, Farmer R, et al. Physiotherapy for functional motor disorders: a consensus recommendation. Journal of Neurology, Neurosurgery & Psychiatry. 2015;86(10):1113-9.

CUMULATIVE CHILDHOOD TRAUMA, PERCEIVED SEVERITY, AND NON-EPILEPTIC SEIZURE ONSET: A RETROSPECTIVE, OBSERVATIONAL STUDY

Kimberlyn Cook (University of Colorado, kimberlyn.cook@cuanschutz.edu*), Meagan Watson, Sarah Baker, Stefan Sillau, Elizabeth Greenwell, Laura Strom*

Objective: To determine if a relationship exists between quantity or perceived severity of childhood trauma and the latency period between the last traumatic experience reported and the onset of non-epileptic seizures (NES).

Background: Childhood trauma is associated with NES development. Previous research focuses on trauma as a clinical indicator when assessing for NES,[1] using small sample sizes, but little is known about the effects of childhood trauma on latency to NES onset.

Methods: Patient cohort was diagnosed with NES by vEEG (n=266), referred to the University of Colorado NES Clinic, and completed baseline standard of care metrics, including the Childhood Trauma Questionnaire (CTQ). Pearson and Spearman correlations and regressions were used to analyze if number of trauma categories and perceived severity of trauma were associated with latency between age of last trauma reported and NES onset. Partial correlations and adjusted regression controlled for age of last CTQ trauma and number of psychiatric diagnoses. The null hypothesis of no association was tested. Univariate alpha was set to 0.05. All tests were two sided, unless otherwise stated. Statistical analysis was performed in SAS 9.4.

Results: Comparison of number of traumatic experiences and NES onset resulted in a Pearson correlation coefficient (PCC) of p=0.24 (95% CI: -0.19, 0.05) and a Spearman correlation coefficient (SCC) of p=0.82 (95% CI: -0.13, 0.10). Comparison of perceived severity of trauma and NES onset resulted in a PCC of 0.99 (95% CI: -0.12, 0.12) and an SCC of p=0.80 (95% CI: -0.11, 0.14). When adjusting for age of last trauma reported and psychiatric comorbidities, comparison of perceived severity and NES onset resulted in a PCC of p=0.23 (95% CI= -0.05, 0.20) and an SCC of p=0.24 (95% CI= -0.05, 0.20). Traumatic experiences, severity of trauma, and psych comorbidities had no statistically significant bearing on the latency of onset to NES.

Conclusions: A portion of previous studies on trauma and NES have small sample sizes which may contribute some uncertainty about observed relationships. However, in our cohort, statistical analysis did not show significant correlations between quantity of traumatic experiences or perceived severity of trauma with latency to NES onset. Adjusting for psychiatric comorbidities and age of last trauma experienced suggests a trend between perceived severity and NES onset. We postulate given this trend, trauma and psychiatric comorbidities in combination may influence latency between experienced trauma and NES onset. Future research should consider psychiatric comorbidities and age of trauma in combination to better understand this relationship.

References:

1. Lenio, S., et al. (2021). "Validation of a predictive calculator to distinguish between patients presenting with dissociative versus epileptic seizures." Epilepsy & Behavior 116: 107767.

2. Fiszman A, Alves-Leon SV, Nunes RG, D'Andrea I, Figueira I. Traumatic events and posttraumatic stress disorder in patients with psychogenic nonepileptic seizures: a critical review. Epilepsy Behav. 2004;5(6):818-825. doi:10.1016/j.yebeh.2004.09.002

OUTCOME IN FUNCTIONAL TIC DISORDERS DIAGNOSED DURING THE COVID-19 PANDEMIC

Alexander Mathew (University of Virginia, asm6gy@virginia.edu*), Amal Abu Libdeh, James Patrie, Jordan Garris*

Objective: To examine the exposures, phenomenology, social media engagement, and clinical courses of pediatric patients diagnosed with functional tics (FT) during the COVID-19 pandemic and explore factors predicting prognosis.

Background: Cases of pediatric functional tics have risen dramatically worldwide since the beginning of the COVID-19 pandemic and may be associated with social media usage.[1,2] Patient outcomes and prognosticating factors are poorly understood.

Methods: Thirty-one pediatric patients diagnosed with FT at our institution between March 1, 2020, and December 31, 2021 were enrolled. Demographic data, tic phenomenology, and other clinical features including estimates of Clinical Global Impressions Improvement (CGI-I) scores at follow up were obtained from patients' medical records. Twenty patients and their respective guardians provided additional exposure and outcome information by phone interview. Paired tests were performed to assess patient-guardian differences in survey responses. Logistic regression models were constructed with variables of interest to predict probability of any improvement within one month of diagnosis, and probability of substantial improvement at last follow-up.

Results: Patients were 90% female with median age of 15.8 years at diagnosis. The majority reported exposures such as life stressors, viewing tic-like behavior on social media, or close contacts with tics. Tic phenomenology was predominantly complex and varied. Symptom onset preceded diagnosis by a median of 193 days. Overall, patients agreed with the diagnosis and reported significant but not complete improvement (median CGI-I of "much improved") at last follow-up (median 202 days after diagnosis). Median time to initial improvement was 21 days after diagnosis. 5/31 patients never reported improvement and 11/20 noted ongoing interference from tics. Increased time to diagnosis decreased odds of improvement within one month of diagnosis [Figure 1].

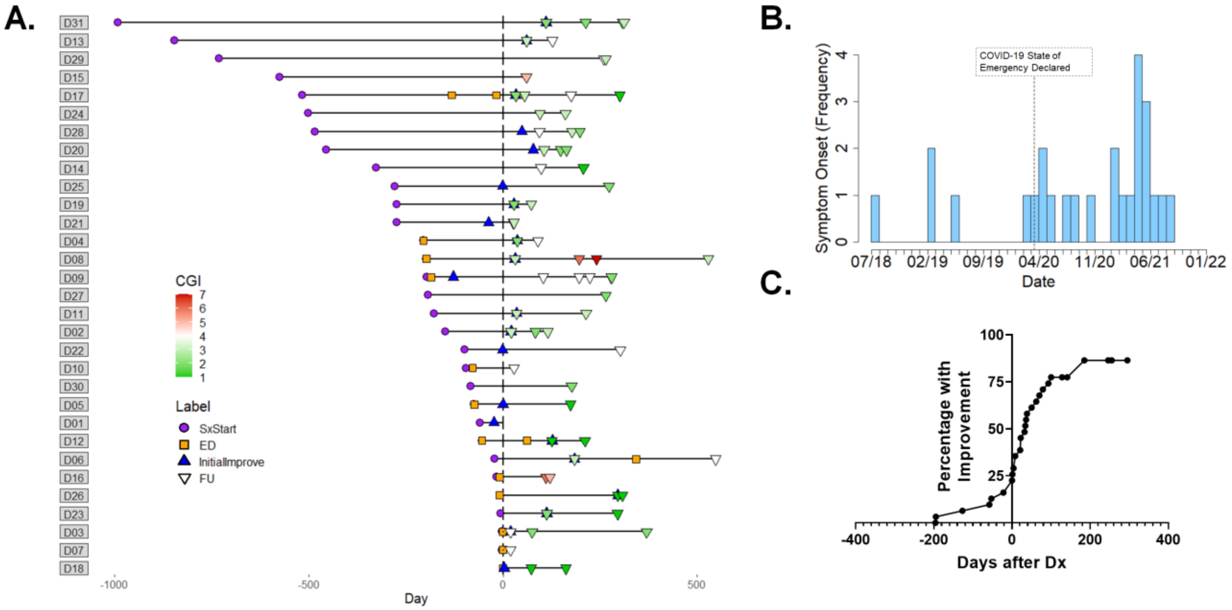


Figure 1.

Conclusions: Similar phenomenology and exposures were found among patients with FT diagnosed during the COVID-19 pandemic as previously reported; newly describe long term FT patient clinical courses. Most patients have rapid improvement but not resolution of symptoms after diagnosis. Often, mild symptoms persist months after initial improvement and continue to cause interference. Time to diagnosis modestly predicted prognosis, consistent with prior studies in functional neurologic disorders. The importance of early diagnosis, minimizing exposure to social media tics, and clear discussion of the diagnosis for patients with FT should be emphazied.

References:

1.Pringsheim, Tamara, et al. "Rapid onset functional tic-like behaviors in young females during the COVID-19 pandemic." Movement Disorders (2021).

2.Paulus, Theresa, et al. "Pandemic Tic-like Behaviors Following Social Media Consumption." Movement Disorders 36.12 (2021): 2932-2935.

DESCRIPTIVE STUDY OF A FUNCTIONAL MOVEMENT DISORDERS MEXICAN COHORT

Daniel Martinez-Ramirez (Tecnologico de Monterrey, Escuela de Medicina y Ciencias de la Salud, daniel.martinez-ramirez@tec.mx*), Brenda Aracely Ventura-Gomez, Mirna E. Davila-Garcia, Jose Roberto Arreola-Martinez, Daniel Leon-Rojas*

Objective: To describe the characteristics of functional movement disorders in a Mexican cohort.

Background: Functional movement disorders (FMD) are among the most challenging movement disorders to diagnose since the presentation is variable in terms of phenomenology and course.[1] Over the past decade, important progress has been made toward better understanding risk factors and effective treatment interventions.[2] However, there is a need to become more knowledgeable and comfortable diagnosing and treating this group of disorders. In the present study, characteristics of a FMD cohort that will help further investigate risk factors, clinical characteristics and possible treatments in our population will be described.

Methods: An observational cross-sectional study was conducted to describe characteristics of a FMD cohort. Patients were selected during the period of 2019 to 2021 from a Movement Disorders Clinic in Monterrey, Mexico. Of 101 FMD patients seen, 78 were included for the analysis. Diagnosis was made based on clinical criteria for FMD by a movement disorders neurologist[2]. Patients were referred to a multidisciplinary team for therapy. Psychiatry reported an improvement if a reduction of at least 30% of the initial symptoms were achieved.

Results: Of 78 FMD patients, 58 (74.4%) were female with 51 (SD 14.7) years. The most common initial symptom was limb tremor 42/78 (53%), and the most common referral diagnosis was Parkinson's disease (32/78, 41%). Of the 27/78 (34.6%) patients that came to psychiatric consult, 13/27(48.1%) showed clinical improvement. We observed that those with longer psychiatric follow-up time (21.2 w vs 9.6 w, p = 0.029), who did not switched pharmacologic therapy (100% vs 57%, p=0.007), and presence of comorbidities (85% vs 50%, p=0.05) reported clinical improvement.

Conclusions: Results suggest that those FMD patients with psychiatric comorbidities and being on psychiatric therapy could benefit their clinical outcomes.

References:

1. Galli, S., Béreau, M., Magnin, E., Moulin, T., & Aybek, S. (2020). Functional movement disorders. Revue neurologique, 176(4), 244–251.

2. Thenganatt MA, Jankovic J. (2019) Psychogenic (Functional) Movement Disorders. Continuum (Minneap Minn), 25(4):1121-1140.

FUNCTIONAL SEIZURES AND THEIR MIMICS AND CHAMELEONS: A RETROSPECTIVE REVIEW OF A TERTIARY VIDEO-TELEMETRY DATABASE

Peter Dudley (University College London Hospitals NHS Foundation Trust, peter.dudley@nhs.net*), Jan Paul Marquez*

Objectives: To identify the proportion of patients referred with putative functional seizures (FS) that were subsequently diagnosed as epileptic seizures (ES) following video telemetry EEG (VT-EEG), and describe the characteristics of those seizures.

Background: Differentiating between ES and FS by patient and witness description alone can prove challenging. While much is published about mis-diagnosis of functional seizures as epileptic in nature,[1] less has been written about the reverse occurrence.

Methods: The reports of VTEEG's performed on patients admitted to the Chalfont Centre for Epilepsy between 2019 and 2021 were reviewed. Recordings that did not capture seizures were excluded. The purpose of referral, accompanying letter and suspected aetiology for each patient's seizures were evaluated and categorized based on the pre-VT-EEG impression as either epileptic, functional, equipoise, or unclear. Subsequently, the EEG reports were categorized based on the EEG findings of the habitual event as either epileptic or functional. Those seizures that had a pre-VT-EEG impression of functional and a post-VT-EEG diagnosis of epileptic were analyzed.

Results: There were 371 VTEEG reports where patients had habitual events recorded. Approximately three percent of patients referred with FS, were subsequently diagnosed as ES. In those patients whose diagnosis was revised from FS to ES, several groups could be delineated. The largest group was of frontal lobe seizures with bizarre semiology. In another group, no ictal abnormalities were present but stereotyped seizures arose in EEG-defined sleep. Others included: patients with insular epilepsy and predominant somato-visceral/autonomic symptoms +/- hyperkinetic movements; patients with multi-focal epilepsy with seizures of variable semiology; and patients with brief focal seizures that were missed by witnesses and were followed by behavioral overlay.

Conclusions: In patients referred to a tertiary epilepsy unit and in whom there is a change in seizure classification, the predominant change is from ES to FS. However, in a minority of cases, seizures previously diagnosed as FS may be reclassified as ES. It is clinically important to be aware of these mimics.

References:

1. Lanzillotti AI, Sarudiansky M, Lombardi NR, Korman GP, D Alessio L. Updated Review on the Diagnosis and Primary Management of Psychogenic Nonepileptic Seizure Disorders. Neuropsychiatr Dis Treat. 2021;17:1825-1838. Published 2021 Jun 4. doi:10.2147/NDT.S286710

SOMATIC EXPERIENCING FOR FUNCTIONAL NEUROLOGICAL DISORDERS: A LITERATURE REVIEW

Yadira Velazquez-Rodriguez (Somatic Experiencing International, scienceandshamanism@gmail.com*)*

Objective: To review the therapeutic methods used in Somatic Experiencing (SE), to determine if they could influence all the etiological models and pathophysiological processes that mediate the origin and maintenance of Functional Neurological Disorders (FND).

Background: The most identified risk factors to cause FND are stressors and trauma, being it mental, physical, emotional, or social. SE is a body-oriented therapeutic model born in 1976 to heal trauma and associated conditions.

Methods: A selective review was performed, to group the etiological and pathophysiological models behind the origin and maintenance of FND. The SE literature was analyzed, to understand their therapeutic techniques, and the FND models it could address. Since overlap exists between the causes and pathophysiology of FND, these were organized as follows [Figure 1]:

- Etiologies: 1) Stressors and trauma, 2) Cognitive-behavioral and hypnotic theories, 3) Unknown, 4) Perpetuating factors
- Pathophysiological mechanisms were grouped as a set of dysfunctional networks in the: I) Neo-cortex, II) Limbic, III) Autonomic (ANS), IV) Somatic systems

SE methods were grouped as cognitive, emotional, ANS and somatic, following its theoretical model

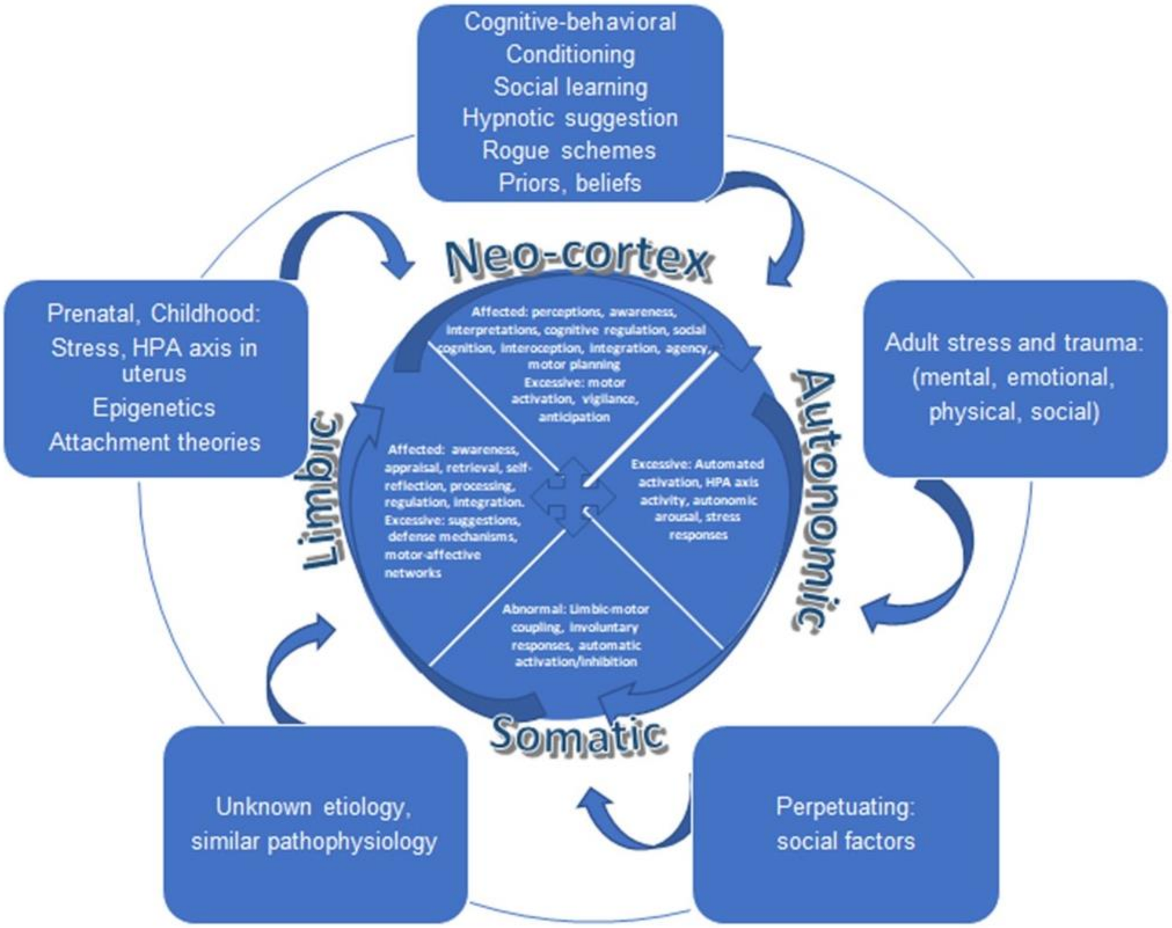


Figure 1. Summary of etiological and pathophysiological models in FND

Results: Some of the SE interventions identified are [Figure 2]:

1. Emphasis on interoception and implicit memory
2. Builds nervous system capacity for organization
3. Tracks, titrates, pendulates, discharges, and stabilizes ANS, affect, somatic and behavioral activation
4. Integrates sensation, impression, affect, memory, and behavior
5. Orients to and organizes neuronal and somatic networks in the present moment
6. Uncouples abnormally linked networks and defense mechanisms
7. Adjusts attachment issues by consolidating implicit-explicit memory
8. Regulates affect
9. Increases resilience
10. Prepares clients to manage activation
11. Helps find meaning in client's experiences, changing beliefs. Educates about stress, trauma physiology, prevention, and recovery

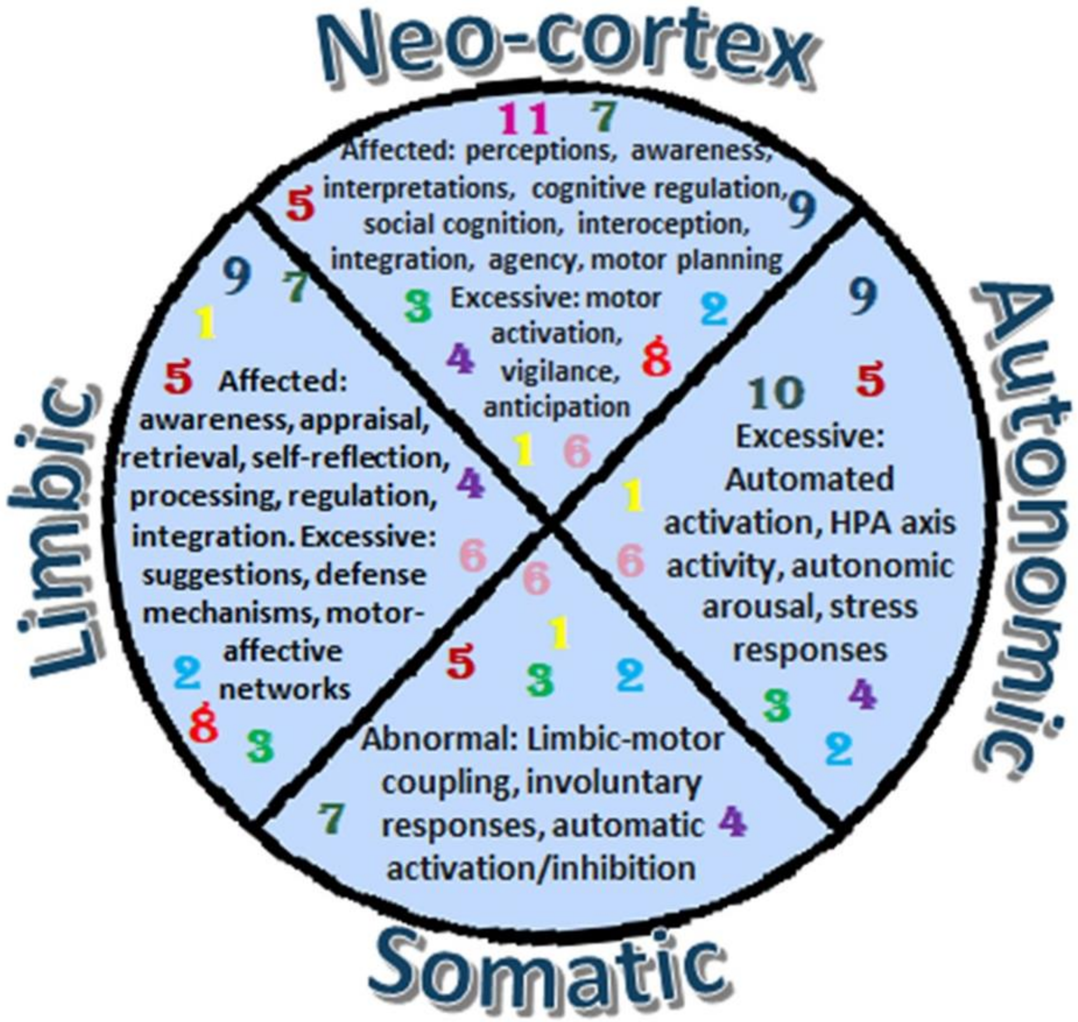


Figure 2. SE interventions represented in colored numbers

Conclusions: SE is a body-oriented therapeutic modality capable of influencing all components involved in the production and maintenance of FND. Prospective clinical research is needed to understand better the extent of its benefits in this population.

References:

Hallett M, Stone J, Carson A, Handbook of Clinical Neurology, Vol. 139, Functional Neurological Disorders, Elsevier, 2016

Somatic Experiencing Training Manual

POTENTIAL BENEFITS OF AYAHUASCA FOR FUNCTIONAL NEUROLOGICAL DISORDERS: A LITERATURE REVIEW

Yadira Velazquez-Rodriguez (Somatic Experiencing International, scienceandshamanism@gmail.com*)*

Objective: To review the benefits of ayahuasca described in the literature looking for possible influences in the etiological and pathophysiological models involved in the production and maintenance of FND.

Background: Functional Neurological Disorders (FND) are caused by dysfunction in the neo-cortex, limbic, somatic systems, and perpetuated by social factors. Shamans have used ayahuasca, a brew made with two plants [Figure 1], for millennia for functional complaints.

Figure 1. A) Psychotria viridis, B) Banisteriopsis capii

Methods: A literature review was performed, looking at all studies describing clinical effects of ayahuasca, looking for influences in the etiological and pathophysiological models involved in the production and maintenance of FND.

Since social stressors, challenges and trauma have been identified as the commonest risk factors for FND, and its pathophysiology involves the neo-cortex, the limbic system, and the sensory-motor complex, the effects of ayahuasca were grouped in four categories or “four bodies”, respecting the nomenclature used by native tribes, which are: 1) Mental (cognitive and psychological model) 2)

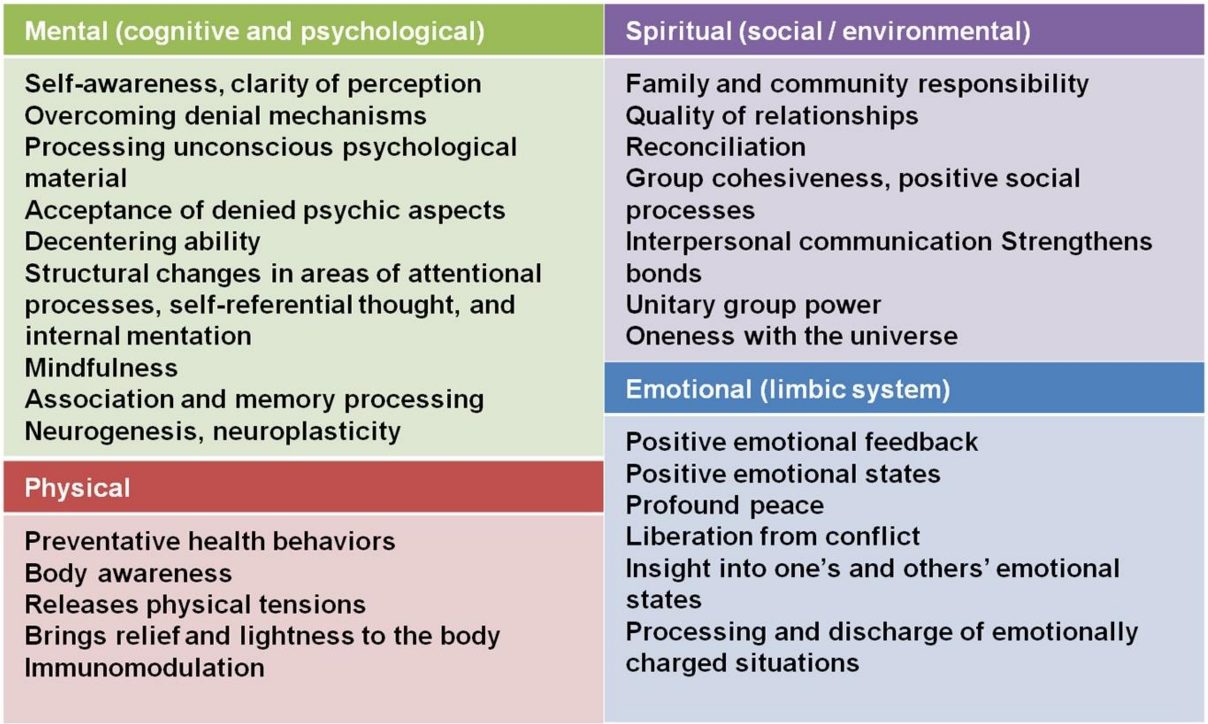
Emotional (limbic System) 3) Physical (sensory-motor system), and 4) Spiritual (social or environmental complex).

Results: The effects of ayahuasca are described in Table 1.
Other benefits overlapping between the four bodies are:

- Facilitates trauma processing, healing of past traumas
- Traumatic life events are repaired, reordered and integrated in a functional way
- Helps transcend developmental and existential wounds
- Aids clients overcome the roots of their psychological issues
- Allows for the formation of new cognitive, emotional, and behavioral strategies
- Aids introspection, self-realizations
- Facilitates therapeutic interventions
- Improves and cures anxiety and depression
- Rapid and sustained antidepressant effects in treatment-resistant patients

Ayahuasca was not associated with any significant long term side effects.

Table 1. Effects of ayahuasca in the Four Bodies



Mental (cognitive and psychological)	Spiritual (social / environmental)
Self-awareness, clarity of perception Overcoming denial mechanisms Processing unconscious psychological material Acceptance of denied psychic aspects Decentering ability Structural changes in areas of attentional processes, self-referential thought, and internal mentation Mindfulness Association and memory processing Neurogenesis, neuroplasticity	Family and community responsibility Quality of relationships Reconciliation Group cohesiveness, positive social processes Interpersonal communication Strengthens bonds Unitary group power Oneness with the universe
Physical	**Emotional (limbic system)**
Preventative health behaviors Body awareness Releases physical tensions Brings relief and lightness to the body Immunomodulation	Positive emotional feedback Positive emotional states Profound peace Liberation from conflict Insight into one's and others' emotional states Processing and discharge of emotionally charged situations

Conclusions: Ayahuasca addresses multiple factors and systems involved in the production and maintenance of FND, without major long term side effects. Prospective clinical studies are needed to determine the effects of this natural medicine in the FND population.

References:

HamillJ, Hallak J, Dursun SM, Baker G. Ayahuasca: Psychological and Physiologic Effects, Pharmacology and Potential Uses in Addiction and mental Illness. Curr Neuropharmacol. 2019;17(2): 108-128.

Lunda LE, White ST, Ayahuasca Reader: Encounters with the Amazon’s Sacred Vine, Synergetic Press, 2016.

THE NATIVE AMERICAN MEDICINE WHEEL'S APPROACH OF FUNCTIONAL ILLNESSES

Yadira Velazquez-Rodriguez (Somatic Experiencing International, scienceandshamanism@gmail.com*)*

Objective: To describe the treatment approaches for functional illnesses (FI) in accordance with shamanism and the native American medicine wheel, healing traditions that have existed for more than 30,000 years

Background: FI have been reported in the literature for 3,922 years, however, no evidence exists about the methodology of shamanism for healing FI. Today, despite the scientific advances, FI have poor prognosis, so we look for insights in ancient traditions.

Methods: To understand the theory and practices used in native, north and south American shamanic traditions for healing FI, a literature review was performed. Given the lack of written knowledge about shamanism and its treatment approaches for FI, an experiential collection of ancient wisdom was undertaken, while visiting shamans from Brazilian Amazonian, Peruvian and Bolivian Andes communities, during one year. Their healing methods were personally experienced, reviewed, and scrutinized, considering the etiological and pathophysiological models described to cause functional neurological disorders (FND).

Results: Concepts in shamanism related to healing FI are summarized in Figure 1, and described below:
Three Worlds: Uku Pacha (past challenges, traumas), Kay Pacha (current situation) and Hannaq Pacha (desired future) are interdependent, must be investigated, and brought up to consciousness

Four Bodies: Mental, Emotional, Physical and Spiritual (social/environmental), must be rebalanced, in a slow and steady manner

Four Seasons: one body is studied and perfected during each season
Our interconnectedness with nature must be repaired

Animal guides: used to awaken lost capacities and to control harmful instincts
Plants and fungi: Ayahuasca, Huachuma, Peyote, Santa Maria, Cocoa and Psylocibin are used for moderate to severe cases

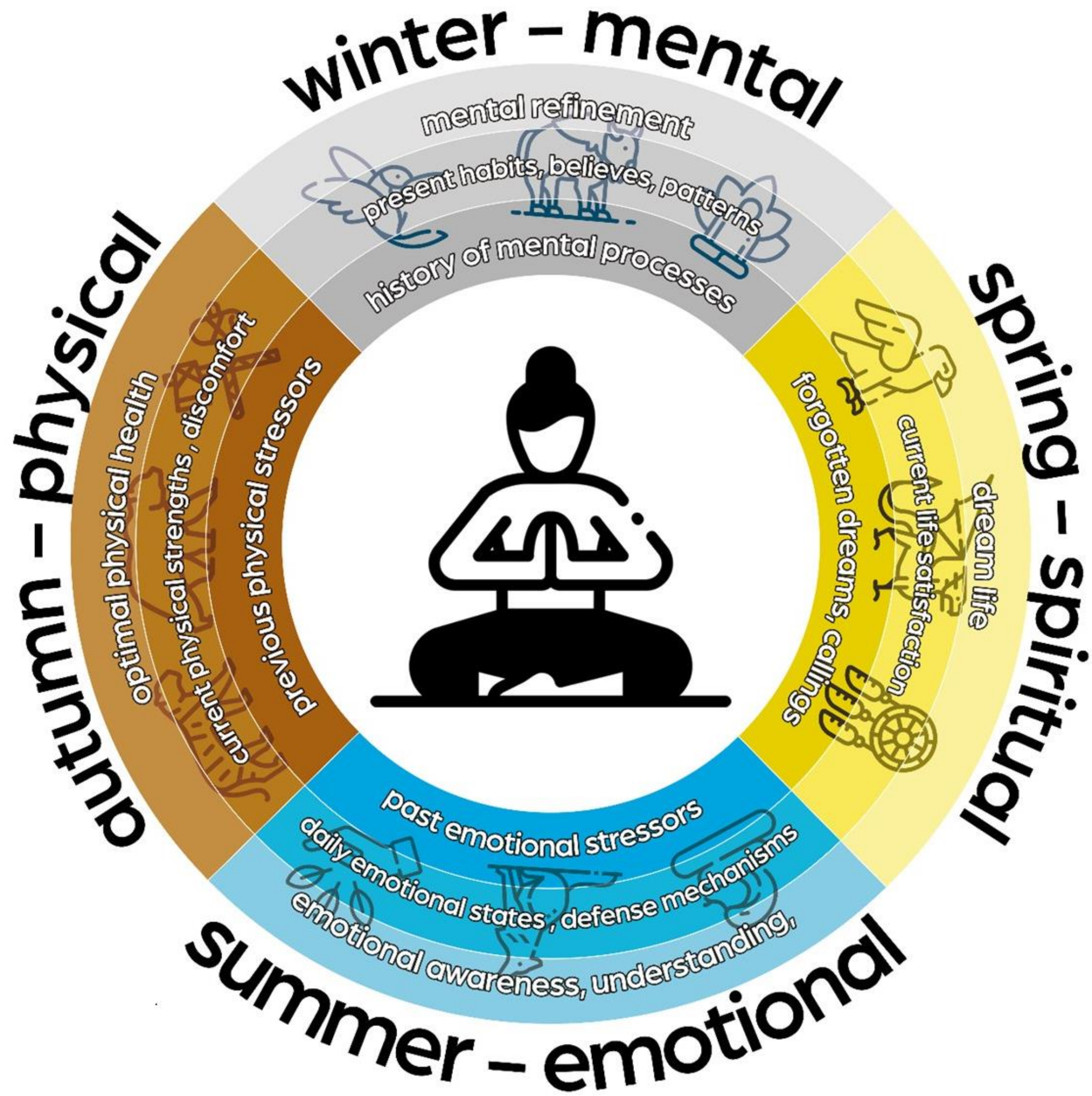


Figure 1. The shamanic native medicine wheel.

Conclusions: Native traditions offer valuable perspectives about the treatment of FI. Clinical studies are needed to determine if integrating their concepts in modern therapies could better the prognosis of FI.

References:

Mitchell, S, Sacred Instructions: Indigenous Wisdom for Living Spirt-Based Change, North Atlantic Books, 2018

Ruiz, DJ, The Medicine Bag: Shamanic Rituals & Ceremonies for Personal Transformation, Hierophant Publishing, 2020

RAPID ACCESS REHABILITATION FOR FND

Florian Zirpel (University Of Oxford, florian.zirpel@ndcn.ox.ac.uk*), Christopher Symeon, Yiota Constantinou, Zoe Ilivitzky, Mark Edwards*

Objective: To describe the development of a new service, developed in response to the impact of the COVID-19 and providing rapid access to rehabilitation for patients with FND.

Background:
Waiting lists for FND rehabilitation increased significantly due to the Covid-19 pandemic, doubling from two to four years. An acute admission pathway was developed to allow rapid access to a specialist inpatient multi-disciplinary rehabilitation service.

Methods: Patients who were an inpatient on acute hospital sites and were diagnosed by a neurologist with FND were referred to our specialist inpatient multi-disciplinary FND service. Referrals were expedited and patients were transferred directly to the rehabilitation service within 30 days. Rehabilitation outcome measures on admission and discharge were obtained for 12 patients. These included the EuroQol 5-dimensional 5-level score (EQ-5D-5L); Work and Social Adjustment Score (WSAS); Rehabilitation Complexity Scale (RCS); Modified Rivermead Mobility Index (MRMI); Rivermead Motor Assessment (RMI); Clinical Global Impression – Improvement Scale (CGI-I); Brief Illness Perception Questionnaire (BIPQ); Short Form Health Survey (SF-36).

Results: Demographics between acute and elective admission were comparable: F:M ratio was 5:1 (vs 2.4:1); median age (in years) on admission was 31 (vs 37). Significant improvements were observed in measures surveying physical function, as evidenced by improved scores in the MRMI, RMA and SF-36 physical domain. This was reflected in reductions in complexity of care, nursing, therapy and equipment needs (RCS). Improved health perception scores (EQ-5D-5L and BIPQ) were accompanied by reduced impairments in functioning (WSAS). Homelessness was identified as a complicating social factor in 2 patients. With the exception of these two patients, the average admission duration was comparable between acute and elective admission groups (103 vs 87 days).

Conclusions: Patients who were admitted acutely had positive rehabilitation outcomes, comparable to those admitted electively. Concerns of acute admission to rehabilitation due to fears about limited acceptance of their condition, or high levels of unrecognized psychosocial complexity, but we did not find these factors negatively impacted on rehabilitation in our cohort.

Admission through this pathway allowed rapid access to specialist treatment; the result was a reduction in healthcare burden for primary and secondary care services and improved patient experience.
Some social factors, such as housing, or medicolegal issues came to light during the admission. These factors would usually have been explored prior to an elective admission. Findings show that faster admission of patients with FND to specialist rehabilitation is a viable alternative to the established treatment pathway.

FUNCTIONAL /DISSOCIATIVE SEIZURES: WHY AND HOW?

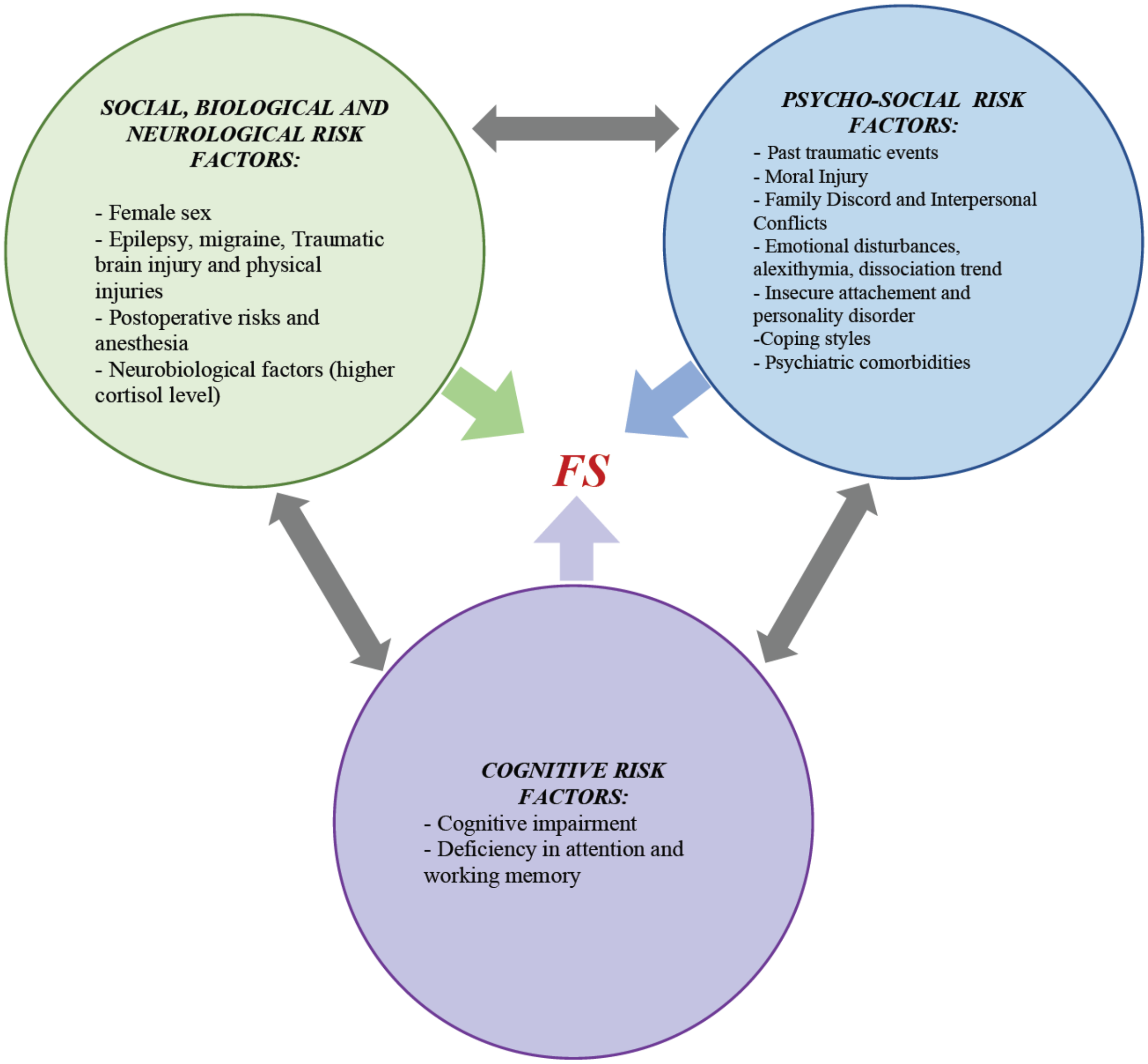
Coraline Hingray (CHRU Nancy, coralinehingray@gmail.com*), Ertan Deniz, Markus Reuber, Selma Aybeck, W. Curt LaFrance, Jr., Wissam El Hage*

We propose a narrative review on etiopathogenesis of Functional/Dissociative seizures (FDS). FDS known also as psychogenic non epileptic seizures, present with ictal semiological manifestations, along with various comorbid neurological and psychological disorders. Terminology inconsistencies and discrepancies in nomenclatures of FDS may reflect limitations in understanding the neuropsychiatric intricacies of this disorder. Psychological and neurobiological processes of FDS are incompletely understood. Nevertheless, important advances have been made on underlying neuropsychopathophysiological mechanisms of FS.

These advances provide valuable information about the underlying mechanisms of mind-body interactions. From this perspective, this narrative review summarizes recent studies about etiopathogenesis of FDS at two levels: possible risk factors (why) and different etiopathogenic models of FDS (how).

We divided possible risk factors for FDS into 3 categories, namely neurobiological, psychological and cognitive risk factors [Figure 1,2]. We also presented different models of FDS based on psychological and neuroanatomical understanding, multilevel models and integrative understanding of FDS [Figure 3]. Several models attempting to explain the pathogenesis of FS highlight the inter-relatedness of their underlying biopsychosocial mechanisms. These models also explain the varied phenotypic clinical profiles in FDS.

This work should help professionals to better understand current views on the multi-factorial mechanisms involved in the development of FDS. Shedding light on the different FDS profiles in terms of etiopathogenesis will help guide how best to direct therapy, based on these different underlying mechanisms. Indeed, the different therapeutic options such as psychoeducation, psychotherapy, physical therapy, neuromodulation and drug treatments could be personalized according to the risk factors that led the patient to develop FDS.



SOCIAL, BIOLOGICAL AND NEUROLOGICAL RISK FACTORS:

- Female sex
- Epilepsy, migraine, Traumatic brain injury and physical injuries
- Postoperative risks and anesthesia
- Neurobiological factors (higher cortisol level)

PSYCHO-SOCIAL RISK FACTORS:

- Past traumatic events
- Moral Injury
- Family Discord and Interpersonal Conflicts
- Emotional disturbances, alexithymia, dissociation trend
- Insecure attachement and personality disorder
- Coping styles
- Psychiatric comorbidities

FS

COGNITIVE RISK FACTORS:

- Cognitive impairment
- Deficiency in attention and working memory

Figure 1. Summary of putative FS risk factors.

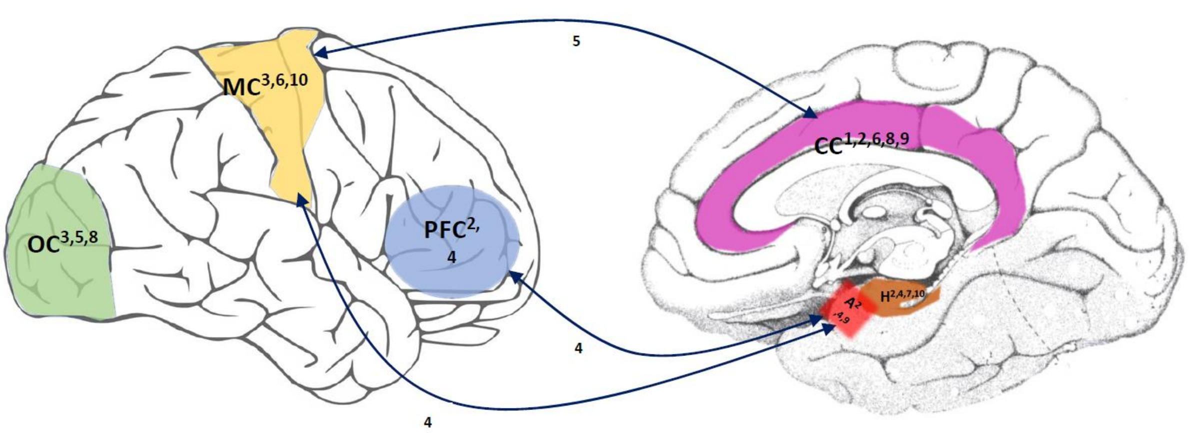


Figure 2: Schematic representation of abnormal brain regions and abnormal connectivity reported in neuroimaging studies of FS patients (only regions with findings in at least two studies are represented; OC: occipital cortex; MC: motor cortices; PFC: prefrontal cortex; CC: cingulate cortex; A: amygdala; H: hippocampus; arrows represent connectivity) (138–145).

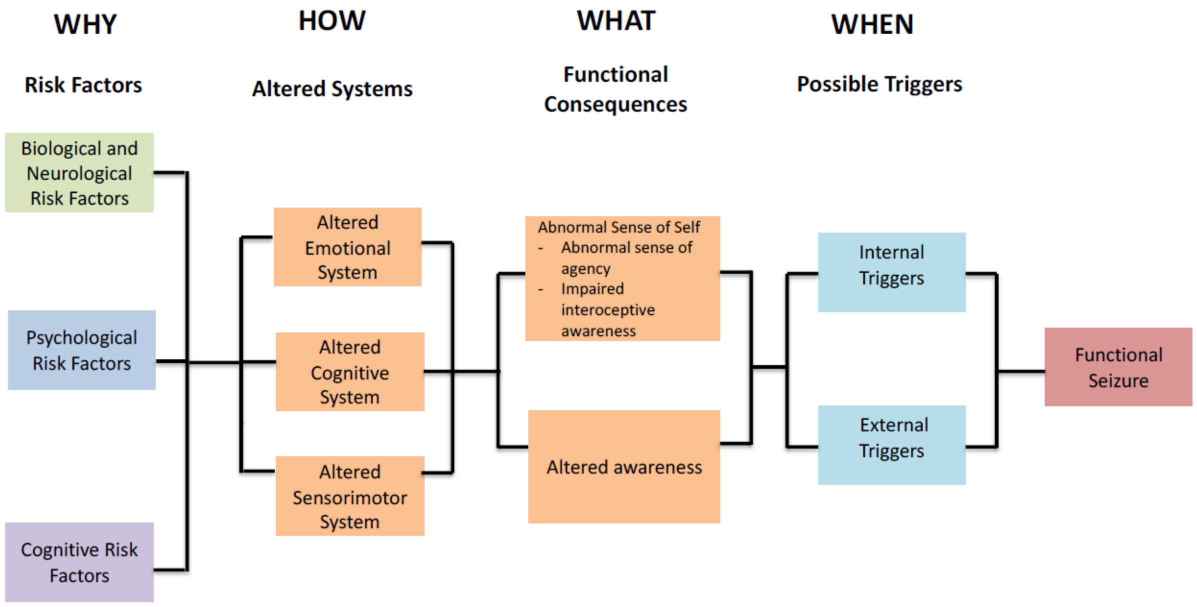


Figure 3. Interaction between the potential risk factors and possibly altered systems in FS.

V.FND: DELIVERING A FULLY DIGITAL FND REHABILITATION SERVICE

Christopher Symeon (St George's University Hospitals NHS Foundation Trust, Csymeon@circlemedical.co.uk*), Florian Zirpel, Mark Edwards, Helen Clarke, Rachel Dean, Kate Holt, Paula Murphy*

Objective: To describe a novel service delivery model for Functional Neurological Disorder (FND) rehabilitation.

Background: Gold standard rehabilitation in FND is via inpatient admission, which is expensive, low volume and geographically constrained. During the COVID-19 pandemic we evaluated a virtual service as an alternative method for delivering rehabilitation.

Methods: During the COVID-19 pandemic, a pathway allowing patients to access specialist online rehabilitation for FND was developed. Selected patients who had previously been accepted onto our inpatient rehabilitation program were offered the digital pathway as an alternative option.

Multidisciplinary initial assessments were completed within three weeks, including 1:1 and joint assessments with clinicians. This was followed by up to eight weeks of virtually conducted rehabilitation with a minimum of four sessions per week. Tailored therapy consisting of Speech and Language, Occupational therapy, Psychology, Physiotherapy, Neurology and Neuropsychiatry were provided. Rehabilitation outcomes and healthcare costs were provided and measured using established tools.

Results: The initial v.FND cohort pilot comprised nine patients, over a period of nine months and observed significant improvements in outcome measures assessing functioning and illness severity (EQ-5D-5L and CGI-I). The majority of patients had improvements in scales measuring illness perception and participation (BIPQ, WSAS). The cost associated with the virtual service was significantly lower compared to the elective admission pathway.

The demographic of the virtual cohort was different to the overall elective cohort, which reflects the specific eligibility requirements for this service. Collectively, enrolling patients to the virtual service achieved positive rehabilitation outcomes, while reducing healthcare costs.

Conclusions: An innovative method of providing rehabilitation for FND which complements existing treatment models was presented. The service - the Virtual FND team (v.FND) - is fully digital and aims to provide timely access to specialist multidisciplinary rehabilitation.

This digital pathway has allowed patients to access specialized multidisciplinary rehabilitation more rapidly, at home, reducing wait times by 90%.

Patient satisfaction levels were high, and despite the pilot being small, there were significant improvements in outcome measures.

The cost of delivering digital rehabilitation is 10% of the cost of the inpatient programme. This direct cost should be considered in addition to the compound saving through reduced healthcare burden on primary and secondary healthcare services by providing rapid access to care.

FUNCTIONAL/DISSOCIATIVE SEIZURES TREATED WITH PSYCHOEDUCATION BASED ON BROWN & REUBER´S INTEGRATIVE COGNITIVE MODEL OF MUS

Cristina Tenreyro (University of Buenos Aires, cristenreyro@gmail.com*)*

A 43-year-old patient (physician), presented with a two-year history of aggravated paroxysmal discomfort and sudden psychomotor excitement. The episodes lasted five to 30 minutes, and she could often remember the whole episode. The frequency was two events every 10 days. She had consulted different neurologists in different hospitals who had diagnosed her as having dissociative (conversion) disorder and anxiety disorder. Current medication: paroxetine, clonazepam. Video electroencephalogram (VEEG), and brain MRI are normal. She was referred for psychological treatment.

She has received psychoeducation based on Brown and Reuber´s Integrative Cognitive Model: an explanation of the hypotheses that serve to elaborate, consolidate, and activate the seizure scaffold.

Her treatment also included grounding exercises, mindfulness practice, relaxation techniques, CBT strategies, and weekly records of episodes, thoughts, emotions, and behavior.

There has been a prompt response in the reduction of seizure frequency and intensity.

A NOVEL RADIOGRAPHIC AND CLINICAL ASSESSMENT (RC) SCORING TOOL FOR SEIZURE RISK STRATIFICATION IN THE ACUTE PHASE OF CEREBRAL VENOUS THROMBOSIS

Stella Pak (Albany Medical College, paks@amc.edu*), Miriam Quinlan, Jessica Francis, Tamer Abdelhak*

Objective: To systematical review and do a meta-analysis of observational studies conducted to identify risk factors to construct a clinical prediction tool for seizure in acute CVT.

Background: Nearly 40% of cerebral venous thrombosis (CVT) cases experience a seizure. A plethora of problems may arise from seizures. Many of these are well recognized, in the literature, as well as in clinical practice, including the risk for acute respiratory failure, acute renal injury, demand ischemia of myocardium, aspiration pneumonia, and a variety of musculoskeletal injury. Given the lack of a validated tool to predict seizure in the acute phase of CVT, the use of prophylactic anti-epileptic drugs (AEDs) is controversial.

Methods: Systematic review was performed according to PRISMA guidelines. Observational studies that investigated the risk factors for seizure in acute CVT were retrieved from MEDLINE, EBSCO, Web of Science, and Pro-Quest. The summary odds ratios were calculated from the pool of data under the random effects model.

Result: Initial literature search revealed 1,046 articles discussing seizure as a complication of acute CVT. Through a robust systematic review process with two independent reviewers, 14 studies fully meeting the inclusion criteria were selected. Data elements extracted from the studies were analyzed and re-synthesized. Anatomical involvement of frontal lobe (OR 4.85; 95% CI 3.52-6.68) , cortical vein thrombosis (OR 3.16, 95% CI 2.18-4.58), hemorrhagic venous ischemia (OR 3.85; 95% CI 3.20-4.64), and clinical presentation of motor deficit (OR 3.07; 95% CI 2.66-3.55) or confusion (OR 2.15; 95% CI 1.57-2.94) showed a strong association with increased risk for seizure in the setting of acute CVT.

Conclusion: A novel Radiographic and Clinical assessment (RC) scoring system was developed, which we propose be used to stratify the seizure risk based on radiographic findings and the clinical presentation in the acute phase of CVT. This predictive tool may be helpful in identifying patients whose seizure risk is high and can potentially further be used as a clinical decision support tool for prophylactic anti-epileptic drug treatment.

PHYSICAL EXERCISE IN PEOPLE WITH EPILEPSY: STUDY PROTOCOL

Stella Pak (Albany Medical College, paks@amc.edu*), Rmneek Kaur, Shakthi Sureddi, Tamer Abdelhak*

Objective: To identify modifiable determinants of physical activity in PWE.

Background: In 1968, the American Medical Association Committee advised restricting the physical activity of people with epilepsy (PWE) for fear of inducing seizures. In the following few decades, groundbreaking discoveries describing reduction or disappearance of epileptic discharges during physical activity in PWE were made. Release of noradrenaline and GABA during exercise has been postulated to inhibit the epileptic discharges. Recommendation of international league against epilepsy, in 1997, stating the only restricted sports for people with epilepsy are skydiving and scuba diving, officially marked the beginning of this paradigm shift towards promoting physical exercise in PWE.

Methods: Multicenter cross-sectional cohort study on PWE will be performed March 2022 to January 2023, using Research Electronic Data Capture (REDCap) tool. The inclusion criteria for the cohort group are: age greater than 15 and onset of epilepsy more than 1-year duration. A web link to the survey will be disseminated via email, social media, and adult epilepsy clinics across the country. The survey will be a questionnaire to comprehensively assess the type and level of physical exercise in PWE.

Discussion: This is the first nationwide survey of physical exercise levels among PWE in the United States. Identifying the challenges associated with physical exercise will help clinicians in developing and implementing effective interventions to promote physical activity in PWE. The wide scope and the innovative design promise high quality insight for clinical practice.

NEUROPSYCHOLOGICAL REHABILITATION IN A CASE OF FUNCTIONAL COGNITIVE DISORDER

Diane Gillan (RCSI, dianegillan@gmail.com*), Maria Diaz*

Objective: To described the effectiveness of a multi-component intervention with a 53 year-old woman with diagnoses of functional cognitive disorder (FCD) with comorbid chronic dissociative difficulties, including dissociative seizures (DS). This case highlights the importance of a holistic, individual.

Background: Subjective cognitive difficulties that are internally inconsistent, without neurostructural pathology and cause distress and/or impaired functioning have been conceptualized as FCD, a subset of Functional Neurological Disorder (FND). Currently, there are no evidence-based consensus regarding interventions for FCD and data on neuropsychological rehabilitation are even more sparse (Staniloiu & Markowitsch, 2018).

Methods: Neuropsychological assessment was conducted which showed story recall in the 'borderline' range; list recall and visual memory in the 'low average' range. These scores were in the context of low average verbal IQ and borderline non-verbal IQ. A biopsychosocial formulation was developed. The presenting problem was conceptualised as FCD with overlapping subtypes: health anxiety about dementia; dissociative retrograde amnesia and ongoing dissociative memory problems (Stone et al. 2015). (i) Pre-disposing vulnerabilities included a history of trauma and unresolved losses; insecure enmeshed attachment style; longstanding history of dissociation; history of post-natal depression. (ii) Perpetuating factors included social anxiety and shame regarding diagnosis; fear of developing dementia; rumination and symptom-focused attention; ongoing psychosocial stressors; poor coping strategies. (iii) An electrocution event was hypothesised to trigger both FCD and DS.
A multi-faceted intervention was commenced based on principles of treatment outlined by Staniloiu and Markowitsch (2018) i.e. a holistic approach to achieve optimal psychological, social and occupational well-being. This involved cognitive-behaviour therapy to manage health anxiety and attentional biases, psychiatry, and liaison with the patients family and multi-disciplinary team. A neuropsychological rehabilitation plan was devised with an emphasis on SMART goals.

Results: Results comprised enhanced overall well-being; reduced functional impairment; effective use of memory compensatory strategies and increased memory self-efficacy. Effective rehabilitative strategies included (1) Shifting the focus of intervention from reinstating "forgotten" memories and resolving past traumas to developing strategies and skills to increase adaptation and accomplishing realistic goals (2) Utilisation of external devices and written information to compensate for dissociative memory and planning problems and (3) Providing strategies to address the specific difficulty with verbal memory and word-finding reported. It was identified that specific questions asking her to recall information led to a panic response which triggered a dissociative 'mental block' to verbally accessible material. She was able to compensate for an inability to verbalise responses by communicating through gestures and she was able to address verbal recall deficits utilising visual imagery (e.g. unable to recall the breed of her dog when asked, but could do so by consciously trying to recall visual imagery of her discussing this with her neighbours). Strategies were given that capitalised on this avenue to enhance declarative recall: e.g. using association techniques to attach visual images to remember peoples' names.

Conclusions: There is a need for empirically-informed therapeutic and rehabilitative interventions for FCD. Furthermore, FCD categories need to be better characterised and incorporate ongoing dissociative memory problems. Research has shown specific deficits in verbal memory in dissociative conditions, although remains poorly understood. Other patients do not show marked impairments on objective testing but manifest this problem only under conditions of challenge or emotional stress, as in this case. Disruption to encoding via the phonological loop or auditory retrieval processes under anxiety-provoking conditions may explain this in at least some cases. The relevance of this to cognitive rehabilitation has also not yet been explored. This case highlights successful utilisation of compensatory and metacognitive methods to enhance day-to-day function and memory self-efficacy, in the context of a wider multi-faceted approach. Effective interventions need to be based on comprehensive, collaborative formulations, with a focus on targeting exacerbating factors and rehabilitative techniques.

References:

Staniloiu, A., & Markowitsch, H.J. (2018). Dissociative Amnesia – A Challenge to Therapy. International Journal of Psychotherapy Practice and Research.

Stone, J., Pal, S., Blackburn, D., Reuber, M., Thekkumpurath, P., & Carson, A. (2015). Functional (Psychogenic) Cognitive Disorders: A Perspective from the Neurology Clinic. Journal of Alzheimer's disease : JAD, 48 Suppl 1, S5–S17. https://doi.org/10.3233/JAD-150430

A SYSTEMATIC REVIEW OF NEUROMODULATION TO DIAGNOSE OR TREAT PATIENTS WITH FUNCTIONAL NEUROLOGICAL DISORDER, SOMATIC SYMPTOM DISORDER, AND RELATED DISORDERS

Jay Lusk (Duke University School of Medicine, jay.lusk@duke.edu*), Alexandra Lallier, Sarah Martin, Alexis Domeracki, Tamar Chukrun, Steph Hendren, Husam Mikati, Wuwei Fen*

Objective: To systematically review the literature on the use of neuromodulation to diagnose or treat functional neurological disorder (FND), somatic symptom disorder (SSD), and other related neuropsychiatric conditions.

Background: A recent systematic review investigated the use of neuromodulation to treat FND and SSD. However, no review has searched a broad range of alternative terminologies to capture the breadth of literature on neuromodulation in FND and related disorders.

Methods: Searched MEDLINE, Embase, CINAHL Complete, and Web of Science for studies which used any form of neuromodulation (including search terms such as transcranial magnetic stimulation (TMS), deep brain stimulation (DBS), electrical convulsive therapy (ECT), etc., as well as general terms for neuromodulation) in patients with FND, SSD, or other terms historically or currently used to describe somatoform disorders. The full search strategy is shown in Table 1. Study type was classified, and type of neuromodulation used was extracted. Study quality was assessed using a standardized National Institutes of Health study quality tool. Blinded two-party extraction with consensus adjudication of disagreement was used at all stages of review.

Table 1. Search strategy for the systematic review, by database, performed on August 13, 2021.

MEDLINE (Ovid)		
Search Strategy Step	**Keywords Utilized**	**Number of Results**
1. neuromodulation keywords	exp Transcranial Magnetic Stimulation/ OR exp Deep Brain Stimulation/ OR (neuromodulation OR neuromodulations OR neuromodulate OR neuromodulating OR neuromodulated OR neurostimulation OR neurostimulations OR neurostimulating OR neurostimulate OR neurostimulated OR "magnetic stimulation" OR "magnetic stimulations" OR TMS OR rTMS OR "vestibular stimulation" OR "vestibular stimulations" OR "electroconvulsive therapy" OR "electroconvulsive therapies" OR "current stimulation" OR "current stimulations" OR "cortical stimulation" OR "cortical stimulations").ti,ab. OR (("deep brain" OR "brain depth") adj2 (stimulation OR stimulations OR stimulate OR stimulates OR stimulating)).ti,ab.	62286
2. Disorder keywords	exp Conversion Disorders/ OR Somatoform Disorders/ OR ((psychosomatic OR psychophysiologic OR psychophysiological OR psychogenic OR conversion OR conversions OR somatic OR somatization OR somatisation OR somatoform) adj2 (disorder OR disorders OR reaction OR reactions OR neurosis OR neuroses OR hysteria OR hysteria OR symptom OR symptoms)).ti,ab. OR (pseudodystonia OR pseudodystonias OR astasia-abasia OR "astasia abasia" OR pseudostroke OR pseudostrokes OR astasia-	52338

	abasia OR "astasia abasia" OR FMD OR FMDs OR FND OR FNDs).ti,ab. OR ((functional OR somatic OR non-organic OR nonorganic OR "non organic" OR psychogenic OR psychosomatic OR psychophysiologic OR psychophysiological OR unexplained OR unexplainable OR hysteria OR hysteria OR hysteric OR hysterical) adj2 (neurological OR neurologic OR movement OR movements OR motor OR paralysis OR paraplegia OR stroke OR strokes OR weakness OR weaknesses OR dyskinesia OR diskinesias OR dystonia OR dystonias OR dystonic OR dysphonia OR parkinsons OR parkinsonian OR parkinsonism OR parkinson's OR hypesthesia OR hypesthesias OR parasthesias OR myoclonus OR sensory OR dizziness OR vertigo OR raspiness OR hoarse OR hoarseness OR tremor OR tremors OR trembling OR tremble OR trembles OR shake OR shakes OR shaking OR myoclonus OR akathisia OR dyskinesia OR dyskinesias)).ti,ab. OR ((functional OR somatic OR somatization OR somatisation OR somatoform OR non-organic OR nonorganic OR "non organic" OR psychogenic OR psychosomatic OR psychophysiologic OR psychophysiological OR unexplained OR unexplainable OR hysteria OR hysteria OR hysteric OR hysterical).ti,ab AND (exp dyskinesias/ OR exp dystonic disorders/ OR exp paraplegia/ OR exp tremor/OR exp muscle weakness/))	
3.	1 AND 2	789
	Embase (Elsevier)	
Search Strategy Step	**Keywords Utilized**	**Number of Results**
1. neuromodulation keywords	'transcranial magnetic stimulation'/exp OR 'brain depth stimulation'/exp OR (neuromodulation OR neuromodulations OR neuromodulate OR neuromodulating OR neuromodulated OR neurostimulation OR neurostimulations OR neurostimulating OR neurostimulate OR neurostimulated OR 'magnetic stimulation' OR 'magnetic stimulations' OR TMS OR rTMS OR 'vestibular stimulation' OR 'vestibular stimulations' OR 'electroconvulsive therapy' OR 'electroconvulsive therapies' OR 'current stimulation' OR 'current stimulations' OR 'cortical stimulation' OR 'cortical stimulations'):ti,ab OR (('deep brain' OR 'brain depth') NEAR/2 (stimulation OR stimulations OR stimulate OR stimulates OR stimulating)):ti,ab	112714
2. Disorder keywords	'conversion disorder'/exp OR 'somatoform disorder'/exp OR ((psychosomatic OR psychophysiologic OR psychophysiological OR psychogenic OR conversion OR conversions OR somatic OR somatization OR somatisation OR somatoform) NEAR/2 (disorder OR disorders OR reaction OR reactions OR neurosis OR neuroses OR hysteria OR hysteria OR symptom OR symptoms)):ti,ab OR (pseudodystonia OR pseudodystonias OR astasia-abasia OR 'astasia abasia' OR pseudostroke OR pseudostrokes OR astasia-	115518

	abasia OR 'astasia abasia' OR FMD OR FMDs OR FND OR FNDs):ti,ab OR ((functional OR somatic OR non-organic OR nonorganic OR 'non organic' OR psychogenic OR psychosomatic OR psychophysiologic OR psychophysiological OR unexplained OR unexplainable OR hysteria OR hysteria OR hysteric OR hysterical) NEAR/2 (neurological OR neurologic OR movement OR movements OR motor OR paralysis OR paraplegia OR stroke OR strokes OR weakness OR weaknesses OR dyskinesia OR diskinesias OR dystonia OR dystonias OR dystonic OR dysphonia OR parkinsons OR parkinsonian OR parkinsonism OR parkinsons OR hypesthesia OR hypesthesias OR parasthesias OR myoclonus OR sensory OR dizziness OR vertigo OR raspiness OR hoarse OR hoarseness OR tremor OR tremors OR trembling OR tremble OR trembles OR shake OR shakes OR shaking OR myoclonus OR akathisia OR dyskinesia OR dyskinesias)):ti,ab OR ((functional OR somatic OR somatization OR somatisation OR somatoform OR non-organic OR nonorganic OR 'non organic' OR psychogenic OR psychosomatic OR psychophysiologic OR psychophysiological OR unexplained OR unexplainable OR hysteria OR hysteria OR hysteric OR hysterical):ti,ab AND ('dyskinesia'/exp OR 'dystonic disorder'/exp OR 'paraplegia'/exp OR 'tremor'/exp OR 'muscle weakness'/exp))	
3.	1 AND 2	2762
CINAHL Complete (EBSCOhost)		
Search Strategy Step	**Keywords Utilized**	**Number of Results**
1. neuromodulation keywords	MH "Transcranial Magnetic Stimulation" OR MH "Deep Brain Stimulation" OR TI(neuromodulation OR neuromodulations OR neuromodulate OR neuromodulating OR neuromodulated OR neurostimulation OR neurostimulations OR neurostimulating OR neurostimulate OR neurostimulated OR "magnetic stimulation" OR "magnetic stimulations" OR TMS OR rTMS OR "vestibular stimulation" OR "vestibular stimulations" OR "electroconvulsive therapy" OR "electroconvulsive therapies" OR "current stimulation" OR "current stimulations" OR "cortical stimulation" OR "cortical stimulations") OR AB((neuromodulation OR neuromodulations OR neuromodulate OR neuromodulating OR neuromodulated OR neurostimulation OR neurostimulations OR neurostimulating OR neurostimulate OR neurostimulated OR "magnetic stimulation" OR "magnetic stimulations" OR TMS OR rTMS OR "vestibular stimulation" OR "vestibular stimulations" OR "electroconvulsive therapy" OR "electroconvulsive therapies" OR "current stimulation" OR "current stimulations" OR "cortical stimulation" OR "cortical stimulations") OR TI(("deep brain" OR "brain depth") NEAR/2 (stimulation OR stimulations OR stimulate OR stimulates OR stimulating)) OR AB(("deep brain" OR "brain	12280

	depth") NEAR/2 (stimulation OR stimulations OR stimulate OR stimulates OR stimulating))	
2. Disorder keywords	MH "Somatoform Disorders+" OR TI((psychosomatic OR psychophysiologic OR psychophysiological OR psychogenic OR conversion OR conversions OR somatic OR somatization OR somatisation OR somatoform) N2 (disorder OR disorders OR reaction OR reactions OR neurosis OR neuroses OR hysteria OR hysteria OR symptom OR symptoms)) OR AB((psychosomatic OR psychophysiologic OR psychophysiological OR psychogenic OR conversion OR conversions OR somatic OR somatization OR somatisation OR somatoform) N2 (disorder OR disorders OR reaction OR reactions OR neurosis OR neuroses OR hysteria OR hysteria OR symptom OR symptoms)) OR TI(pseudodystonia OR pseudodystonias OR astasia-abasia OR "astasia abasia" OR pseudostroke OR pseudostrokes OR astasia-abasia OR "astasia abasia" OR FMD OR FMDs OR FND OR FNDs) OR AB(pseudodystonia OR pseudodystonias OR astasia-abasia OR "astasia abasia" OR pseudostroke OR pseudostrokes OR astasia-abasia OR "astasia abasia" OR FMD OR FMDs OR FND OR FNDs) OR TI((functional OR somatic OR non-organic OR nonorganic OR "non organic" OR psychogenic OR psychosomatic OR psychophysiologic OR psychophysiological OR unexplained OR unexplainable OR hysteria OR hysteria OR hysteric OR hysterical) N2 (neurological OR neurologic OR movement OR movements OR motor OR paralysis OR paraplegia OR stroke OR strokes OR weakness OR weaknesses OR dyskinesia OR diskinesias OR dystonia OR dystonias OR dystonic OR dysphonia OR parkinsons OR parkinsonian OR parkinsonism OR parkinson's OR hypesthesia OR hypesthesias OR parasthesias OR myoclonus OR sensory OR dizziness OR vertigo OR raspiness OR hoarse OR hoarseness OR tremor OR tremors OR trembling OR tremble OR trembles OR shake OR shakes OR shaking OR myoclonus OR akathisia OR dyskinesia OR dyskinesias)) OR AB((functional OR somatic OR non-organic OR nonorganic OR "non organic" OR psychogenic OR psychosomatic OR psychophysiologic OR psychophysiological OR unexplained OR unexplainable OR hysteria OR hysteria OR hysteric OR hysterical) N2 (neurological OR neurologic OR movement OR movements OR motor OR paralysis OR paraplegia OR stroke OR strokes OR weakness OR weaknesses OR dyskinesia OR diskinesias OR dystonia OR dystonias OR dystonic OR dysphonia OR parkinsons OR parkinsonian OR parkinsonism OR parkinson's OR hypesthesia OR hypesthesias OR parasthesias OR myoclonus OR sensory OR dizziness OR vertigo OR raspiness OR hoarse OR hoarseness OR tremor OR tremors OR trembling OR tremble OR trembles OR shake OR shakes OR shaking OR myoclonus OR akathisia OR dyskinesia OR dyskinesias)) OR (TI(functional OR somatic OR somatization OR somatisation OR somatoform OR	16288

	non-organic OR nonorganic OR "non organic" OR psychogenic OR psychosomatic OR psychophysiologic OR psychophysiological OR unexplained OR unexplainable OR hysteria OR hysteria OR hysteric OR hysterical) AND (MH "Dyskinesias+" OR MH "Dystonic Disorders+" OR MH "Paraplegia+" OR MH "Tremor" OR MH "Muscle Weakness+")) OR AB (TI(functional OR somatic OR somatization OR somatisation OR somatoform OR non-organic OR nonorganic OR "non organic" OR psychogenic OR psychosomatic OR psychophysiologic OR psychophysiological OR unexplained OR unexplainable OR hysteria OR hysteria OR hysteric OR hysterical) AND (MH "Dyskinesias+" OR MH "Dystonic Disorders+" OR MH "Paraplegia+" OR MH "Tremor" OR MH "Muscle Weakness+"))	
3.	1 AND 2	186
	Web of Science (Clarivate)	
Search Strategy Step	**Keywords Utilized**	**Number of Results**
1. neuromodulation keywords	TS=(neuromodulation OR neuromodulations OR neuromodulate OR neuromodulating OR neuromodulated OR neurostimulation OR neurostimulations OR neurostimulating OR neurostimulate OR neurostimulated OR "magnetic stimulation" OR "magnetic stimulations" OR TMS OR rTMS OR "vestibular stimulation" OR "vestibular stimulations" OR "electroconvulsive therapy" OR "electroconvulsive therapies" OR "current stimulation" OR "current stimulations" OR "cortical stimulation" OR "cortical stimulations") OR TS=(("deep brain" OR "brain depth") near/2 (stimulation OR stimulations OR stimulate OR stimulates OR stimulating))	85405
2. Disorder keywords	TS=((psychosomatic OR psychophysiologic OR psychophysiological OR psychogenic OR conversion OR conversions OR somatic OR somatization OR somatisation OR somatoform) near/2 (disorder OR disorders OR reaction OR reactions OR neurosis OR neuroses OR hysteria OR hysteria OR symptom OR symptoms)) OR TS=(pseudodystonia OR pseudodystonias OR astasia-abasia OR "astasia abasia" OR pseudostroke OR pseudostrokes OR astasia-abasia OR "astasia abasia" OR FMD OR FMDs OR FND OR FNDs) OR TS=((functional OR somatic OR non-organic OR nonorganic OR "non organic" OR psychogenic OR psychosomatic OR psychophysiologic OR psychophysiological OR unexplained OR unexplainable OR hysteria OR hysteria OR hysteric OR hysterical) near/2 (neurological OR neurologic OR movement OR movements OR motor OR paralysis OR paraplegia OR stroke OR strokes OR weakness OR weaknesses OR dyskinesia OR diskinesias OR dystonia OR dystonias OR dystonic OR dysphonia OR parkinsons OR parkinsonian OR parkinsonism OR parkinson's OR hypesthesia OR hypesthesias OR parasthesias OR myoclonus OR sensory OR dizziness OR vertigo OR raspiness OR hoarse OR hoarseness OR	52819

	tremor OR tremors OR trembling OR tremble OR trembles OR shake OR shakes OR shaking OR myoclonus OR akathisia OR dyskinesia OR dyskinesias))	
3.	1 AND 2	1039

Results: There were 3466 unique studies identified through this search; 104 studies were ultimately included. [Figure 1] Of these 104 studies, 23 were conference abstracts. A total of 1175 patients with FND and 509 controls were included. Thirty studies explicitly defined patients as having FND; the other studies used a broad range of terms such as SSD, somatoform disorder, conversion disorder, or psychogenic reaction. Most studies were case reports or case series; 12 case-control studies, six cohort studies, nine randomized controlled trials, four cross-sectional studies, and 11 non-randomized studies were included. Fifty-one studies used TMS, 23 used ECT, 12 used DBS, and four used transcranial direct current stimulation (tDCS). Study quality was generally poor or fair.

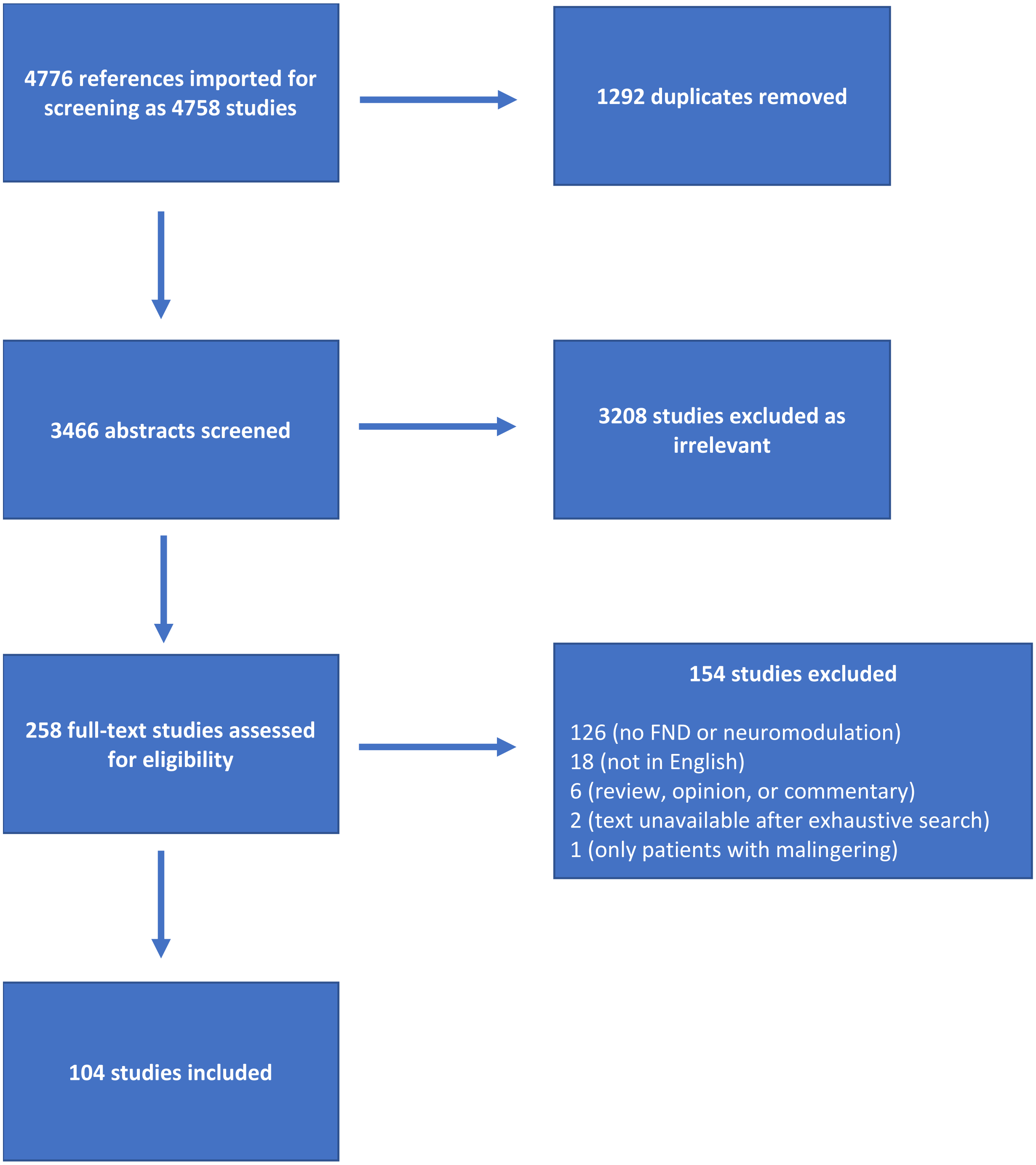


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Diagram

Conclusions: The literature on neuromodulation to diagnose and treat FND and related neuropsychiatric conditions is heterogeneous in study design and quality. Ongoing debate about the appropriate classification of medically unexplained neurological symptoms has presented challenges for conducting reliable and reproducible research. There is a paucity of high-quality studies investigating the use of neuromodulation to assess and treat functional neurological disorder and related conditions. Many studies utilized unusual study designs that increased risk of bias. A sizable body of abstracts and conference proceedings not subsequently published as full articles suggests that there may be publication bias present in the current published literature.

References:

Oriuwa C, Mollica A, Feinstein A, et al. Neuromodulation for the treatment of functional neurological disorder and somatic symptom disorder: a systematic review Journal of Neurology, Neurosurgery & Psychiatry 2022;93:280-290.

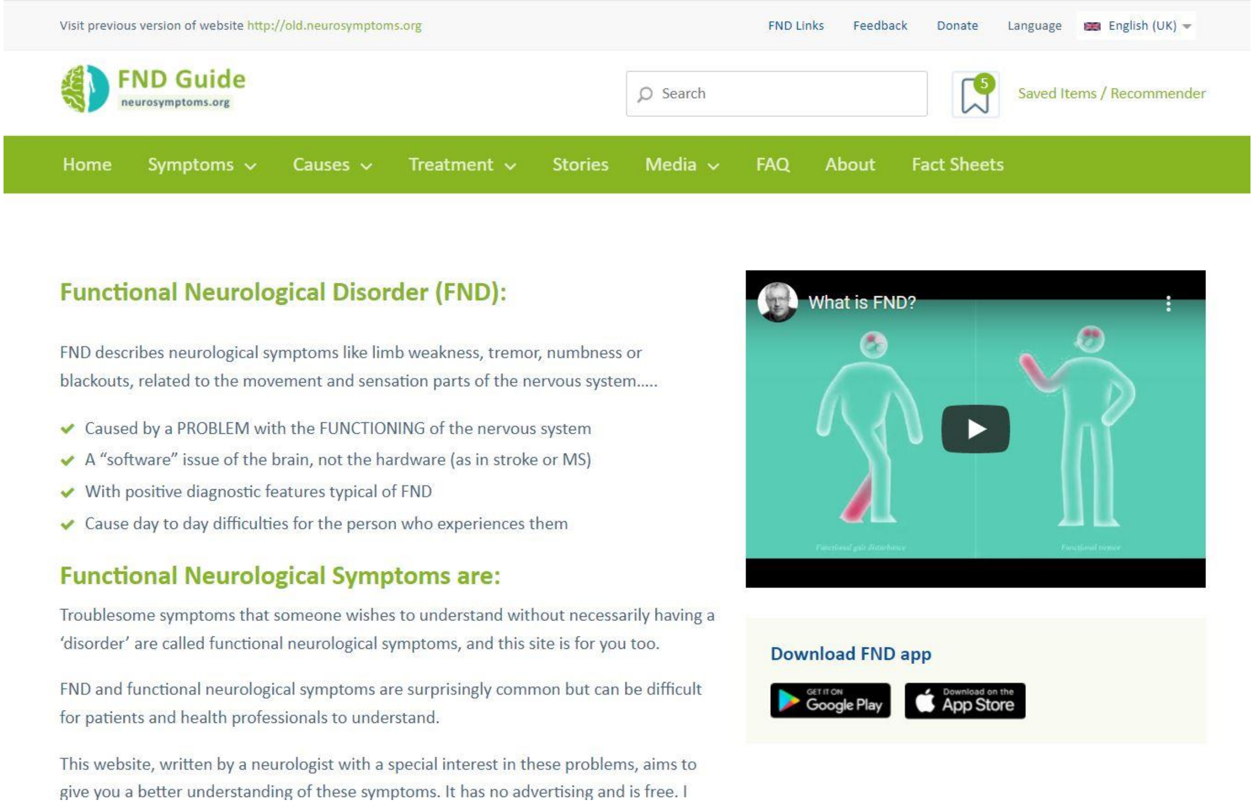
Pollak TA, Nicholson TR, Edwards MJ, et al. A systematic review of transcranial magnetic stimulation in the treatment of functional (conversion) neurological symptoms. Journal of Neurology, Neurosurgery & Psychiatry 2014;85:191-197.

NEUROSYMPTOMS FND GUIDE – A GLOBAL COLLABORATION TO PROVIDE INFORMATION FOR PEOPLE WITH FND

Jon Stone (Center for Clinical Brain Sciences, University of Edinburgh, Jon.Stone@ed.ac.uk*), Pooja Jain*

Objective: 1) To provide an update on the new neurosymptoms.org website and app. 2) To thank existing collaborators and invite new ones.

Background: Jon Stone, MBChB, FRCP, PhD made neurosymptoms.org in 2009 to provide additional information about FND to patients he was seeing in clinic. In 2021 he launched a new version and app with the help of Pooja Jain and Cognihealth with funding from the Scottish Government [Figure 1].



Functional Neurological Disorder (FND):

FND describes neurological symptoms like limb weakness, tremor, numbness or blackouts, related to the movement and sensation parts of the nervous system.....

- ✓ Caused by a PROBLEM with the FUNCTIONING of the nervous system
- ✓ A "software" issue of the brain, not the hardware (as in stroke or MS)
- ✓ With positive diagnostic features typical of FND
- ✓ Cause day to day difficulties for the person who experiences them

Functional Neurological Symptoms are:

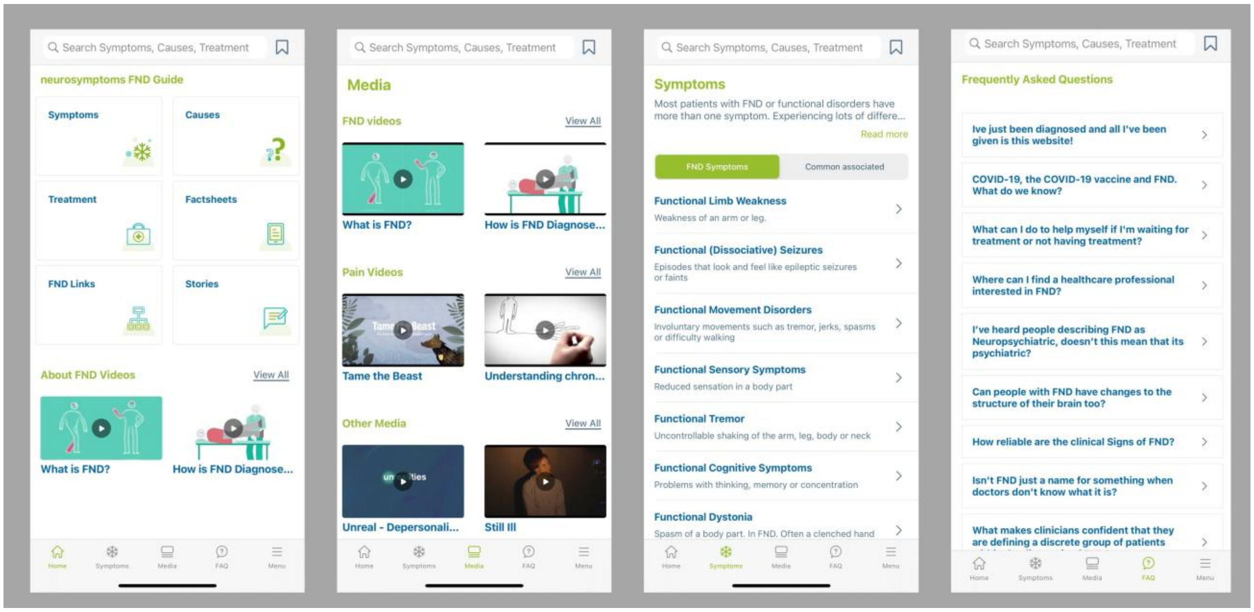
Troublesome symptoms that someone wishes to understand without necessarily having a 'disorder' are called functional neurological symptoms, and this site is for you too.

FND and functional neurological symptoms are surprisingly common but can be difficult for patients and health professionals to understand.

This website, written by a neurologist with a special interest in these problems, aims to give you a better understanding of these symptoms. It has no advertising and is free. I

Figure 1.

Methods: The new neurosymptoms.org site was developed using feedback from an online survey in 2020 of 450 patients and health professionals. New designs and additional features include an iPhone and android app [Figure 2], integrated language versions, a 'recommender' so that patients or healthcare professionals can share particular pages [Figure 3], a search function and a 'FAQ' page.



Most patients with FND or functional disorders have more than one symptom. Experiencing lots of differe...

Functional Limb Weakness
Weakness of an arm or leg.

Functional (Dissociative) Seizures
Episodes that look and feel like epileptic seizures or faints

Functional Movement Disorders
Involuntary movements such as tremor, jerks, spasms or difficulty walking

Functional Sensory Symptoms
Reduced sensation in a body part

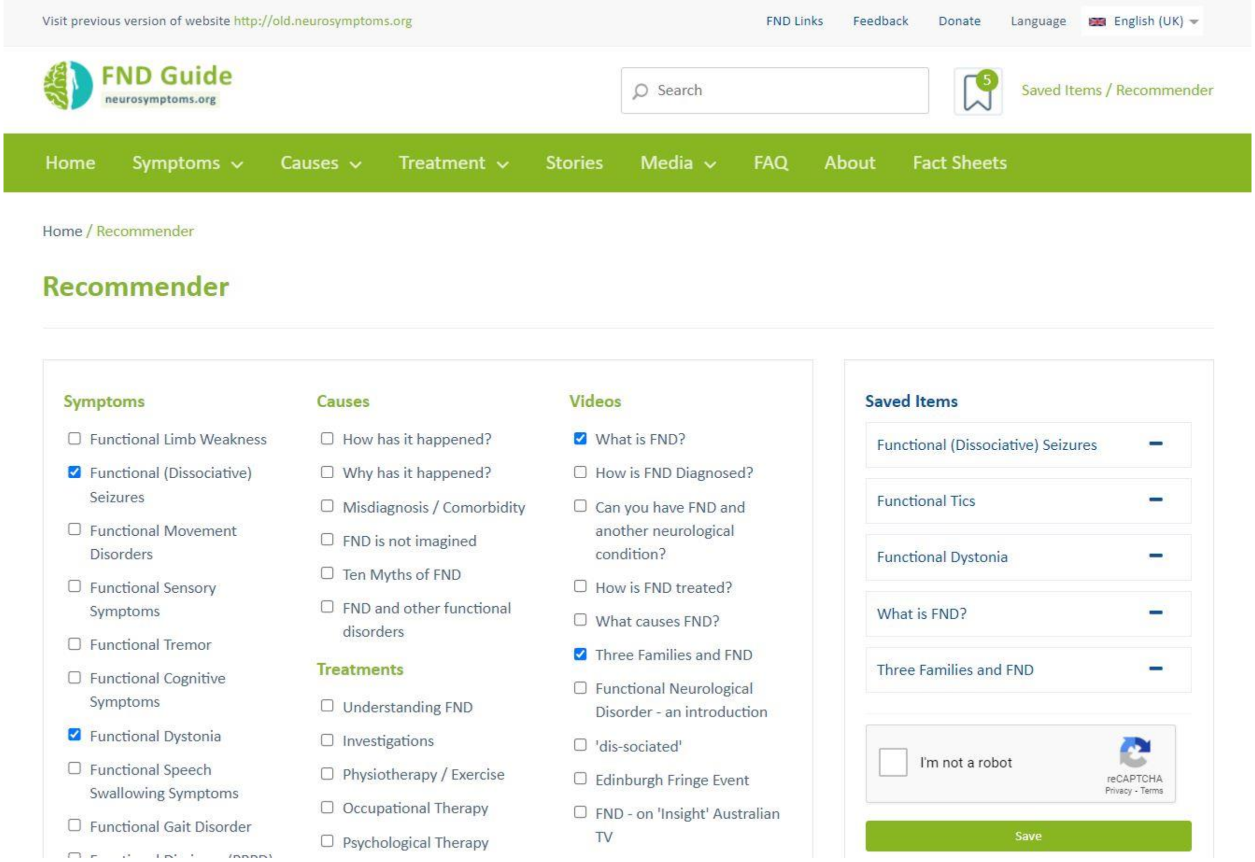
Functional Tremor
Uncontrollable shaking of the arm, leg, body or neck

Functional Cognitive Symptoms
Problems with thinking, memory or concentration

Functional Dystonia
Spasm of a body part. In FND. Often a clenched hand

- Ive just been diagnosed and all I've been given is this website!
- COVID-19, the COVID-19 vaccine and FND. What do we know?
- What can I do to help myself if I'm waiting for treatment or not having treatment?
- Where can I find a healthcare professional interested in FND?
- I've heard people describing FND as Neuropsychiatric, doesn't this mean that its psychiatric?
- Can people with FND have changes to the structure of their brain too?
- How reliable are the clinical Signs of FND?
- Isn't FND just a name for something when doctors don't know what it is?
- What makes clinicians confident that they are defining a discrete group of patients

Figure 2.



Visit previous version of website http://old.neurosymptoms.org

Home / Recommender

Recommender

Symptoms
☐ Functional Limb Weakness
☑ Functional (Dissociative) Seizures
☐ Functional Movement Disorders
☐ Functional Sensory Symptoms
☐ Functional Tremor
☐ Functional Cognitive Symptoms
☑ Functional Dystonia
☐ Functional Speech Swallowing Symptoms
☐ Functional Gait Disorder

Causes
☐ How has it happened?
☐ Why has it happened?
☐ Misdiagnosis / Comorbidity
☐ FND is not imagined
☐ Ten Myths of FND
☐ FND and other functional disorders

Treatments
☐ Understanding FND
☐ Investigations
☐ Physiotherapy / Exercise
☐ Occupational Therapy
☐ Psychological Therapy

Videos
☑ What is FND?
☐ How is FND Diagnosed?
☐ Can you have FND and another neurological condition?
☐ How is FND treated?
☐ What causes FND?
☑ Three Families and FND
☐ Functional Neurological Disorder - an introduction
☐ 'dis-sociated'
☐ Edinburgh Fringe Event
☐ FND - on 'Insight' Australian TV

Saved Items
Functional (Dissociative) Seizures
Functional Tics
Functional Dystonia
What is FND?
Three Families and FND

☐ I'm not a robot
reCAPTCHA
Privacy - Terms

Figure 3.

Results: The site continues to receive around 50,000 visits a month. Of the more than five million sessions since it started, the US (2 million), UK (1.5 million) have been the largest users of the site. Nineteem new language versions, adapted to the needs of users in different health systems and cultures are either in development or have been completed. Further improvements and enhancements continue.

Conclusions: Dr. Stone thanks the dozens of people who have collaborated with him on both the English and additional language versions of neurosymptoms, and to invite any new ideas for the site, as well as new collaborators for languages not currently represented.

WHEN NEUROLOGISTS DIAGNOSE FUNCTIONAL NEUROLOGICAL DISORDER, WHY DON'T THEY CODE FOR IT?

Jeff Waugh (UT Southwestern, jeff.waugh@utsouthwestern.edu*), Lorena Herbert, Asim Hassan, Rachel Kim, Alison Wilkinson-Smith*

Objective: Clinicians who recognize functional neurological disorder (FND) may not share the diagnosis with patients. Poor communication delays treatment and adds to disability. This problem was quantified and assessed for reasons why clinicians fail to communicate.

Background: Diagnostic coding offers an insight into clinicians' face-to-face communication: failing to utilize FND-related diagnosis codes is a form of noncommunication. Understanding non-coding may suggest routes to improve communication and prognosis in FND.

Methods: Reviewed all consultations at the UT Southwestern hospital from 2017-2020, selecting those in which pediatric neurologists explicitly stated an FND-related diagnosis (N=57). We identified the neurological symptoms and all ICD-10 codes assigned for each consultation. We reviewed all encounters that utilized FND-related codes to determine whether insurers paid for this care. In parallel, we assessed beliefs and practices that influence FND-related coding through a nationwide survey of pediatric neurologists (N=460), including all of our local physicians whose consultations we reviewed. Local and national physicians were highly similar (prior beliefs, type and duration of practice), allowing us to compare our survey and retrospective review datasets.

Results: After diagnosing FND, neurologists selected FND-related ICD-10 codes only 22.8% of the time; 96.2% of neurologists estimated that they would code for non-epileptic seizure (NES) when substantiated by EEG; in practice, they coded for 36.7% of such consultations. For other FND manifestations, neurologists coded in only 13.3% of cases. When presented with FND and non-FND scenarios with equal levels of data, neurologists coded for FND 41% less often. The strongest predictor of non-coding was the outdated belief that FND is a diagnosis of exclusion. After making an FND diagnosis, 39.1% of neurologists faced a personal negative consequence. Coding for FND never resulted in insurance non-payment, for any type of physician or healthcare service.

Conclusions: Non-coding for FND is common. Research based on ICD-10 coding (e.g., prevalence, prognosis, cost) may underestimate the impact of FND by >4-fold. The true cost of care for FND in the US likely exceeds $5.3 billion per year. Since physicians held FND to a higher diagnostic threshold, the costs of FND may be higher than in comparable neurological disorders. The true frequency of FND manifestations is likely distorted, as physicians were far less likely to code for non-NES manifestations of FND. Most factors that amplify non-coding also hinder face-to-face communication. Better FND-specific education for physicians, both during training and continuing education courses, will improve communication and care delivery, speeding recovery.

OUTPATIENT MOTOR REHABILITATION FOR FUNCTIONAL MOVEMENT DISORDERS: PREDICTORS OF FAVORABLE RESPONSE

Marcus Callister (Mayo Clinic | Arizona, callister.marcus@mayo.edu*), Molly C. Klanderman, Sayi P. Boddu, Margaret Moutvic, Elizabeth N. Geissler, Katie J. Traver, Anhar Hassan*

Objective: To assess variables associated with a favorable response to a one-week outpatient motor-reprogramming physiotherapy protocol for functional movement disorders (FMD) in the Physical Medicine & Rehabilitation Department at Mayo Clinic.

Background: Specialized motor-reprogramming therapy can improve FMD, and has been applied at our center since 2005.[1] However, these programs are resource-intensive and scarce, and predictors of favorable response to therapy remain poorly understood.

Methods: All patients enrolled in the Mayo Clinic FMD program from February 2019-August 2021 with sufficient data (n=204) were included. Most (87%) completed a PMR screening visit to confirm diagnosis, provide education, and exclude patients with predominant pain, fatigue, or neuropsychiatric symptoms that limit program participation. Prospective activity performance scales were administered at baseline and program end (Canadian Occupational Performance Measure [COPM, range 0-10], patient Global Rating of Change [GROC, -7 to +7], and others). The main outcome was patient-rated improvement in activity performance (COPM-P). Linear regression was used to identify variables that predicted favorable outcomes.

Results: The patients were 73% female, mean age 45, median FMD duration 24 months. The most common FMD subtypes were gait disorder 64%, tremor 40%, and weakness 17%; 52% had 2 or more subtypes. Clinician impression of outcome was moderately improved to completely resolved FMD in 82%. COPM-P improved by mean 3.8 +/- SD 1.9, post-program GROC +5.5 +/- 1.7. Factors predicting greater COPM-P improvement included: greater patient-rated improvement between screening visit and program start (pre-program GROC), and higher number of non-motor symptoms. Number of motor symptoms did not influence outcomes. Factors predicting lesser COPM-P improvement included: longer FMD duration, greater delay from screening to program, and higher baseline COPM-P.

Conclusion: Most patients had clinically meaningful improvement in activity performance and FMD symptoms with this treatment program. Routine use of an educational screening visit with rapid access to the program may improve outcomes. Further study to identify factors underpinning patient-rated improvement between the screening visit and program start could further enhance patient selection and outcomes. Presence of non-motor symptoms as favorable should be interpreted with caution: patients with predominant/disabling non-motor symptom burden were excluded from this program, but among participants absent or minimal non-motor symptoms were not necessarily advantageous for outcomes. Patient-reported motor symptom burden did not influence outcomes.

References:

1. Czarnecki K et al. Functional movement disorders: successful treatment with a physical therapy rehabilitation protocol. Parkinsonism Relat Disord. 2012 Mar;18(3):247-51.

PURPLE FEET

Victor Mark (University of Alabama at Birmingham, victor.mark1@gmail.com*)*

Objective: To prospectively evaluate an unusual integumentary finding in persons with Functional Neurological Disorder (FND).

Background: Skin changes have not been investigated in FND. Wilson (1931) noted that FND patients can have abnormal vasomotor function. An incidental observation in the present author's FND clinic found dependent limb rubor. Further observations follow.

Methods: Over one year, FND clinic patients were prospectively examined for discoloration of their extremities. The distribution and postural dependence of the changes were examined. To facilitate examination, observations were concentrated in light-pigmented patients.

Results: Of 89 such patients, 15 (17%, ages 19-64, 11 women) had dusky changes, mostly in the feet. [Figure 1] The changes could be blanched with light manual compression, and usually without pain. The rubor was dependent. However, in some cases these changes also appeared in the hands and in one case the knees. Occasional cool extremities occurred, without edema.

Figure 1.

Conclusions: Dependent rubor is usually attributed to diffuse peripheral vascular insufficiency. However, dependent rubor also has been reported to vary with sympathetic nervous system disturbances (Bahrani and Sladden, 2017). This finding suggests that a common autonomic disturbance may occur in FND. If confirmed in this population, this may support new hypotheses concerning neurobiological foundation for FND. Standardized controlled assessment is warranted to improve understanding the specificity of this finding and its implications for modeling physiological processes in FND.

References:

Bahrani B, Sladden CS. Dependent erythema of the legs associated with mild autonomic nervous system dysfunction. J Cutan Med Surg 2017;21:556-558.
Wilson SAK. The approach to the study of hysteria [review]. J Neurol Psychopathol 1931;11:193-206.

THE ROLE OF NEUROPHYSIOLOGY IN FUNCTIONAL DYSTONIA

Maryamnaz Hosseinzadeh Zaribaf (NIH NINDS, maryamnaz.hosseinzadehzaribaf@nih.gov)*, Mark Hallett, Patrick McGurrin*

Objective: To illustrate a method that might have clinical utility for identifying functional blepharospasm.

Background: Clinically it can be difficult to decide whether a patient has functional or organic dystonia.[1] A 49-year-old woman presented with dystonia, including blepharospasm. After a laminectomy, her right foot became progressively rotated and fixed. She also had unsynchronized frequent blinking in both eyes and long spasms in the right eye.

Methods: Surface/needle EMG on the patient's right lower extremity muscles was performed. Needle recordings included the tibialis anterior (TA), tibialis posterior muscle, and the toe flexors and extensors. Surface EMG included TA, gastrocnemius, and the toe flexors and extensors.

An entrainment test of the blinking with tapping of the two hands was also performed. Surface EMG electrodes were placed on bilateral orbicularis oculi muscles, and accelerometers were placed on the dorsum of each hand to record the tapping motion. Guided tapping was performed using a metronome at 1, 2, and 3 Hz frequencies.

Results: Surface EMG activity of the leg muscles showed continuous activity sometimes fragmented into short bursts at a frequency of 20 Hz. Needle EMG showed large motor units indicative of chronic denervation. Motor unit firing occasionally also came in clusters at about 20 Hz.

During tapping with the left hand, entrainment of the blinking or slowing of blink rate occurred when tapping at various frequencies. There was more interference when tapping with the left hand than with the right hand.

Conclusions: The patient developed right leg dystonia after back pain and laminectomy, raising suspicion of post traumatic dystonia. The neurophysiology is consistent with that diagnosis, showing clear signs of nerve injury. The occasional fragmentation into 20 Hz pattern is unusual with uncertain explanation but is not a pattern that is possible voluntarily.

The blepharospasm was thought to be functional on clinical exam, and the neurophysiological testing with entrainment supported this finding. This should be studied more and might well be a useful clinical test, as no known entrainment has previously been reported for blinking.

The patient does appear to illustrate the combination of post-traumatic dystonia and functional dystonia.

References

1. Hallett, Mark. "Physiology of psychogenic movement disorders." Journal of clinical neuroscience 17.8 (2010): 959-965.

STEPPED CARE MODEL FOR FUNCTIONAL NEUROLOGICAL DISORDER AT THE ROSA BURDEN CENTRE, NORTH BRISTOL NHS TRUST, UK

Elizabeth Mallam (North Bristol NHS Trust, elizabeth.mallam@nbt.nhs.uk*), Dane Rayment, Kumaravalli Taralipoyina, Monica Mohan, Patrick Cookson, Ulrike Barthe, Alex Reuben, Amy Stanley, Rachael Crowley, Victoria Bradley*

Objective: To describe the stepped care model as we have applied it at the Rosa Burden Centre, North Bristol NHS Trust, United Kingdom.

Background: Recent research, consensus guidelines, and descriptions of models for delivery of services for people with functional neurological disorder (FND) have prompted us to review and refresh our service for FND at the Rosa Burden Centre.

Methods: For decades, the Rosa Burden Centre has provided care for people with FND. Contact with the Centre currently leads to a 22% reduction in ED attendance and 43% reduction in admissions to our main hospital. Published literature on therapeutic approaches and service delivery [1, 2] and liaised with other centres was reviewed. The need to expand service was identified. In addition to the multidisciplinary inpatient programme, there is now an outpatient therapy clinic; a novel liaison therapist role to streamline care at our main hospital, and an online Education Group. The refreshed service promotes local training for therapists and provides FND education for health professionals with team members delivering local, regional and national teaching.

Results: Pathway diagram: [Figure 1]
People with FND symptoms present to their GP or the Emergency Department.

The diagnosis of FND is made by a neurologist in the outpatient or inpatient setting.

Inpatient admission to the main hospital is supported by the FND liaison therapist.

Onward referral to the Rosa Burden Centre Functional Neurology Clinic for assessment and triage into outpatient or inpatient therapy programmes.

The aim is for self-management or ongoing support in the community.

A FND Service Working Group was set to keep the service under review using standardised outcome measures (EQ5D5L, CGI, Core 10) alongside NHS Friends and Family feedback.

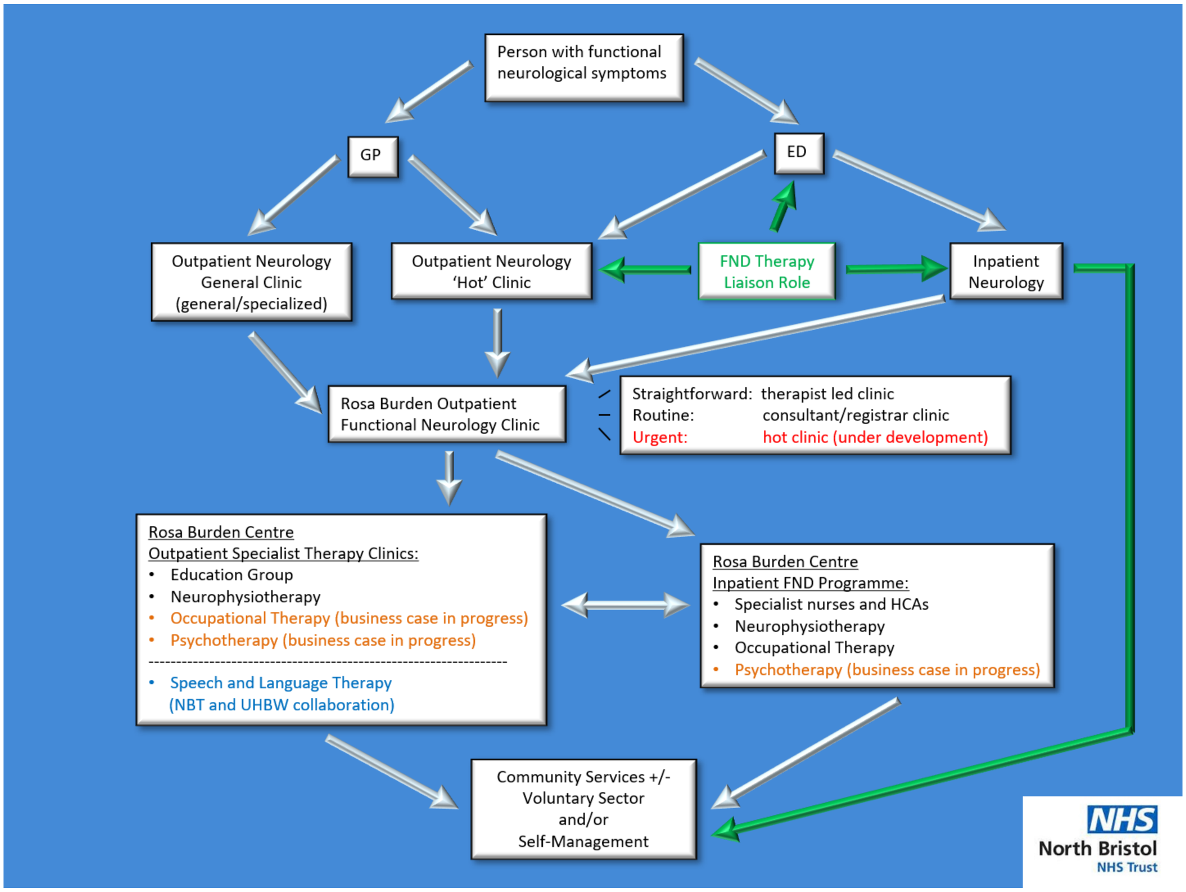


Figure 1.

Conclusions: Aspects of the pathway went live in 2022. Outcome measures to inform ongoing refinement of the service are being gathered and analyzed. Data will be published to share the experiences and contribute to the growing evidence-base on-service provision for people with FND.

There will be ongoing collaboration with neighbouring services to improve access to evidence-based treatment for people with FND across the South West. Next steps include re-establishing our psychotherapy service and developing an individually-tailored integrated outpatient therapy programme.

The new pathway represents the ambitions to develop the Rosa Burden Centre at North Bristol NHS Trust as a regional centre of excellence for service provision for people with FND.

References:

1. Healthcare Improvement Scotland. (2012). Stepped care for functional neurological symptoms: A new approach to improving outcomes for a common neurological problem in Scotland. Retrieved from www.healthcareimprovementscotland.org

2. Optimal clinical pathway: Functional Neurological Disorder (2019). Retrieved from www.nnag.org.uk February 2022.

COLLECTION OF SELF-REPORTED TRAUMA HISTORY DATA IN AN NES POPULATION

Sarah Baker (University of Colorado, sarah.l.baker@cuanschutz.edu*), Meagan Watson, Stefan Sillau, Kelly Thoma, Chelsea Frantz, Laura Strom*

Objective: To investigate differences in patient's self-reported trauma history, comparing an online survey to a clinical interview; and if the reporting of trauma is influenced by patient's self-reported level of confiding at the time of the trauma.

Background: Early traumata, especially sexual abuse, is a factor correlated with the development of NES.[1] Trauma assessment is recommended when NES is suspected but this is rarely included in a neurologists' clinical interview.[2]

Methods: All patients (N=177) had vEEG confirmed diagnosis and both neurological and behavioral health evaluations with the NES Clinic between the dates of March 12, 2020, and December 31, 2021. Trauma history was gathered by clinical interview during evaluations and categorized to match questions on the Childhood Trauma Questionnaire (CTQ). Confiding was measured by the CTQ per trauma category on a scale of 1 (not at all) - 7 (a great deal); 1-3 were coded as low confiding, and 4-7 as high confiding. This score was used to determine if the level of confiding explained any difference between the traumatic experiences endorsed per reporting method. Summary statistics were calculated using relative risk models and Wald confidence intervals.

Results: Traumas in the following categories were statistically significantly more likely to be reported on the CTQ than the clinical interview: death of a loved one, parental upheaval, sexual, and illness or injury. Violence was the only category equally likely to be reported by both collection methods [Table 1]. Level of confiding, as measured by the CTQ per trauma category, was not statistically significant in explaining whether a trauma is disclosed or not by either collection method. Only one category was trending towards significance, and this was sexual. These results show that more trauma was captured using the CTQ than clinical interview but was not explained by the level of confiding reported per trauma.

Table 1.

Trauma Category	Mean		L'Beta Estimate
	Confidence Limits		
Death	2.4959	4.401	3.3143
Parental Upheaval	1.8084	3.0106	2.3333
Sexual	1.0468	1.3165	1.1739
Violence	0.8440	1.1849	1.0000
Illness or Injury	1.5483	2.6411	2.0222

Conclusions: The current clinical methods of collecting trauma history rely on patient willingness to disclose sensitive personal information. With trauma being a suspected contributor to NES onset, it is important that this history can be reliably and accurately collected. We hypothesized that a clinical interview would not yield the most complete history due to patients' inability to confide in others about trauma. This analysis suggests that an administered questionnaire is likely to be a more reliable tool to collect comprehensive trauma history across all categories. This relationship was not explained by the patient's reported willingness to confide those traumas at the time of the trauma.

References:

1. Duncan, R. and M. Oto (2008). "Predictors of antecedent factors in psychogenic nonepileptic attacks: multivariate analysis." Neurology 71(13): 1000-1005.

2. Perez, D. L., et al. (2019). "Cautionary notes on diagnosing functional neurologic disorder as a neurologist-in-training." Neurology: Clinical Practice: 10.1212/CPJ.0000000000000779.

DEVELOPMENT OF A DIAGNOSTIC DECISION CHECKLIST FOR PATIENTS WITH FUNCTIONAL MEMORY SYMPTOMS: A DELPHI STUDY

Verónica Cabreira (University of Edinburgh, veronica.cabreira@gmail.com*), Laura McWhirter, Lisbeth Frostholm, Craig Ritchie, Jon Stone, Alan Carson*

Objective: To collect expert opinion data on the diagnostic practices and distinctive profiles of a Functional Cognitive Disorder (FCD). A diagnostic decision aid will be developed using a consensus process.

Background: Around a third will have a FCD diagnosis, which is characterized by distinct positive features and cognitive internal inconsistency. So far, a reliable diagnostic test or clinical profile is yet to be identified. [1,2]

Methods: Multi-step electronic Delphi survey, informed by a previous systematic review. Participants with both clinical expertise and publications in the field were invited. Further participants were recruited by a snowball method. Background data including healthcare setting, specialty and number of years of relevant clinical experience was collected. In Phase 1, participants were asked to share their clinical approach to seven different scenarios describing patients with cognitive complaints (investigation, treatment strategy and follow-up). [Table 1] Participants were also presented a list of 30 clinical features and asked to rate their relevancy for a FCD diagnosis, using a 7-point Likert scale (extremely unimportant to extremely important).

Table 1. Clinical scenarios and actions to be appraised

Clinical Scenarios presented to each Delphi Participant in Round 1	Clinical Actions to be appraised for each scenario
Case A: 78-year-old woman complaining of “bad memory” progressing for two years, poor speech content. Attends clinic with her husband. Patient and informants very concerned. Neurological examination unremarkable except for difficulties with copying hand movements. Score of 22/30 on Mini Mental State Examination (failing orientation to time and delayed recall).	Choosing between a set of investigations to conduct in each patient (assuming all are available) ▪ Blood tests (namely, thyroid, renal, and hepatic function, B-12 and folate levels, electrolytes, and glucose) ▪ Propose to the patient an assessment of CSF biomarkers ▪ Psychometric testing done by a neuropsychologist ▪ Bedside cognitive testing (physician-led) ▪ Cognitive nursing assessment ▪ CT brain scan ▪ MRI brain scan ▪ Electroencephalogram (EEG) ▪ PET (PET-PiB/PET-tau) scan ▪ Clinical history and neurological examination are sufficient for the diagnosis ▪ Other
Case B: 64-year-old woman, independent. Loses track while doing things, forgets people’s names on TV and sometimes her phone number, but able to recall moments later. Need to check her things regularly to not leave them on the bus or at the supermarket. Neurological examination is normal. On neuropsychological testing, she struggles to complete the required tasks, looking anxious and concerned about a potential failure. She performs poorly on executive and attention tasks, but otherwise her scores are appropriate for her norm.	
Case C: 44-year-old woman, university teacher on leave, used to run marathons but now gets tired after a few miles. Memory is “worse than ever”. Difficult concentration during important meetings. Attends clinic alone. On neuropsychological tests, obvious problems with digit span and other attention tasks. Struggles with immediate recall, but generally well on delayed recall, verbal fluency and object naming testing. Neurological examination is unremarkable.	
Case D: 61-year-old man, with overweight, diabetes and chronic back pain, decreased performance and some disputes with his colleagues at work. Episodic memory lapses and word finding difficulties, exacerbated by fatigue and insomnia. Currently on opioid and amitriptyline, and benzodiazepines at times. On examination, mild extrapyramidal signs are evident in the lower limbs. His wife reports reduced empathy and lower ability to manage complex tasks at home, like if is “unable to think properly” at times. Blood tests are normal and a prior MRI brain scan, from two years ago, showed small vessel disease and mild generalized atrophy. On neuropsychological testing, he performs on the average range except for concrete interpretation of proverbs. No failure is identified on performance validity tests. The patient and his wife pre-emptively deny mood disturbances.	Choosing a treatment strategy potentially relevant to each individual patient ▪ Cognitive stimulation (brain games, puzzles, reading...) ▪ Psychological therapy ▪ Psychiatric assessment

Case E: 56-year-old woman, loses the thread during conversations, forgets colleague's name and often misplace things. Reports her thinking as sluggish and effortful, "not like it used to be". Few episodes when she felt "spacy" or "confused" after her mom died from cancer. In the clinic, she rated her own memory as significantly impaired, despite she continued working. Still enjoys novels but not able to recall the ending of a novel she has read months before. Neurological exam entirely normal. On cognitive testing, she performs on the normative range.	▪ Add an antidepressant drug (e.g. selective serotonin reuptake inhibitor) ▪ Add an antidementia drug (e.g. cholinesterase inhibitor) ▪ Other
Case F: 53-year-old woman with a 1-year history of decreased ability to find words in a sentence and to pronounce them correctly. Obvious inability to repeat long sentences and at times to perform complex actions. MoCA test score of 17/30 with a prominent decline in verbal fluency and serial reversals. Delayed recall and visual memory were intact.	Deciding on the need of a follow-up appointment? (Yes/No)
Case G: 19-year-old male, complains of headache, dizziness, and fatigue after he suffered a concussion while he was playing rugby months ago. That day he lost consciousness for a few seconds. Upon awakening, he remembers feeling dazed and confuse, not being able to recall the moments immediately before the fall. He was taken to the hospital and discharged the same day after exclusion of neurological abnormalities. Nowadays no longer enjoys playing videogames and no longer seems able to hang out with his friends without feeling exhausted. Even simple tasks now take long time to complete. During consultation, he expresses himself very worried that these might be signs of brain damage.	

Results: Thirty-nine participants were invited to participate, from 8 different countries, and both a neurology and psychiatry background. A quantitative analysis of the results of Round 1 is being conducted. Qualitative text responses will be object of a thematic analysis to identify additional items for Round 2. Consensus is defined as a topic rating of 6 or 7 by ≥66.6% of the panel. After each round, participants will received anonymous feedback of their individual answers and the amalgamated results of the panel. [Figure 1] For each round, the number of participants invited and those who completed the surveys will be documented. Those items considered to demonstrate adequate validity will be included in the final diagnostic inclusive decision tool.

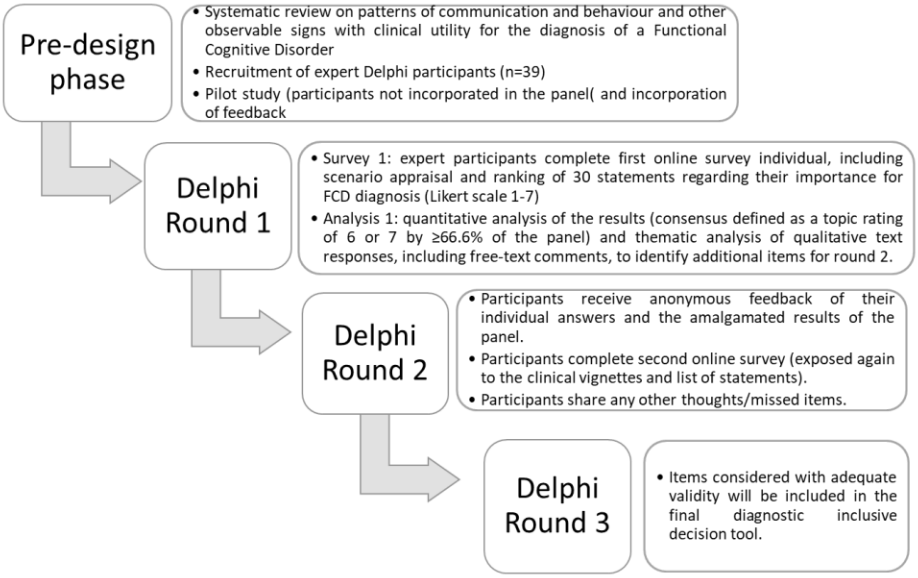


Figure 1. Delphi exercise flowchart.

Conclusions: This study will explore the perceived discriminant ability of a characteristic profile of communication and behaviour features observable during standard clinical assessment in real settings, by surveying a panel of experts in the field. This will be the starting point for the development of a diagnostic scoring tool to be tested in memory clinics and other clinical settings. This study is funded by the EU H2020 Marie Skłodowska-Curie grant agreement 956673.

References:

1.McWhirter L, Ritchie C, Stone J, Carson A. Functional cognitive disorders: a systematic review. Lancet Psychiatry, 2020;7(2):191-207. doi: 10.1016/S2215-0366(19)30405-5.

2.Ball, H.A., McWhirter, L., Ballard, C. et al. Functional cognitive disorder: dementia's blind spot. Brain, 2020;143 (10):2895-2903.

DIAGNOSTIC DECISION TOOLS FOR A FUNCTIONAL COGNITIVE DISORDER DIAGNOSIS: A SYSTEMATIC REVIEW

Verónica Cabreira (University of Edinburgh, veronica.cabreira@gmail.com*), Laura McWhirter, Lisbeth Frostholm, Jon Stone, Alan Carson*

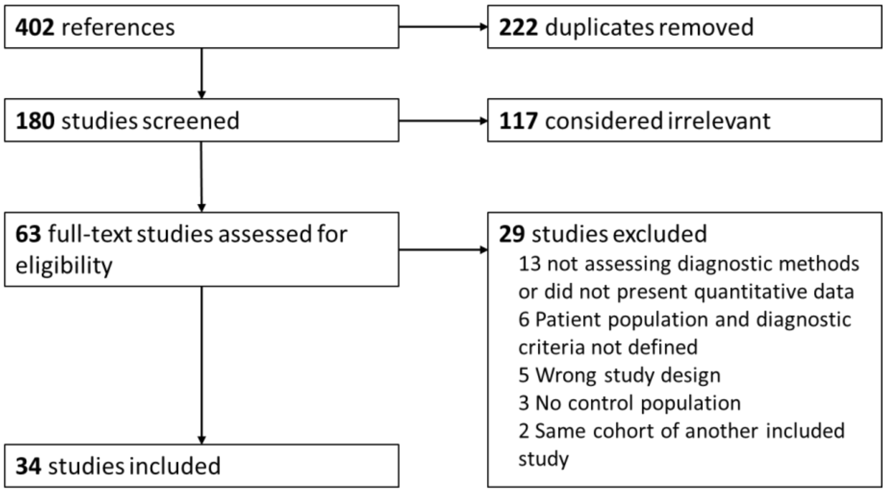
Objective: To review the best available evidence on decision tools supporting the diagnosis of a functional cognitive disorder (FCD). Their diagnostic discriminative ability for a differential stratification of patients with memory complaints will be explored.

Background: FCD is a common diagnosis in patients attending memory clinics and it is overrepresented in populations such as those with functional somatic symptoms. The diagnosis relies on the demonstration of positive features of internal inconsistency.[1]

Methods: A systematic review of observational studies focusing on the diagnosis of FCD was conducted. The search strategy was developed to cover overlapping terminologies and broad spectrum of subjective memory complaints and applied to MEDLINE, EMBASE and PsycINFO databases. Only those with quantitative data and a control group population with a neurodegenerative disease were included. Positive diagnostic outcomes related to demographic characteristics, ability to detail symptom history, concomitant non-cognitive symptoms, bedside cognitive assessments, language and behavioral features and clinical signs with diagnostic utility were extracted. Data was synthesized into a narrative review, which was conducted in line with the PRISMA guidelines.

Results: Thirty-four studies were included [Figure 1] for a total of 8679 patients (FCD prevalence of 39.5%). There were heterogeneous terminologies and diagnostic criteria, with internal inconsistency only rarely mentioned. FCD patients are described as younger and higher educated; report a higher number of cognitive complaints and recall memory failures in detail. Communication patterns were identified including ability to handle compound questions, longer duration of spoken response and comparison to a benchmark memory. FCD commonly attend consultation alone and are more likely to be self-referred. A risk model evaluating the performance of two of these characteristics (age <74 years and duration of spoken response >67 seconds) reached excellent accuracy.

Figure 1. Study PRISMA flowchart.



Conclusion: Assessing patients with cognitive impairment has become increasingly challenging. Further research on the identification of diagnostic patterns and their prospective validation is required for the positive identification of FCD during a standard clinical assessment. Uniform diagnostic criteria need to be adopted. While the presence of one of these differentiating features will hardly be diagnostically conclusive, research into diagnostic prediction models needs to be addressed for accurate communication of diagnosis, prognostic prediction, and treatment referral. This study is funded by the EU H2020 Marie Skłodowska-Curie grant agreement 956673.

References:

1. Ball, H.A., McWhirter, L., Ballard, C. et al. Functional cognitive disorder: dementia's blind spot. Brain, 2020;143 (10):2895-2903.

CHRONIC INFLAMMATORY DEMYELINATING POLYNEUROPATHY AS A NOVEL RISK FACTOR FOR THROMBOEMBOLISM

Stella Pak (Albany Medical College, paks@amc.edu*), Nihita Manem, Miriam Quinlan, Allen Gerbe*

Background: Chronic inflammatory demyelinating polyneuropathy (CIDP) is a severe debilitating neurological condition, which involves an aberrantimmune response against peripheral nerve system. An increased risk of thromboembolism has been well studied in other autoimmune neurological disorders, such as multiple sclerosis, Guillain Barre Syndrome, or Myasthenia Gravis. However, the risk of thromboembolism associated with CIDP has not been reported due to it rare entity. Herein, we report a case of extensive thromboembolism associated with CIDP.

Method: A 72-year-old right-handed male presented with symmetrical leg weakness, which has been worsening in a stepwise manner. First dose of COVID-19 vaccination six months ago triggered development of the leg weakness. Six weeks following the initial dose, he received second dose of COVID-19 vaccination. Soon after the vaccination, he experienced a critical worsening of leg weakness. As a result, he become wheel chair bound. Physical examination was remarkable for symmetrical weakness and numbness in lower extremities. His legs were mildly atrophic and hypotonic at rest. He was also areflexic at the knees and ankles. He had bilateral down-going plantar reflex. MRI with contrast for the brain, cervical spine, thoracic spine, and lumbar spine did not show a mass, demyelination, inflammation, or swelling. Lumbar puncture analysis revealed protein of 88mg/dL with normal white cell count of <8 leukocytes/mm3. This finding was most consistent with the diagnosis of CIDP.Patient underwent a robust five-day course of IVIG (0.4mg/kg), with mild improvement in weakness and numbness in the lower extremities. Patient was scheduled to undergo further IVIG therapy every three weeks in the outpatient setting. Unfortunately, soon after the discharge, the patient developed acute hypoxic respiratory failure, requiring oxygen support, from bilateral pulmonary embolism.

Conclusion: This case illustrates the under-recognized risk of thromboembolism associated with CIDP, due to systemic inflammation, impaired mobility, and peripheral denervation, resulting in venous stasis.

RITUXIMAB FOR ANTI-N-METHYL-D-ASPARTATE RECEPTOR ENCEPHALITIS

Stella Pak (Albany Medical College), Shakthi Sureddi, Allen Gerber

Background: Anti-N-Methyl-D-Aspartate (NMDA)receptor encephalitis is a sever, but potentially reversible autoimmune encephalitis, dominantly affecting children and young adult woman. Approximately 60% of patients with NMDA encephalitis have tumors containing nervous tissue, such as ovarian teratoma.

Method: A 34-year-old otherwise healthy woman presented with two-weeks duration of visual hallucination, inappropriate laugh, impulsivity, short-term memory difficulty, and headache. She then developed hypersalivation, which required an intubation to protect the airway. Brain MRI revealed scattered FLAIR hyper-intensities in the bi-frontal cerebral white matter. CSF from lumbar puncture was positive for NMDA receptor antibody with the titer of 1:16. The patient's clinical symptoms were refractory to a robust course of IVIG treatment. Given the association of NMDA encephalitis and tumor association, Pelvis MRI was performed to screen for malignancy. On the MRI, a small cyst in the left ovary was visualized. The patient underwent alaparoscopic left salpingo-oophorectomy. The surgical biopsy from the operation revealed an ovary with mature teratoma. Even after the removal of tumor, there was no significant improvement. For this reason, four weeks course of Rituximab 700 mg once a week was started. Her respiratory, neurological, and musculoskeletal function dramatically improved after three weeks of Rituximab treatment. On third week of the Rituximab therapy regimen, the patient was discharged to an acute rehabilitation facility, as she gained the strength to participate in more rigorous exercises.

Conclusion: This case illustrates the novel therapeutic approach to NMDA encephalitis, using Rituximab, the monoclonal antibody targeting the B cells. Awareness of the effectiveness of Rituximab in NMDA encephalitis may improve the prognosis for the patients who fail the conservative treatments, such as steroids, IVIG, and plasmapheresis.

CEREBRAL NOCARDIOSIS: A DIAGNOSTIC CHALLENGE

Stella Pak (Albany Medical College, paks@amc.edu*), Neha Pirwani, Kelly Donnelly-Mueller*

Background: Nocardia is a gram-positive, filamentous bacterium, capable of producing a plethora of organ pathologies, including the central nervous system.Cerebral nocardiosisis considered a rare entity, accounting for less than two percent of brain abscesses.[1] Overall mortality has decreased from 60% to 37% over the last decades.[2] A continuous diagnostic challenge has been the mimicry between abscesses and other CNS pathologies, such as neoplasm, post-surgical scarring, or radiation-related inflammation. Herein, this report references a patient who suffered multiple brain abscess infested by filamentous Nocardia.

Method: A 62-year-old woman with lung adenocarcinoma stage IV, underwent a surgical resection and radiation therapy for a brain metastasis in the right cerebellar hemisphere. On the three-month follow-up MRI, a new thin, irregular enhancement on the peripheral rim of the post-surgical cavity was noted. At the time, it was uncertain if this represented post-surgical change, residual neoplasm, radiation reaction, or infection.

One year after the brain mass resection, the patient presented to the hospital with new-onset expressive aphasia and focal weakness in the left lower extremity. Repeat MRI showed three new ring-enhancing lesions within the left cerebellum, left temporo-parietal junction, and left para-median superior parietal lobe. There was persistent irregular enhancement within the right cerebellum, now extending to the right middle cerebellar peduncle. Aspiration biopsy revealed a large amount of Nocardiafarcinica, which was resistant to ceftriaxone, imipenem, clarithromycin, tobramycin, doxycycline, and minocycline. The patient was started on trimethoprim-sulfamethoxasole 400 mg three times/day, but despite continued antibiotic treatment, she became bacteremic. This was complicated by acute toxic metabolic encephalopathy, invasive pulmonary nocardiosis, and multiple skin abscessesShe eventually expired after 8 weeks of antibiotic treatment.

Conclusion: This case illustrates the diagnostic challenges associated with cerebral nocardiosis in the setting of multiple co-morbidities.

References:

1. Kennedy KJ, Chung KH, Bowden FJ, Mews PJ, Pik JH, Fuller JW, et al. A cluster of nocardial brain abscesses. Surg Neurol. 2007;68(1):43-9.

2. Mamelak AN, Obana WG, Flaherty JF, Rosenblum ML. Nocardial brain abscess: treatment strategies and factors influencing outcome. Neurosurgery. 1994;35(4):622-31.

SEX- AND TRAUMA-SPECIFIC VS SHARED METHYLOMIC PROFILES ASSOCIATED WITH FUNCTIONAL MOVEMENT DISORDER

Primavera Spagnolo (Brigham and Women's Hospital/Harvard Medical School, pspagnolo@bwh.harvard.edu*), Kory Johnson, Colin Hodgkinson, David Goldman, Mark Hallett*

Objectives: To identify DNA methylation (DNAm) changes variations associated with Functional Movement Disorder (FMD) and to uncover distinct vs shared epigenetic signatures occurring in female patients and in the presence or absence of exposure to childhood abuse.

Background: Multiple risk factors have been implicated in the development of FMD, including exposure to childhood trauma and female sex, although the underlying pathogenetic mechanisms of this disorder remain largely unknown.

Methods: Genome-wide DNAm analysis was performed from peripheral blood in 57 patients with FMD and 47 healthy controls with and without childhood abuse exposure. Principal component analysis (PCA) was used to examine the association of principal components (PCs) with FMD case status in exposed and non-exposed individuals, in the entire study sample and in female subjects only. Next, PCA-based enrichment pathway analysis to investigate the biological significance of DNAm changes and explored differences in methylation levels of genes annotated to the top enriched biological pathways shared across groups were used.

Results: Using PCA, FMD was associated to variation in DNA methylation across the genome both in the presence and absence of childhood abuse. Changes in DNAm were identified in the female-only subgroup as well as when considering the entire group. Furthermore, enrichment analyses indicated that FMD subgroups shared a common epigenetic 'signature' enriched for biological pathways implicated in chronic stress and chronic pain (i.e., CRH signaling; immune response-related pathways; neurotransmission-related pathways, including GABA receptor, opioid and endocannabinoid signaling). However, methylation levels of genes included in the top two shared pathways across subgroups hardly overlapped, suggesting that transcriptional profiles may differ as a function of childhood abuse exposure and sex among subjects with FMD.

Conclusion: This study is unique in providing genome-wide evidence of DNAm changes in FMD and to suggest that female-specific and trauma-specific molecular profiles may be associated to this disorder. Furthermore, our findings indicate that FMD may be characterized by perturbations in biological pathways related to chronic stress and pain. Further studies are required to confirm these findings and characterize their impact on FMD pathophysiology.

FUNCTIONAL NEUROLOGICAL DISORDER ON THE INPATIENT PSYCHIATRY UNIT

Caitlin Adams (Mass General Brigham - Salem Hospital, caitlinmnewman@gmail.com*)*

Objective: This case will focus on the importance of clear and consistent communication for patients with a functional neurological disorder by discussing a patient who experienced challenges in interacting with clinical staff unfamiliar with an FND diagnosis.

Background: Functional neurological disorder (FND) is a common and sometimes debilitating diagnosis at the intersection of neurology and psychiatry. This case will highlight the gap between advancements in the understanding and treatment of FND and the application of these learnings in the clinical world – in this case on an acute inpatient psychiatric unit. While there may be a role for inpatient psych admission for a particular patient with FND, not all patients stand to benefit, and for those that might benefit, the stigma associated with FND and false beliefs around this being a variation of malingering may create a nontherapeutic environment. Clear and consistent communication regarding the FND diagnosis and use of appropriate language among the interdisciplinary team working on an inpatient psych unit is paramount.

Methods: The patient is a 70-year-old male, who carried no formal psychiatric or neurologic illnesses prior to admission to inpatient psychiatry. He reported onset of symptoms shortly after the start of the COVID pandemic. He has retired from a sales job to transition to a part time job working for a rental car company. That job was later lost due to the pandemic, and with it, the socialization he had with his coworkers. He then began to focus on somatic concerns – starting with symptoms he believed were secondary to new onset pancreatic cancer. He pursued extensive workup that was unremarkable. He then focused on concerns around his liver – the workup again unremarkable. Patient began to experience rapid cognitive decline, which he feared was secondary to rapidly progressive dementia. He was enrolled into a partial hospitalization program (virtual groups), but was noted to be too anxious to participate, at which point he was referred to inpatient psychiatry for admission. While on the unit, he expressed ongoing concern for cognitive issues, MOCA 29/30, he feared team scored unfairly.

Neuropsych testing was completed. Results were consistent with an anxiety disorder, but not with a primary neurocognitive disorder. In addition, neurology was consulted (given it is a community hospital, there is only tele-neurology available), and MRI, EEG were recommended. The MRI showed possible dural swelling, so an LP was recommended and pursued, and unremarkable. A second opinion on the MRI from another neurologist was that there was not appreciable dural enhancement or notable swelling.

After an abrupt and unexpected change in providers on the unit, he developed a tremor that started in his upper arm, but progressed to include a head tremor, followed by a full body tremor with flexion at his waist. The tremor resolved completely with distraction - specifically when he tapped his thumb and first finger or counted backwards from ten. A diagnosis of functional neurological disorder was discussed both with him directly and with his wife, and printed information from neurosymptoms.org was provided. His wife felt the diagnosis was consistent with his symptoms, but the patient was initially ambivalent, but later was more open to this as a possible explanation for his symptoms. He seemed encouraged when told that his symptoms would improve. At discharge, he was referred to an FND outpatient team.

Shortly after he discharged, he was readmitted to a different unit with a chief complaint of escalating depression and anxiety. He continued to complain about cognitive symptoms. For example, he would report that he could not remember what he watched on television – but would remember the exact questions he was not able to answer the night before on Jeopardy. His depression, which was described as severe, was treated with biweekly electroconvulsive (ECT) sessions. As his anxiety improved, he also engaged in psychodynamic therapy with a psychologist while on the unit. He spoke about feeling embarrassed by his functional tremor and the way people may view him or react to him, and recalled a memory from childhood in which a peer was making fun of his classmate with cerebral palsy and the patient punched the peer that was making the jokes.

Patients with FND can often face a negative stigma, particularly when interfacing with staff unfamiliar with the diagnosis, as FND can be misinterpreted as malingering. The patient in this case study provides a narrative about the difficulties of overhearing staff accusing him of “faking” or feigning his symptoms, of providing an oversimplified explanation that his symptoms were exclusively or directly related to anxiety. After transferred to a unit where providers were more familiar with and discussed an FND diagnosis directly with the patient. He also speaks to benefitting from interacting with a psychologist on the unit who did not avoid speaking to him about the tremor and possible stressors that might worsen or exacerbate the tremor. As he speaks about the progression of his symptoms, he starts to experience a tremor, as he focuses his attention on these symptoms.

This case also raises the question about what role, if any, ECT can be added to additional approaches to a patient with FND. There is a growing body of literature to support that while stressors may influence the vulnerability, there is a neurobiological process, and this might benefit from therapies such as ECT or transcranial magnetic stimulation (TMS). While not the focus of this grand rounds, it was a factor in the improvement in depression and anxiety symptoms for this particular patient and may have also helped to improve FND symptoms. While likely not a cause and effect, ECT added to other multidisciplinary treatment and with clear and consistent communication

Conclusion: This case highlights the importance of both ongoing education for clinical providers who interface with FND and the power of language and importance of communication in the treatment of FND. Patients interface with a variety of medical providers both in discipline (MD/DO, RN, OT, PT, SLP), but also specialty (neurology, psychiatry, internists) - it is important for the consistent language to be used despite these differences. For this particular patient, and likely for others like him, his symptoms did not improve and arguably worsened on a unit where his symptoms were oversimplified and attributed simply to anxiety and where he was accused of faking or feigning his symptoms. When surrounded by a multidisciplinary team that consistently communicated that they believed him and that his symptoms are in fact real and not feigned, his symptoms began to improve.

A STRATEGIC MODEL OF CARE FOR FUNCTIONAL NEUROLOGICAL DISORDER: PATHWAY AND FINANCIAL DATA

Meredith Lindsey (Advocate Aurora Health Care, meredithklindsey@gmail.com*), Sarah Danforth*

Background: Functional neurological disorder (FND) is a common neurologic impairment with limited treatment options. Evidence supports a multi-disciplinary approach involving neurology, rehab and behavioral health.[1] Advocate Aurora Healthcare, the 10th largest healthcare system in the US, developed a comprehensive FND program with concurrent rehab and behavioral health services for immediate and longitudinal outcomes. This treatment protocol outlines a pathway for individuals with both motor and non-motor symptoms and is based on research supporting FND-specific treatment.[3] The value of this protocol was demonstrated in a 2020 financial proforma.

The Advocate Aurora Health Care protocol delivers a strategically timed care model driven by primary symptom presentation with an emphasis on collaborative care.[4] Entry begins with a diagnosis followed by a referral to physical medicine and rehabilitation (PM&R). The program intake specialist completes the intake process to streamline patient history and assesses diagnosis understanding and acceptance, which is critical to symptom remission. Collaborative evaluations with PM&R and rehab clinicians follow. [Figure 1]

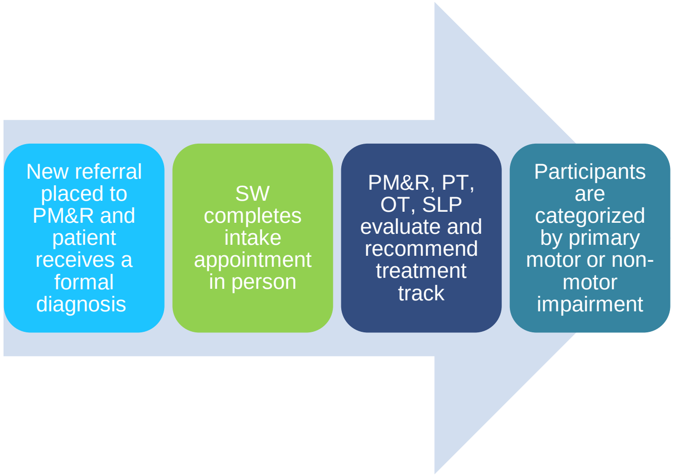


Figure 1.

Candidates with primary motor impairments including tremors, gait disturbance or functional weakness participate in a one week intensive in the outpatient rehab setting. Patients receive specialized behavioral health, specifically created for FND including self-agency and behavioral activation,[2] for six weeks. Rehab services are timed four to five weeks after starting behavioral health for optimal recovery and outcomes.

Candidates with primary non-motor symptoms including sensory changes, cognitive complaints, dizziness, and fatigue, receive rehab outpatient frequency of 1-2x/week in parallel with the specialized behavioral health treatment protocol. [Figure 2]

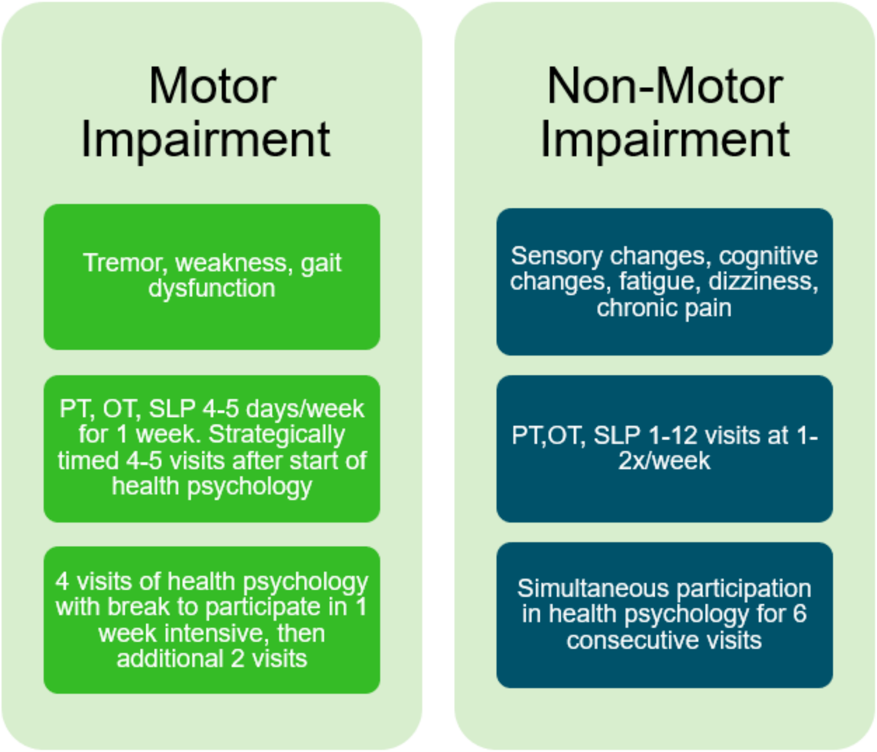


Figure 2.

Methods: FND patients have increased healthcare utilization[5]. A financial proforma was completed assessing patient outcomes and healthcare utilization for both FND patients who received this strategic model (n=17) as well as FND patients who did not (n=28). This detailed analysis aimed to study the significant health care utilization of FND patients without strategic care and support program viability. Healthcare utilization in all settings specific to FND management was analyzed over a period of 12-24 months.

Results: FND specific treatment resulted in decreased cost of care ($1,276,953) compared to those who did not ($3,574,630). Costs to the patient in the strategic care group totaled $12,708. The direct cost to the patient who did not receive care was $20,902. The contribution margin showed patients with strategic treatment contributed $7,794 to the healthcare organization while patients who did not receive this care contributed nearly half this amount at $3,673.

Conclusions: With this key piece of healthcare utilization in mind and financial information, Advocate Aurora is one of the first large-scale healthcare systems to implement a strategic model of care and demonstrate the financial viability of this care model. Additional areas of focus for further research includes repeating this financial proforma with additional participants, assessing outcomes in a longitudinal study, exploring the role of health literacy in long-term symptom management and completing a randomized control trial with protocol-based health psychology intervention vs. without to assess long term functional outcomes.

References:

1. Anderson JR, Nakhate V, Stephen CD, Perez DL. Functional (Psychogenic) Neurological Disorders: Assessment and Acute Management in the Emergency Department. Semin Neurol. 2019 Feb;39(1):102-114. doi: 10.1055/s-0038-1676844. Epub 2019 Feb 11. PMID: 30743296.

2. Espay, A. J., Aybek, S., Carson, A., Edwards, M. J., Goldstein, L. H., Hallett, M., . . . Morgante, F. (2018). Current concepts in diagnosis and treatment of functional neurological disorders. JAMA Neurology, 75(9), 1132. doi:10.1001/jamaneurol.2018.1264

3. Maurer, C. W., LaFaver, K., Ameli, R., Epstein, S. A., Hallett, M., & Horovitz, S. G. (2016). Impaired self-agency in functional movement disorders. Neurology. doi:10.1212/wnl.0000000000002940

4. Nielsen, G., Buszewicz, M., Stevenson, F., Hunter, R., Holt, K., Dudziec, M., . . . Edwards, M. (2016). Randomised feasibility study of physiotherapy for patients with functional motor symptoms. Journal of Neurology, Neurosurgery & Psychiatry, 88(6), 484-490. doi:10.1136/jnnp-2016-314408

5. O'Neal MA, Baslet GC, Polich GR, Raynor GS, Dworetzky BA. Functional Neurologic Disorders: The Need for a Model of Care. Neurol Clin Pract. 2021 Apr;11(2):e152-e156. doi: 10.1212/CPJ.0000000000000949. PMID: 33842084; PMCID: PMC8032429.

NEW ONSET FUNCTIONAL NEUROLOGICAL DISORDER WITH CONCURRENT COVID-19 INFECTION

Daniel Freedman (Dell Medical School, daniel.freedman@austin.utexas.edu*)*

Objective: To review how concurrent infections like COVID-19 can obscure and potentially contribute to a diagnosis of functional neurological disorder.

Background: A 14-year-old girl presented to an outside hospital with seizure-like activity after one day of fever, congestion and headache. She was found to be positive for COVID-19 with PCR testing. She had witnessed convulsions in the ED for which she was given midazolam and levetiracetam. Her head CT was read as possible early cerebral edema and she was transferred to the children's hospital. There was concern for seizures on the initial EEG read, resulting in additional treatment with midazolam, levetiracetam, and lacosamide. The first brain MRI showed T2 signal abnormality in the corticospinal tracts. On the second day of admission, EEG was overread as ongoing movements without epileptiform activity. Repeat MRI was normal. Two lumbar punctures were performed which were both normal. The patient was eventually tapered off of seizure medications and discharged nine days after admission. Two weeks after discharge, she started having daily events of right arm pain (where her PICC line had been placed) and decreased responsiveness resulting in two ED visits, where she was restarted on antiseizure medication. She was then admitted to the Epilepsy Monitoring Unit admission six weeks from the initial presentation. A typical episode of right arm pain and decreased responsiveness was captured in the EMU provoked by a child screaming down the hall. This event was without associated EEG change. In meeting with the psychologist for a diagnosis of functional seizures, the patient endorsed significant psychological trauma and physical pain associated with the initial admission. Since her visit with the psychologist in the EMU, she has been event free and off of antiseizure medication.

She was diagnosed with functional seizures following a prolonged hospitalization which was complicated by her concurrent COVID-19 diagnosis. The COVID-19 infection and concern for encephalitis may have influenced the treatment team towards more investigation and less consideration for a functional diagnosis. Furthermore, the procedures, investigations, and treatments may have exacerbated functional symptoms resulting in the development of recurrent functional seizures after discharge. This case highlights the importance of keeping functional seizures in the differential diagnosis, including in patients with intercurrent viral illness, as the two are not mutually exclusive.

FUNCTIONAL NEUROLOGICAL DISORDER IN AN ADOLESCENT TRANSGENDER MALE

Alison Wilkinson-Smith (Children's Medical Center Dallas, alison.wilkinson-smith@childrens.com*), Jeff Waugh*

Objective: To present a case of functional gait disorder and functional blindness in an adolescent transgender male.

Background: FND is more common in females and symptoms vary across gender. Most studies do not distinguish sex assigned at birth and gender identity. Transgender youth are at risk for poor health outcomes. There is little known about FND in transgender youth.

Methods: The patient is a transgender male who began to express gender dysphoria at 13 years of age. Social transition and gender-affirming treatments (hormones) were initiated soon after. He developed functional movement symptoms at 15 years of age, followed by functional blindness several months later. Hormone treatments were paused. The patient was evaluated four months after symptom onset. Physical exam revealed astasia-abasia. The patient's gait was significantly improved with kinesiology tape. He was also depressed. The family was concerned that providers had been quick to attribute his FND symptoms to his process of transitioning from female to male.

Results: While the stress associated with transition could be contributing to the picture, the FND and depression required treatment in addition to gender-affirming care. He resumed hormone treatment. He participated in physical therapy. He attended an inpatient treatment program for FND. He underwent mastectomy at 16. Throughout his gender affirming treatment, the patient expressed satisfaction with the changes in his body. By age 17, the patient's vision and ambulation had largely returned to normal. He no longer reported depression or body image distress. Although he continued to take medications to manage depression, he no longer participated in therapy. By 18, he had resumed therapy, but his FND remained in remission.

Conclusions: There is considerable evidence that social transition and gender-affirming medical care can reduce depression in transgender individuals. Treating comorbid depression in youth with FND is often a key component of improving FND symptoms. It could be hypothesized, therefore, that support for social and medical transition in transgender youth with FND could improve the FND symptoms. For our patient, improvements in FND symptoms occurred alongside gender-affirming medical care and mental health treatment. Given that emerging literature suggests that the transgender population is increasing over time, studies that evaluate the unique needs of these individuals within healthcare will be increasingly needed.

References:

Baizabal-Carvallo JF, Jankovic J. Gender differences in functional movement disorders. Mov Disord Clin Pract 2019, 7: 182-187.

Johnson B, Leibowitz S, Chavez A, & Herbert, SE. Risk vs. resiliency: Addressing depression in lesbian, gay, bisexual, and transgender youth. Child Adolesc Psychiatric Clin N Am 2019, 28: 509-521.

STIGMA AND SOCIAL ISOLATION IN PATIENTS WITH NON-EPILEPTIC SEIZURES

Andrea Chau (University of Colorado School of Medicine, andrea.chau@cuanschutz.edu*), Sarah Baker, Meagan Watson, Stefan Sillau, Laura Strom*

Objective: To examine the prevalence, severity, and sociodemographic associations of experienced, perceived, and internalized stigma reported by patients referred for treatment.

Background: Although up to 87% of patients with non-epileptic seizures (NES) report feeling stigmatized,[1] few studies have investigated sociodemographic associations of stigma, and no studies have examined internalized stigma in patients with NES.

Methods: This study used convenience sampling among patients referred to the NES Clinic for treatment. Sociodemographic data were collected via chart review. Stigma was measured with The Epilepsy Stigma Scale (ESS), Neuro-QoL Stigma Form (Neuro-QoL), and the Internalized Stigma of Mental Illness Inventory (ISMI-9) to measure different types of stigma. Summary statistics were presented for the stigma scales for the entire sample. The stigma scales were fit to one way ANOVA models for categorical explanatory variables. Pair-wise differences in the mean stigma scale among the levels of the explanatory variable were estimated, and the hypothesis of no difference was tested with T-tests. Univariate alpha was set to 0.05. All tests were two-sided.

Results: Of 126 patients enrolled in the study, 73.8% reported feeling internalized stigma on the ISMI-9, with 32.5% reporting severe levels of internalized stigma. Higher levels of stigma were associated with reported suicidal thoughts (p=0.03), single relationship status (p=0.05), or unemployment (p=0.02). Patients reported a mean total score of 4.9 (SD 1.4) on the ESS, indicating perceived stigma. Higher levels of perceived stigma were associated with single relationship status (p=0.05) and not driving (p=0.05). On Neuro-QoL, patients rated a mean T-score of 61.3, which was 1SD above a clinical reference population. Higher levels of stigma were associated with not driving (p=0.02).

Conclusions: It is believed that this is the first study to date that examines the association between different types of stigma and sociodemographic characteristics. Internalized stigma is not only prevalent and severe, but it is also associated with suicidal thoughts. Engagement in social networks, driving, and employment are important components in health and quality of life[2], and socially isolating factors were associated with experienced, perceived, and internalized stigma as measured on the ESS, Neuro-QoL, and ISMI-9. Future studies should further examine the impact of internalized stigma on quality of life, the relationship between stigma and social isolation, and targets for stigma mitigation.

References:

1. Rawlings, G. H., Brown, I., & Reuber, M. (2017). Deconstructing stigma in psychogenic nonepileptic seizures: An exploratory study. Epilepsy & Behavior, 74, 167-172. doi:10.1016/j.yebeh.2017.06.014

2. Asadi-Pooya AA, Brigo F, Kozlowska K, et al. Social aspects of life in patients with functional seizures: Closing the gap in the biopsychosocial formulation. Epilepsy Behav. 2021;117:107903. doi:10.1016/j.yebeh.2021.107903

UTILIZATION PATTERNS OF A DROP-IN CLINIC FOR FUNCTIONAL MOVEMENT DISORDER

Keschey Marcelle (University Health Network, keschey.marcelle@uhn.ca*), Laura Langer, Gabriela S. Gilmour, Haseel Bhatt, Sarah Lidstone*

Objective: To evaluate a nurse-led drop-in clinic as a transitional care model after rehabilitation for functional movement disorder (FMD).

Background: FMD is a common presentation to neurology clinics and remains challenging to treat. Relapses of functional symptoms are common, emphasizing that FMD recovery is complex and meaningful outcome measures that demonstrate sustained clinical improvement are lacking. We developed a drop-in clinic to support self-management and better understand the long-term recovery trajectory after rehabilitation.

Methods: The drop-in clinic was led by a clinical nurse specialist with expertise in mental health and offered for one year to all patients after completing a three-month rehabilitation program. The clinic ran weekly with appointments booked at the patient's request and a maximum visit length of 30 minutes. All visits were done virtually and reviewed with the neurologist. Patients were encouraged to use the service to continue to build their skills, set new goals, celebrate success, and manage FND symptom flares. Clinical data were prospectively collected from January 2021-February 2022.

Results: Forty-five patients were offered the drop-in clinic and it was used by 12 (27%) over a total of 45 visits. The mean wait time was six (+/-3) days and the mean appointment duration was 26 (+/- 4) minutes. Mean time to drop-in use was 50 (+/- 38) days after rehabilitation. Four (31%) patients used the service only once, seven (55%) used it two to five times and two patients used it > five times. The most frequent chief complaint was flare of FND symptoms, i.e., pain or fatigue (37%), followed by flare of the original FMD motor symptom (28%). The most common interventions provided were symptom validation (100%) and review of learned rehabilitation skills (51%). Compared to those who did not use the service, those who accessed the drop-in showed a trend toward better outcomes in rehab as measured by a reduction in the S-FMDRS (-16.1 +/- 12.5 vs. -8.1 +/- 7.8, p=0.064).

Conclusions: A drop-in clinic is a feasible model of care supporting FMD recovery. This data demonstrate that 1) the service was under-utilized, 2) patients with better rehabilitation outcomes may engage more with the clinic, 3) functional symptoms persist after treatment and self-management "tune-ups" are within the scope of practice of a trained nurse, and 4) further research into cost-effectiveness ais needed.

Reference:

Gelauff J, Stone J, Edwards M, et al. The prognosis of functional (psychogenic) motor symptoms: a systematic review. J Neurol Neurosurg Psychiatry 2014;85:220–226.

Thomas M, Vuong K, Jankovic J. Long-term prognosis of patients with psychogenic movement disorders. Parkinsonism and Related Disorders 2006;12:382-387.

FUNCTIONAL MOVEMENT DISORDER REHABILITATION IN SCHIZOPHRENIA: A TRANSDIAGNOSTIC APPROACH

Lindsey MacGillivray (University Health Network, lindsey.macgillivray@uhn.ca*), Haseel Bhatt, Keschey Marcelle, Sarah Lidstone*

Objective: To explore the clinical viability of a transdiagnostic rehabilitation approach in a patient with schizophrenia and functional movement disorder (FMD)

Background: Integrated rehabilitation programs can effectively treat FMD.[1] Diagnostic acceptance is considered a positive prognostic factor.[2] Psychosis often precludes enrollment in FMD treatment, though management of FMD in this population is not well studied.

Methods: Mr. Z is a 47-year-old male with schizophrenia and upper extremity functional movements. Neuropsychiatric evaluation revealed limited diagnostic acceptance of schizophrenia or FMD. He endorsed a psychotic interpretation of his abnormal movements, despite optimized antipsychotic treatment. Anger and anxiety were suspected to be predisposing factors for his FMD, though there was minimal engagement in psychological exploration. Mr. Z enrolled in physiotherapy rehabilitation. A transdiagnostic therapeutic approach targeted body tension and hyperarousal symptoms via education, relaxation, and motor-retraining strategies. Clinical efficacy was assessed with the S-FMDRS, collected at baseline and program completion, and the CGI-I scale measured post-program.

Results: While Mr. Z continued to interpret his abnormal movements through the lens of persecutory and somatic delusions, he nonetheless engaged well in a six-session individualized FMD rehabilitation program. His initial therapy session focused on functional goal setting; remaining sessions explored FMD triggers and targeted "nervous system hyperarousal" with environmental modification, progressive muscle relaxation, breathing and cognitive-behavioural strategies. Task-specific motor retraining exercises were utilized and gradually progressed toward Mr. Z's self-identified goals. At program completion, his S-FMDRS scores was reduced from baseline 6 to 0. His post-completion CGI-I was rated as "very much" improved.

Conclusions: It is believed that this is the first report of successful FMD rehabilitation in a patient with schizophrenia. The marked reduction of functional movements in an individual with a psychotic interpretation of his symptoms challenges the notion that diagnostic acceptance is central to clinical recovery; rapport with treating clinicians, a collaborative approach and "buy-in" to the rehabilitative process may be equally important variables. The transdiagnostic treatment approach highlighted in this case forgoes traditional diagnostic boundaries and appreciates that common factors (e.g. sympathetic hyperarousal) can be therapeutic targets in disorders as seemingly disparate as FMD and schizophrenia.

REFERENCES:

1. Lidstone SC, MacGillivray L, Lang AE. Integrated Therapy for Functional Movement Disorders: Time for a Change. Mov Disord Clin Pract 2020;7:169–74. doi:10.1002/mdc3.12888

2. LaFaver K, Lang AE, Stone J et al. Opinions and clinical practices related to diagnosing and managing functional (psychogenic) movement disorders: changes in the last decade. Eur J Neurol. 2020;27:975-84.

DEMOGRAPHIC AND SYMPTOMATOLOGICAL CHARACTERISTICS OF FND PATIENTS AND CAPACITY TO RETURN TO WORK

Mohamed Gheis (University of British Columbia, mgheis@mac.com*), Shannon Ellis, Aakash Gorana, Adam Gheis*

Objective: To identify correlates of return to work for patients with Functional Neurological Disorder.

Background: Limited data is available about prognostic correlates for patients with Functional Neurological Disorder

Method: A total of 162 consecutive referrals to a multidisciplinary specialist FND service were included. All patients included were unemployed at the time of their referral. Patients were followed for a period of 18 months and their employment status was reevaluated. Correlates of return to work were identified using multivariate logistic regression.

Results: Less than 20% of patients returned to work at the end of the study period, mostly to new employment. Factors associated with return to work were recent employment within a year prior to referral (odds ratio = 2; 95% CI, 1.1 to 3.8), and associated structural medical or neurological disorder at the time of FND diagnosis (odds ratio = 2.2; 95% CI, 1.1 to 5). Gender, years of education and FND phenomenology were not significantly associated with employment outcome.

Conclusions: Early diagnosis and rehabilitation of employed patients with Functional Neurological Disorder may be associated with better occupational outcome, regardless to the phenomenology of FND presentation.

References:

Carson A, Stone J, Hibberd C, et al. Disability, distress and unemployment in neurology outpatients with symptoms ’unexplained by organic disease’. J Neurol Neurosurg Psychiatry 2011;82:810–3

Nicholson TR, Carson A, Edwards MJ, et al. Outcome measures for functional neurological disorder: a review of the theoretical complexities. J Neuropsychiatry Clinal Neuroscience 2020;32:33–42.

ICTAL SPECT AND THE BRAIN CIRCUITRY INVOLVED IN FUNCTIONAL SEIZURES

Mahinda Yogarajah (UCL Institute of Neurology, London, mahinda.yogarajah@nhs.net*), Victoria Ros Castello, Samia Elkommos, Nisa Kahn, Maria Centeno*

Objective: To identify the relevant brain networks involved in the generation of functional seizures.

Background: Functional seizures (FS) are common, harmful, costly and yet remain poorly understood. Recently, there has been an increase in attempts to probe the neuro-biological basis of FS by investigating the brain networks involved in their generation.

Methods: Nineteen patients, in whom Ictal SPECT was obtained during an episode of FS while admitted in the video EEG monitoring unit, were retrospectively reviewed. Ictal SPECTS were subtracted from the interictal SPECTS to generate SISCOM (Subtraction of Ictal SPECT co-registered to MRI) images. Group analysis of the SISCOM images was conducted in order to identify common regions of activation and deactivation during the FS episode across the group of patients. Whole brain analysis, as well as hypothesis based analysis on networks of interest of was performed using SPM, with appropriate corrections for multiple comparisons.

Results: During the FS there was increased activity in the cingulate, medial prefrontal cortex, motor regions, anterior insula and basal ganglia, corresponding to regions involved in the perception of autonomic changes, sensory perception, motor control as well as attention. Conversely there was a reduced activity in the temporo-parieto-occipital junction bilaterally, likely implying inhibition of areas associated to self-agency processes.

Conclusion: A variety of brain regions were activated and deactivated at the time of a functional seizure. Many of these changes in activity can be interpreted at one level as changes in salience and default mode networks, and subcortical activity. However, in keeping with predictive coding models of interoception and its relationship to human behaviour[1] and our own recent work,[2] we propose that the regions identified are more parsimoniously interpreted as part of a distributed intrinsic interoceptive network related to the allostatic regulation of the body. That is, FS can be conceptualised as an allostatic response to changes in interoceptive processing.

References:

1. Kleckner et al. Evidence for a large-scale brain system supporting allostasis and interoception in humans, Nature Human Behaviour 2017

2. Koreki et al. Trait and state interoceptive abnormalities are associated with dissociation and seizure frequency in patients with functional seizures, Epilepsia 2020

AWARENESS OF AND PREFERENCES FOR MANAGEMENT TECHNIQUES FOR FUNCTIONAL NEUROLOGIC DISORDER AMONG NEUROLOGISTS

Nandita Shankar (California Northstate University College of Medicine nshankar223@comcast.net*,)*,
Alyssa Nguyen, Craig Wetterer, Rochelle Frank

Objective: To describe the awareness of management techniques for Functional Neurological Disorder (FND) amongst US neurologists.

Background: FND describes neurologic symptoms without organic etiology and reported to be the second most common cause for patient visits in neurology practices.[1] However, literature suggests limited awareness of FND management techniques.[2]

Methods: This ongoing survey-based research design involved an anonymized self-administered IRB-approved study-specific questionnaire-based survey administered to a cohort of US neurologists. Questions included number of patients seen, neurologist diagnosis of FND, proportion of patients referred to other specialties, treatment paradigms to address chronic symptoms of FND. Questionnaire-based outputs were characterized using descriptive statistics.

Results: Data from 27 responses received to date were analyzed. Eighty-one percent are California-based practices and 19% in other parts of the United States. Respondents see 172 patients per month with 15% with symptoms suggestive of FND. Fifty-nine percent of symptomatic patients receive a diagnosis of FND; 60% with FND diagnosis are scheduled for regular neurology follow-up; 66.7% of respondents opt for education and referral to another specialty, with 52% opting to include symptomatic treatment; 78% refer patients to behavioral medicine (BM) and physical therapy (PT); 74% refer patients to three or more services; 66.7% refer patients to PT with BM and other services; 41% agreed that FND management fell within the scope of their practice, 41% disagreed, 18% were neutral.

Conclusions: In the current study, among survey respondents, awareness of diagnostic and management techniques for FND was greater than that reported. However, the proportion of patients presenting with symptoms suggestive of FND appears to be lower than that reported. Taken together, although these data suggest that there is no apparent gap in awareness of management techniques for FND amongst US neurologists, additional work in the setting of a larger, more geographically diverse study may provide more definitive insights.

References:

1. Stone, J., Carson, A., Duncan, R., Roberts, R., Warlow, C., Hibberd, C., Coleman, R., Cull, R., Murray, G., Pelosi, A., Cavanagh, J., Matthews, K., Goldbeck, R., Smyth, R., Walker, J., & Sharpe, M. (2010). Who is referred to neurology clinics?—the diagnoses made in 3781 new patients. Clinical Neurology and Neurosurgery, 112(9), 747–751. https://doi.org/10.1016/j.clineuro.2010.05.011

2. Stone, J., Burton, C., & Carson, A. (2020). Recognising and explaining functional neurological disorder. BMJ, m3745. https://doi.org/10.1136/bmj.m3745

CONVERSION DISORDER IN CHILDREN AND ADOLESCENTS - AN UPDATE

Sigita Plioplys (Northwestern University, Lurie Children's Hospital, splioply@gmail.com*)*

Objectives: 1) To overview new epidemiological, neuroimaging, and clinical findings of Conversion disorder in pediatric and adolescent populations, focusing on Psychogenic Non-Epileptic Events (PNES) and functional movement disorders. 2) To highlight the advances in understanding conversion disorder in this patient population.

Background: Conversion disorder is a challenging condition to diagnose and treat in the pediatric population timely. It is associated with poor quality of life, stigma, comorbid psychiatric and learning problems, and disrupted family functioning.

Methods: The most relevant research studies published in the past ten years will be discussed, focusing on epidemiological, neuroimaging, and treatment findings. Psychiatric and learning comorbidities and other risk factors will be reviewed to demonstrate the multifactorial composition of conversion disorder. The clinical care pathway for the management of conversion disorder in medically hospitalized youth will be presented.

Results: A large body of descriptive data is available about the risk factors, clinical symptoms, family psychoeducation, and effective methods of communication about the conversion diagnosis. Only a few hypothesis-based and case-controlled studies of conversion disorder in the pediatric population have been published. Neuroimaging research in the pediatric population is emerging, and preliminary findings report hyperconnectivity between the emotion, motor, sensory processing brain regions. Randomized case-controlled treatment studies of youth with conversion disorder are lacking. A clinical care pathway for medically hospitalized youth with conversion disorder has been developed and demonstrated to be feasible and economically effective. Comorbid internalizing disorders, not PNES frequency, significantly contribute to the quality of life in youth with PNES. Early diagnosis and mental health treatment in the multidisciplinary clinical setting are associated with better disease outcomes.

Conclusions: The incidence of conversion disorder in youth has been increasing. Youth with conversion symptoms have a poor quality of life and disrupted developmental milestones, often complicated by a chronic disease course into adulthood. More research is needed to understand better the pathophysiology and diagnostic markers of conversion disorder in youth to develop evidence-based and effective treatment models.

References:

Flewelling KD, Koehler A, Shaffer, Dill EJ. Correlates of health-related quality of life in youth with psychogenic non-epileptic seizures. Seizure: European Journal of Epilepsy 83 (2020) 203–207

Kozlowska K et al. Changing the culture if care for children and adolescents with functional neurological disorders. Epilepsy and Behavior Reports 16 (2021) 100486

FUNCTIONAL NEUROLOGICAL DISORDER AS A MIMIC OF STROKE: INCIDENCE, OUTCOMES, AND COMPARISON WITH STROKE, TRANSIENT ISCHEMIC ATTACK, AND NON-FND MIMICS OF STROKE IN THE EMERGENCY DEPARTMENT

Jay Lusk (Duke University School of Medicine, jay.lusk@duke.edu*), Alexis Domeracki, Wuwei Feng*

Objective: To compare the clinical characteristics of patients diagnosed with functional neurological disorders (FND) with patients diagnosed with stroke and non-FND mimics of stroke after presenting to the emergency department with stroke-like symptoms.

Background: Prior studies investigated the clinical characteristics of patients diagnosed with functional mimics of stroke; however, no study evaluated the features of these patients in the United States or upon initial presentation to the emergency department.

Methods: Patients presenting to Duke University Hospital, Duke Raleigh Hospital, or Duke Regional Hospital with stroke-like symptoms in July and December 2019 were evaluated through consecutive retrospective chart review. Standardized data collection included patient demographics, arrival method, medical and psychiatric comorbidities, presenting symptoms, neurological exam findings, whether intravenous thrombolysis or mechanical thrombectomy were received, and other relevant clinical information. Fisher's exact test was used to evaluate group differences for count data and the Kruskal-Wallis test was used to evaluate group differences for continuous variables. Benjamini-Hochberg correction was used to account for multiple comparisons.

Results: There were 200 patients included; 74 (37%) were diagnosed with ischemic stroke or intracranial hemorrhage; 72 (36%) were diagnosed with non-FND mimics of stroke; 36 (18%) were diagnosed with transient ischemic attack; 17 (8.5%) were diagnosed with FND, and one (0.5%) was diagnosed with both ischemic stroke and FND. Patients with FND were younger than patients in the other groups (median age 54 vs. 68 for patients with non-FND mimics of stroke, 70 for patients with stroke, and 73 for patients with TIA, p=0.03). Patients with FND were more likely to arrive by private vehicle and less likely to arrive by ambulance (p=0.001). No patients with FND received intravenous thrombolysis or mechanical thrombectomy.

Conclusions: Patients with functional neurological disorders frequently present to the emergency department and receive emergent evaluation for stroke. Fortunately, in our sample, no patients with FND received potentially harmful acute therapies for stroke, such as intravenous thrombolysis or mechanical thrombectomy; however, our small sample size would potentially preclude detection of this rare event. Future work will expand our cohort size, investigate clinical and demographic characteristics of patients in more detail, and will characterize the outcomes of patients with FND who present to the emergency department with stroke-like symptoms in greater depth.

References:

Gargalas S, Weeks R, Khan-Bourne N, et al. Incidence and outcome of functional stroke mimics admitted to a hyperacute stroke unit. Journal of Neurology, Neurosurgery & Psychiatry 2017;88:2-6.

Wilkins, Stacy Schantz PhD; Bourke, Paula RGN/PGC; Salam, Abdul PhD; Akhtar, Naveed MD; D'Souza, Atlantic MD; Kamran, Saadat MD; Bhutta, Zain MD; Shuaib, Ashfaq MD Functional Stroke Mimics: Incidence and Characteristics at a Primary Stroke Center in the Middle East, Psychosomatic Medicine: June 2018 - Volume 80 - Issue 5 - p 416-421 doi: 10.1097/PSY.0000000000000563

INTERNATIONAL ONLINE REGISTRY FOR FUNCTIONAL NEUROLOGICAL DISORDER PATIENTS

Bridget Mildon (FND Hope International, bridgetm@fndhope.org*), Jiayi Ge, Luke Hsei, Shawn Park, Elizabeth Snow, Rochelle Frank*

Objective: To utilize an online patient registry for those with functional neurological disorder (FND) and equivalent conditions for future use in guiding patient care/management plans.

Background: FND is a common yet poorly understood condition for which large-scale studies remain scarce. Previous online patient registries have been a resource to aggregate patient health information. This registry is the only patient led database for FND.

Methods: An international online self-reported registry was used to survey English speaking patients with a current diagnosis of FND or one of the listed inclusion terms. Initial and follow-up surveys collected self-reported data on demographics, illness progression and characteristics, treatments, and impact on life. Participants were recruited voluntarily through the FND Hope online website, social media platforms and other digital correspondence throughout 2016-2020.

Results: There were 503 participants with a mean age of 43.9 (77.7% female) from 14 countries who responded. Median age of FND diagnosis was 40-49 years old, while median age for first symptom appearance and first doctor visit were both within 30-39 years old. The most common symptoms reported were: excessive fatigue (64.8%), muscle aches (60.7%), joint aches (58.2%), and difficulty walking (53.4%). The most common symptom triggers were stress, exhaustion, and physical exertion. 43% of patients reported symptoms worsening over time, 11% experienced improvement; others reported no change or consistent waxing and waning. Treatment options of medication (38.8%), supplementations (33.9%), and occupational therapy (39.7%) were most commonly cited by patients to be helpful.

Conclusion: This patient registry can contribute further evidence to the demographics of FND patients and illustrate a more complete picture of the various symptoms & comorbidities and their impact on patients' quality of life. Patient quality of life may be improved by more expeditious diagnosing through better characterization and recognition of symptoms, leading to earlier initiation of commonly helpful treatments. Potential exclusion and survivorship bias due to collecting data from participants associated with the online-based community are limitations.

References:

Butler M, Shipston-Sharman O, Seynaeve M, et al. International online survey of 1048 individuals with functional neurological disorder. Eur J Neurol. 2021;00:1–12. https://doi.org/10.1111/ene.15018

THE VALIDATION OF A NEW INSTRUMENT FOR MEASURING OUTCOMES IN FUNCTIONAL NEUROLOGICAL DISORDER: THE FUNCTIONAL NEUROLOGICAL DISORDERS RATING SCALE (FUNDRS)

Lucy Miller (King's College London, Lucy.j.miller@kcl.ac.uk*)*

Objective: To validate the FuNDRS against two established outcome measures: the Health of the Nation Outcome Scales (HoNOS) and Clinical Global Impression Scale (CGI) by exploring the construct and criterion validity, and responsivity of the FuNDRS.

Background: FND is highly prevalent yet lacks an exhaustive outcome measure that reflects treatment efficacy and guides patient treatment, prompting the development of the FuNDRS; a 25-item clinician-rated instrument with five domains spanning FND symptomology.

Methods: As part of a clinical audit, anonymised data from 49 patients aged between 23 - 73 who were patients at a specialised FND service were used. Various outcome measures alongside the FuNDRS were completed by a clinician at the patients' admission (T1) and discharge (T2); however, the two main ones were the HoNOS and CGI scale. Since no gold standard exists for FND, a range of metrics were used to quantify the construct validity of the FuNDRS; convergent, discriminant and known-groups validity and exploratory factor analysis (EFA). Criterion validity and responsivity were also explored. Data analysis was performed using Pearson correlations and t-tests.

Results: The FuNDRS showed a strong positive correlation with the HoNOS at T1 ($r = .87$) and T2 ($r = .87$) and with change score from T1 to T2 on the CGI scale ($r = .7$), showing strong convergent validity. Correlations of individual FuNDRS items with non-corresponding scales were expectedly weak ($r = .01$ – $.38$) demonstrating discriminant validity. The scale also had good responsivity and was able to significantly discriminate between groups of patients with different symptom improvement statuses. These results support the FuNDRS as a valid outcome measure. Responsivity analyses showed at least small effects ($d > .20$) for 21/25 FuNDRS items, demonstrating its sensitivity to change.

Conclusions: The results provide preliminary evidence that the FuNDRS is significantly capable at measuring outcomes in patients with FND. The FuNDRS has demonstrated comparable dynamic properties and a similar capacity to record change as the HoNOS. The FuNDRS shows real potential in being a valid instrument for use in clinical settings and to measure the efficacy of interventions. Since the FuNDRS is the first outcome measure of FND and this was the first study to measure its validity, further validation is required including reliability analyses such as inter-rater and scale reliability.

THE BEATING BREAST

Victor Mark (University of Alabama at Birmingham, vwmark@uab.edu*)*

Objective: To present a case report of an unusual involuntary movement disorder, involving pectoral muscle contraction modified by self-attention. This suggests an instance of Functional Neurological Disorder (FND).

Background: The research of involuntary movements modified by self-attention has been controversial because of hypotheses that imply voluntary modification of the movements in relation to the patient's expectations. The present case suggests alternate mechanisms.

Methods: The 45-year-old woman was repeatedly evaluated in the author's FND Clinic on several in-person and telehealth visits over 12 months. The patient was evaluated for whether the movement complaints might vary in relation to her self-attention to her body. In particular, she volunteered that her chest quivered uncontrollably.

Results: The initial complaints and findings began 2 years prior to initial evaluation, consisting of episodic stuttering and isolated single limb, head, as well as entire body shaking following feeling anxiety. After 1 year of FND Clinic follow-up, the patient complained of episodic involuntary left breast contractions. These contractions were visible with the patient's partial disrobing, involving frequent successive left pectoralis contractions as well as occasional left trapezius contractions. These occurred when attention was directed at her chest but not during other parts of examinations. Exam also shows Painful Legs and Moving Toes, present for 20 years, and not concerning the patient. Sleep study demonstrates periodic limb movements during Stage II sleep, without seizures.

Conclusions: Findings thus far indicate combination of involuntary segmental body contractions while awake, distractible and aggravated by self-attention to the involved parts of the body (except for the moving toes, which are constant) and involuntary limb movements during sleep. Psychological care is not possible because of the patient's finances. Clonazepam has been initiated and follow-up continues. The hypothesis that the patient in some way commences segmental body contractions to match her expectations does not seem plausible, given that the contractions are asymmetric and episodic. The patient appears to have a progressive involuntary movement disorder that extends to light sleep. Further research needs to identify physiological mechanisms that may account for these phenomena.

PATIENTS WITH FND OUTCOMES TREATED IN AN OUTPATIENT CLINIC

Roberta Tedesco, (Rhode Island Hospital, Brown University, roberta.tedesco@unimi.it*), Jeff Wincze, Krista Tocco, Jordan Anderson, Grayson Baird, W. Curt LaFrance, Jr.*

Objective: To investigate clinical outcomes for outpatients diagnosed with Functional Neurological Disorder (FND) treated with Neuro-Behavioral Therapy (NBT).[1] These uncontrolled data would complement recent structured clinical trials.[2]

Background: FND have historically been difficult to treat. Outcomes have been studied in controlled and clinical trials, documenting improvements; however, little information is available from a community treated FND cohort.

Methods: A retrospective chart review of consecutive patients diagnosed with FND, ages 17 to 75, who were evaluated and treated with NBT at Rhode Island Hospital Behavioral Health between 2014 and 2022 was conducted. Basic demographics, diagnoses, treatments, Global Assessment of Functioning (GAF), and Clinical Global Impression (CGI) – Severity and – Improvement were collected. Evaluations of the patients' psychiatric comorbidities were completed via formal psychiatric assessments based on Mini International Neuropsychiatric Interview (MINI) and Structured Clinical Interview for DSM-IV Axis II (SCID-II). NBT consisted of 45 minute individual sessions, in clinic or via telehealth. GAF and CGI were clinician assessed for every NBT session.

Results: Demographic and clinical characteristics at baseline are available for 110 patients. The majority of patients were female (73%), white (87%), with mean age at evaluation of 43 years, and mean age at FND symptom onset of 36.5 years. Patients had a mix of FND semiologies, which included Psychogenic Nonepileptic Seizures (69%), Functional Movement Disorder (23%), Functional Sensory Disorder (13%), Functional Weakness (6%), and Functional Speech Disorder (5.5%). See Table 1 for a summary of patients' characteristics. A number of patients (n=37) received nine or more sessions. Clinical evaluation scores revealed improvements over time.

Table 1. Demographics, comorbidities, diagnoses and treatments (n=110)

DEMOGRAPHICS		
Mean Age at Evaluation (years)		43.10
Mean Age at symptom onset (years)		36.53
Sex (% Female)		72.73%
Race		
	White	87.27%
	Black or African American	8.18%
	Hispanic	1.82%
	Native Hawaiian or Other Pacific Islander	1.82%
Completed college (>/=16 years)		29.63%
Marital status (% Married)		45.87%
Unemployed (or not a full-time student)		69.09%
Receiving or applying for work disability		47.27%
PSYCHIATRIC COMORBIDITIES & CLINICAL FACTORS		

Trauma history		
	Physical	37.27%
	Sexual	36.36%
	Emotional	47.27%
	Verbal	27.27%
Psychiatric History		
	Suicidality	31.82%
	Psychiatric hospitalization	40.91%
	Depressive disorder	72.73%
	Anxiety disorder	76.36%
	PTSD	30.91%
	Cluster B personality disorder	22.73%
	Cluster C personality disorder	19.09%
	Chronic pain	30.00%
	Fibromyalgia	7.27%
	Chronic fatigue	3.64%
	Alcohol misuse	21.82%
	Drug misuse	28.18%
Neurology history		
	Epilepsy	23.64%
	Head trauma	37.27%
	Cognitive disorder	34.55%
	Abnormal brain imaging on MRI/CT scan	26.36%
Semiologies		
(not mutually exclusive)	Psychogenic Nonepileptic Seizures	69.09%
	Functional Movement Disorder	23.64%
	Functional Weakness	6.36%
	Functional Sensory Disorder	13.64%
	Functional Speech Disorder	5.45%
Psychotropic medication history (lifetime)		
	Benzodiazepines	69.09%
	Antidepressants	79.09%
	Antipsychotics	32.73%
	Sleep aid	26.36%
	Mood stabilizer	26.36%
Psychotherapy		
	Previous psychotherapy (past)	61.47%
	Current psychotherapy	42.59%
Anti-Epileptic Drug (AED)		
	On AEDs at baseline	43.12%
	Total lifetime AEDs (N)	2.00

Additional treatment		
	Physical Therapy	10.91%
	Occupational Therapy	2.73%
	Family Therapy	21.82%
	Group Therapy	12.73%

Conclusions: We describe a well-characterized sample of consecutive patients diagnosed with various and mixed FND semiologies, who received manualized therapy, NBT, in an outpatient clinic. Patients had similar psychosocial profiles to those in clinical trials and displayed improvement in clinical measures. These results demonstrate the utility of NBT for FND in an outpatient practice, extending the care beyond structured clinical trials.

References:

1. LaFrance WC Jr, Ho WLN, Bhatla A, Baird GL, Altalib HH, Godleski L. Treatment of psychogenic nonepileptic seizures (PNES) using video telehealth. Epilepsia. 2020;61(11):2572-82.

2. LaFrance WC Jr, Baird G, Barry J, Blum A, et al., Multicenter pilot treatment trial for psychogenic nonepileptic seizures: a randomized clinical trial. JAMA Psychiatry, 2014;71(9):997-1005.

THE PREVALENCE OF ADVERSE CHILDHOOD EXPERIENCES AMONG INDIVIDUALS WITH FUNCTIONAL NEUROLOGICAL DISORDER IN THE FND HOPE SCIENTIFIC REGISTRY

Abraham Salinas (University of South Florida), Bashir Dabo, Bridget Mildon

Objective: To assess the prevalence of ACEs in the FND HSR and determine if the number of ACEs vary by demographic characteristics of registered participants.

Background: The prevalence of adverse childhood experiences (ACEs) among registered patients in the FND Hope Scientific Registry (FND HSR) is unknown.

Methods: This cross-sectional study used data from a sample of 281 individuals with self-reported FND diagnosis, collected from 2016-2020 in the FND HSR. Specific and total ACEs were measured with a 10-item ACE instrument. The proportions of specific ACEs and mean ACEs scores by age, gender, race/ethnicity, marital status, and employment status were calculated. Chi-squared test was used to assess differences of proportions and ANOVA for differences in mean ACEs scores.

Results: The prevalence of one or more ACEs was 78% and for four or more ACEs was 16%. Childhood sexual abuse was the ACE category with the highest prevalence (39%), followed by household dysfunction (33%), physical abuse (28%), and emotional abuse (27.1%). Higher ACEs score was found among Black or African Americans (mean = 8.0), compared to Hispanic (mean = 4.2) and white (mean = 2.5) [F 3, 271 = 3.35, p = 0.01]. Formerly married individuals had higher mean ACEs score (3.9) compared to married/cohabiting (2.6), and never married (2.3) [F 2,271 = 5.65, p = 0.004]

Conclusions: Traumatic experiences such as ACEs are common among individuals with FND. Screening for ACEs should be part of the FND assessment protocols to differentiate those patients who may benefit from trauma therapy. Trauma-informed care for individuals with FND should be integrated into neurological care.

References:

Jones CM, Merrick MT, Houry DE. (2020). Identifying and Preventing Adverse Childhood Experiences: Implications for Clinical Practice. JAMA. 323(1):25–26. doi:10.1001/jama.2019.18499

Ludwig, L., Pasman, J. A., Nicholson, T., Aybek, S., David, A. S., Tuck, S., Kanaan, R. A., Roelofs, K., Carson, A., & Stone, J. (2018). Stressful life events and maltreatment in conversion (functional neurological) disorder: systematic review and meta-analysis of case-control studies. The lancet. Psychiatry, 5(4), 307–320. https://doi.org/10.1016/S2215-0366(18)30051-8

NEUROIMAGING BIOMARKER FOR SEIZURES BASELINE CLINICAL CHARACTERIZATION

Ryan Van Patten (Brown University, ryan_van_patten@brown.edu*), Grayson Baird, Andrew Blum, Stephen Correia, Noah S Philip, Jane Allendorfer, Tyler E Gaston, Adam Goodman, Leslie P Grayson, Krista Tocco, Jerzy P Szaflarski, W. Curt LaFrance, Jr.*

Objective: To examine psychiatric symptoms, social functioning, and clinical variables in adults with traumatic brain injury (TBI) + nonepileptic seizures (NES), TBI + epilepsy, and TBI-alone controls.

Background: Epilepsy and NES both include frequent disabling psychiatric symptoms and TBI is a common comorbidity of both conditions. However, no prior study has compared mental health correlates of epilepsy, NES, and a non-seizure comparison group, while accounting for TBI.

Methods: Three groups of adult patients (civilians and U.S. Veterans) with TBI (TBI; TBI+NES; TBI+epilepsy) completed baseline, midpoint, and end of treatment evaluations including self-report measurement of depression, anxiety, perceived stress, PTSD symptoms, traumatic life experiences, post-TBI symptoms, somatization, impulsivity, quality of life, and subjective cognitive functioning. Psychiatric symptoms were also assessed with structured inventories and participants completed a cognitive screening instrument. Within group changes for the three groups were analyzed, with the two seizure cohorts compared before and after treatment with a 12-session manualized therapy for seizures, Neuro-Behavioral Therapy.[1,2]

Results: Clinical variables and baseline scores are summarized in Tables 1 and 2, for patients with TBI (n=75), Patients with TBI+epilepsy (n=29), and Patients with TBI+NES (n=89).

Conclusions: Clinical variables on a well-characterized, deeply-phenotyped cohort of patients with TBI alone, TBI + NES, and TBI + epilepsy are presented. The TBI comparison group did not receive the manualized therapy and baseline clinical scores are described. The clinical characteristics in the two seizure group's clinical scores collected pre-treatment will be discussed. The results will be correlated with neuroimaging findings in other papers.

References:

1. Reiter JM, Andrews D, Reiter C, LaFrance Jr WC. Taking Control of Your Seizures: Workbook. New York: Oxford University Press; 2015.

2. LaFrance WC Jr, Baird GL, Barry JJ, Blum AS, Frank Webb A, Keitner GI, et al. Multicenter pilot treatment trial for psychogenic nonepileptic seizures: a randomized clinical trial. JAMA psychiatry. 2014;71(9):997-1005

METACOGNITIVE TRAINING FOR FUNCTIONAL MEMORY SYMPTOMS AFTER CONCUSSION: A FEASIBILITY RANDOMIZED CONTROLLED STUDY

Noah D. Silverberg (University of British Columbia, noah.silverberg@ubc.ca*), Sanjana Bedi, and Edwina L. Picon*

Objective: To assess the feasibility of a novel metacognitive training program for adults with chronic subjective memory complaints after concussion.

Background: Metacognitive training may improve healthy adults' ability to accurately self-assess their cognitive performance (Carpenter et al 2019), making it a candidate treatment for functional cognitive symptoms (Bhome et al 2019).

Methods: Treatment-seeking adults (age 18-65) with remote concussion (>six months ago) and persisting memory complaints were approached between Feb-Mar 2022. Participants completed eight online training sessions in which they performed a recognition memory task (8-10 blocks of 15-27 trials per session) and rated their confidence after every trial. Participants were randomly assigned to receive: 1) feedback on how closely their confidence judgements aligned with their accuracy after each block, similar to Carpenter et al 2019, or (2) no feedback on their accuracy or metacognitive calibration. Participants completed questionnaires before and after the intervention. Participants were blinded to condition and study hypotheses.

Results: Of 26 eligible patients approached, 19 (73%) enrolled (M=45 years old; 63% women). All participants in the metacognitive training group (n=9) passed manipulation checks, indicating good comprehension of the training feedback. Of enrolled participants, 17 (89.5%) completed all training sessions (Md=3.0 days apart; Md=30.7 minutes/session). Relative to the control group (n=8), the metacognitive training group (n=9) unexpectedly reported more frequent memory lapses in daily life (Functional Memory Disorder Inventory) from pre- to post-intervention (95% CI for Hedges' g=0.31 to 2.43). There were minimal pre-post group differences in memory concern (Multifactorial Memory Questionnaire-Satisfaction; Hedges' g=-0.89 to 1.02).

Conclusions: An eight-session online metacognitive training program for people with functional memory symptoms after concussion appears feasible. However, a consistent efficacy signal in the hypothesized direction on self-reported measures of memory functioning, suggesting that a larger randomized controlled trial is unlikely to succeed was not found.

References:

Bhome R, McWilliams A, Huntley JD, Fleming SM, Howard RJ. Metacognition in functional cognitive disorder- a potential mechanism and treatment target. Cogn Neuropsychiatry. 2019;24(5):311-321.

Carpenter J, Sherman MT, Kievit RA, Seth AK, Lau H, Fleming SM. Domain-general enhancements of metacognitive ability through adaptive training. J Exp Psychol Gen. 2019;148(1):51-64.

A WEB-BASED EDUCATIONAL MODULE USING CLINICAL NEUROSCIENCE TO DELIVER THE DIAGNOSIS OF FUNCTIONAL NEUROLOGICAL DISORDER

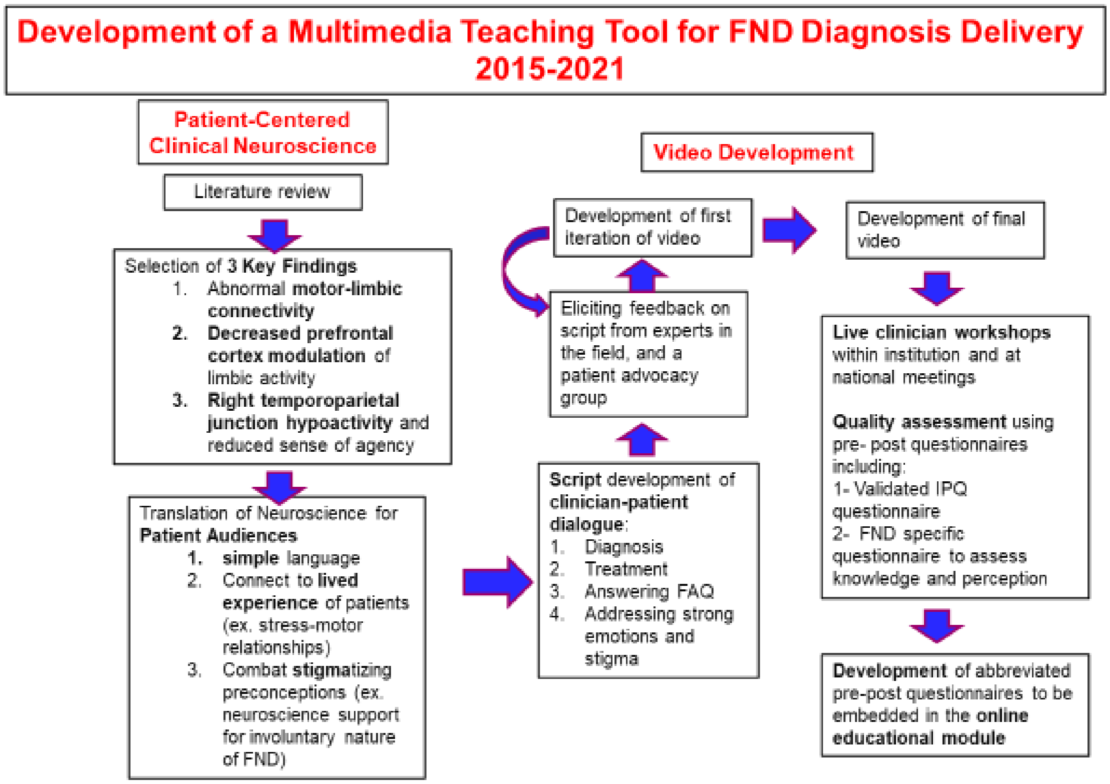
Mark Fusunyan (Stanford University School of Medicine, Mark.fusunyan@gmail.com).*Michel Medina, Luciana Giambarberi, Shelby Scott Lazarow, Juliana Lockman, Nazlie Faridi, Farnaz Hooshmand, Ariela Karasov, Sepideh Bajestan*

Objective: To develop an online educational module for clinicians on delivering neuroscience-based psychoeducation for functional neurological disorder (FND) and assessed changes in clinician perceptions and knowledge about FND following the intervention.

Background: Neuroscience-based patient education is an established approach for chronic pain[1] and may also be effective for FND.[2] Dissemination of such approaches to clinicians may help address the public health need for greater provider expertise on FND.

Methods: The online educational module was developed based on multidisciplinary feedback and includes an eight-minute scripted video modeling neuroscience-informed diagnosis delivery [Table1]. Pre- and post-questionnaire data was collected from participants including self-assessment of FND-related perceptions and knowledge, as well as multiple-choice assessment of neuroscience content retention. Paired T-tests and McNemar's tests were used for statistical analysis ($p<0.05$). The project was deemed a quality improvement initiative by the institutional review board at the submitting author's institution.

Table 1: The development process for an online educational intervention for clinicians on neuroscience-informed diagnosis delivery and patient education for functional neurological disorder.



Results: Forty participants provided complete pre- and post-intervention data out of 103 submitted questionnaires. Self-assessment items showed significantly greater comfort with diagnosis delivery and treatment options ($p<0.01$), as well as decreased stigma towards FND patients following the intervention ($p<0.01$) [Figure 1]. Percentage of correct responses significantly increased on a multiple-choice assessment of the functional neuroanatomy of FND ($p<0.01$) [Figure2].

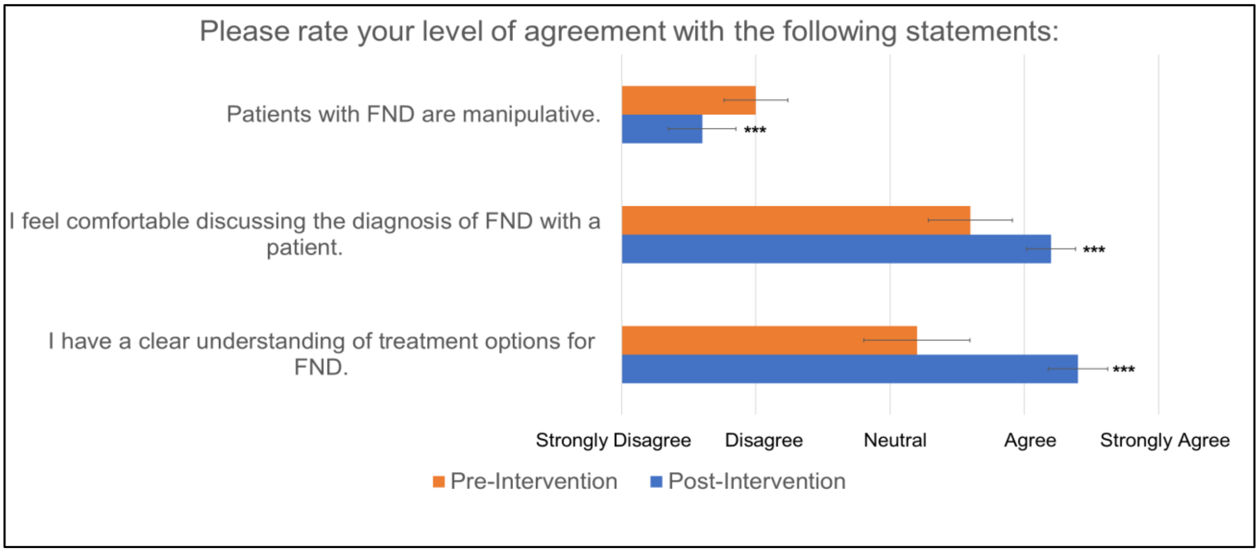


Figure 1. Self-assessment of FND-related knowledge and perceptions before and after intervention. ***$p<0.001$
Statistical test: paired T-test. Error bar = 95% confidence interval (CI)

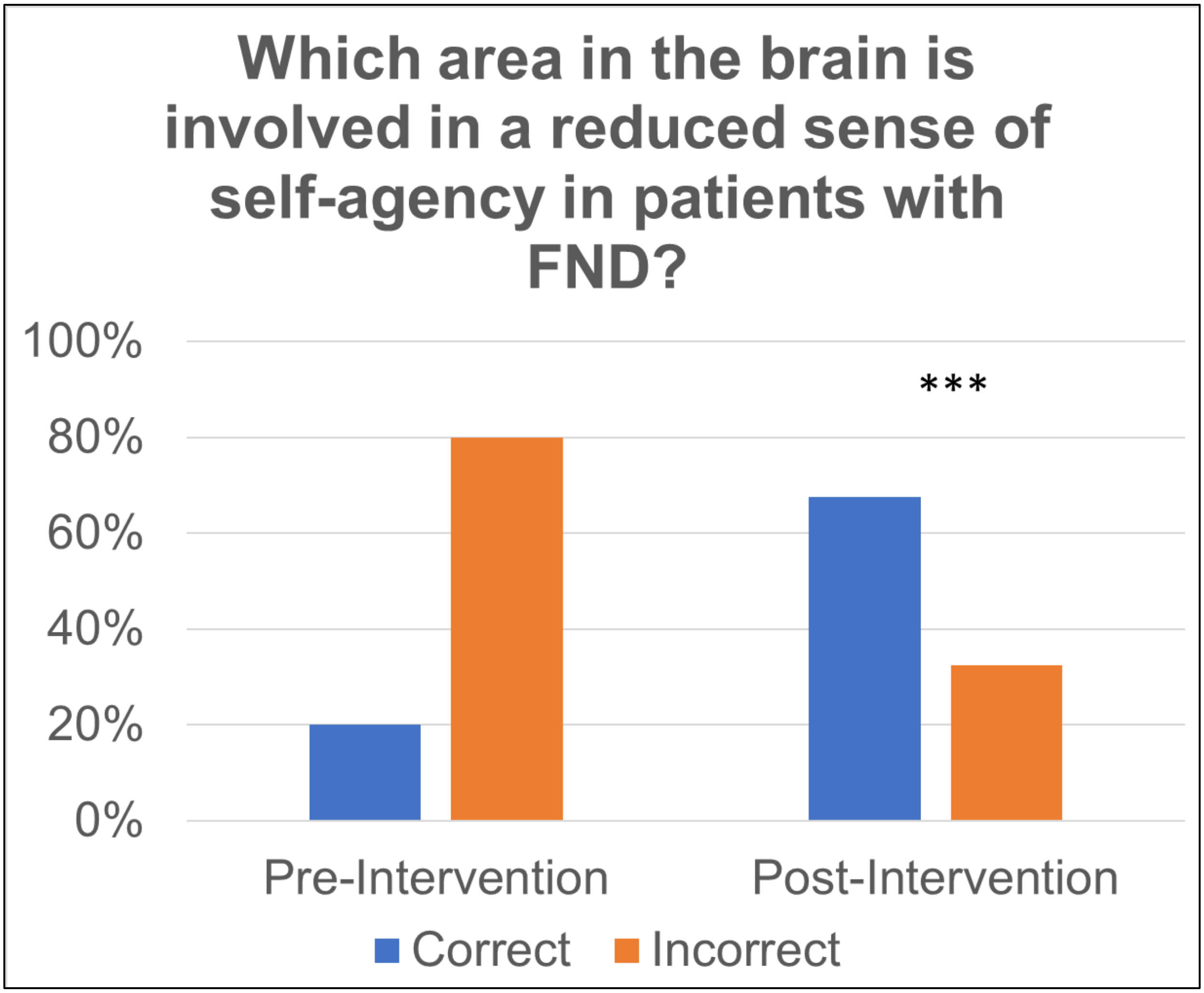


Figure 2. Multiple-choice item assessing neuroscience content retention before and after the educational intervention. ***p<0.001. Statistical test: McNemar's test

Conclusion: An online neuroscience-based educational intervention was effective for increasing clinician knowledge about FND as well as comfort with diagnosis delivery and treatment options. Web-based formats may be a viable and cost-effective approach for disseminating neuroscience-based patient education strategies to clinicians.

References:

1. Louw, A., Zimney, K., Puentedura, E.J. and Diener, I., 2016. The efficacy of pain neuroscience education on musculoskeletal pain: a systematic review of the literature. Physiotherapy theory and practice, 32(5), pp.332-355.

2. Medina, M., Giambarberi, L., Lazarow, S.S., Lockman, J., Faridi, N., Hooshmad, F., Karasov, A. and Bajestan, S.N., 2021. Using patient-centered clinical neuroscience to deliver the diagnosis of functional neurological disorder (FND): results from an innovative educational workshop. Academic Psychiatry, 45(2), pp.185-189.

DEVELOPMENT AND TESTING OF A VIRTUAL REALITY APPLICATION FOR THE MANAGEMENT OF PATIENTS WITH PERSISTENT POSTURAL-PERCEPTUAL DIZZINESS (PPPD)

Trevor Russell (The University of Queensland, t.russell@uq.edu*),* *Tjerk Lagrand*, *Dharsha Petrie, Dharsha Petrie, Dharsha Petrie, Dharsha Petrie, Atiyeh Vaezipour*

Objective: To co-design and test a virtual reality application to assist with the management of patients with Persistent postural-perceptual dizziness (PPPD), a vestibular disorder within the spectrum of functional neurological disorders.

Background: There is increasing evidence to support the inclusion of motion desensitization and graduated exposure to triggers in the management of PPPD.[1] Virtual Reality (VR) may provide an ideal environment to provide both of these therapeutic elements.

Methods: This is a two-part study: In Part 1, a VR application for the management of PPPD was co-designed. A three-step design process was utilized with initial prototyping and wireframing informed by clinical needs (neurologists, physiotherapists), human-centered technology design experts and a VR software developer. Clinicians and consumers trialed the prototype and provided feedback to iterate the design ensuring it was fit for purpose.

Part 2 will investigate the efficacy of VR in addition to a 12-week Vestibular Based Rehabilitation Therapy (VBRT) program. Twenty consenting participants with PPPD will be randomized to receive either VBRT alone or VBRT combined with VR. Outcomes including the Dizziness Handicap Index (DHI) and others will be collected pre-treatment, after 12 weeks, and after 24 weeks to estimate the effect size of the combined intervention.

Results: A fully immersive (head mount display) VR application has been developed and trialed by clinicians and consumers to provide graduate exposure to visual motion and head-body movement across six, increasingly complex levels. The application requires the participant to recognize target objects in a 360 degree virtual environment, and target these objects by moving their head to focus a pointer onto the object for a specific period of time. The six levels of complexity progress from presenting simple stationary objects with high contrast backgrounds, to presenting complex objects in visually challenging environments (such as a supermarket), while in motion. This presentation will provide a demonstration of the novel VR application and will outline the protocol of the pending clinical trial.

Conclusions: A VR environment that has been co-designed by neurologists, physiotherapist, academics, human-centered design experts, software developers and consumers has been developed which is both acceptable to clinicians and consumers and fit for purpose for the management of PPPD. This presentation will provide a demonstration of the novel VR application and outline the protocol of a pending clinical trial to test its efficacy.

References:

1. Popkirov S, Stone J, Holle-Lee D. Treatment of Persistent Postural-Perceptual Dizziness (PPPD) and Related Disorders. Curr Treat Options Neurol. 2018;20(12). doi:10.1007/s11940-018-0535-0

PRELIMINARY REPORT OF A SYSTEMATIC REVIEW OF PATHOPHYSIOLOGICAL STUDIES IN ILLNESS ANXIETY DISORDER / HYPOCHONDRIASIS

Andrew J. Guthrie (Massachusetts General Hospital, ajguthrie@mgh.harvard.edu*), Sara Paredes-Echeverri, and David L. Perez*

Objective: To perform a systematic review of the available pathophysiology literature in DSM-5 Illness Anxiety Disorder (IAD) and DSM-IV hypochondriasis.

Background: Pathological health anxiety is an excessive preoccupation with having or acquiring a serious illness for at least 6-months. To date, the pathophysiological mechanisms underlying IAD / hypochondriasis remain incompletely understood.

Methods: The study in PROSPERO (ID # CRD42022303294) was registered. PubMed, PsycINFO and Embase were searched from 1/1/1990 to 12/31/2021 for the search criteria: "illness anxiety disorder" OR "hypochondriasis" OR "health anxiety" OR "illness anxiety disorder”. Following duplicate record removal, A.J.G. and S.P.E. independently screened title and abstract for the inclusion of case-control, cohort/cross-sectional, or case-series with at least five participants meeting diagnostic criteria for IAD per by DSM-5, ICD-11, or Hypochondriasis per DSM-IV and ICD-10, established by clinical interview (structured or unstructured) or scale based cutoffs. Exclusion criteria were studies that only used self-report questionnaire data, treatment trials, and pediatric cohorts. D.L.P. arbitered discrepancies, followed by complete text review.

Results: There were 8,178 records pulled from databases, and n=2,100 screened. Of these, 63 complete papers were reviewed, with 20 articles meeting inclusion criteria. The investigational (non-mutually exclusive) approaches of the available literature included: behavioral (n=15), autonomic/interoception (n=5), neuroimaging (n=3), electrophysiology (n=1), and serological (n=1).

Conclusion: Overall, the preliminary findings in this study are indicative of a considerable need to comprehensively investigate the neurobiology of pathological health anxiety. This topic is particularly noteworthy given the growing interest and economic burden attributed functional neurological disorder and the broader DSM-5 category of Somatic Symptom and Related Disorders.

BELL'S INDIFFERENCE: THE IMPORTANCE OF PHYSICAL EXAM

Julio Quezada (Children's Mercy Hospital, jfquezada@cmh.edu*)*

An 18-year-old female presents to pediatric emergency room with a two-day history of left sided weakness and numbness. Symptoms started with left tongue numbness, followed by left facial droop and drooling. The day of hospital visit, she developed numbness that involved her entire left hemi body. Her school nurse noted she was weak on her left side and had difficulty walking. Additionally, she reported blurry vision in her left eye, dizziness, nausea and difficulty with coordination. She has a longstanding history of migraines and a family history (brother) of autism and epilepsy. They moved to Kansas City within the prior three months, due to mom being a victim of intimate partner violence. In Kansas City, they were living with a friend, but the home environment became hostile when a gun was brought home by the family friend, they moved out to a homeless shelter. This last move happened about two weeks prior to symptom onset. Patient also reports having no friends at school. In the emergency room, she was diagnosed with functional neurological disorder due to the exam findings of left sided giveaway weakness that resolved with distraction, normal finger to nose, and numbness in her face along with a subtle left facial droop. Physical exam done during neurology consult was concerning for prior findings, but also for decreased/slow blinking on the left eye, decreased strength of left upper eyelid, and mildly abnormal gait (swaying side to side). She also reported a history of food tasting different, having had a "cold" one week prior, and admitting to high stress at home. Due to concern for Bell's palsy and functional hemiplegia, a brain MRI was obtained that revealed contrast enhancement of the tympanic segment of cranial nerve 7 [Figure 1], favored to reflect inflammation. The patient was diagnosed with Bell's palsy and started on a steroid taper. She was also diagnosed with functional hemiplegia and had a good acceptance of the diagnosis. She was referred for CBT therapy and continued follow up with neurology.

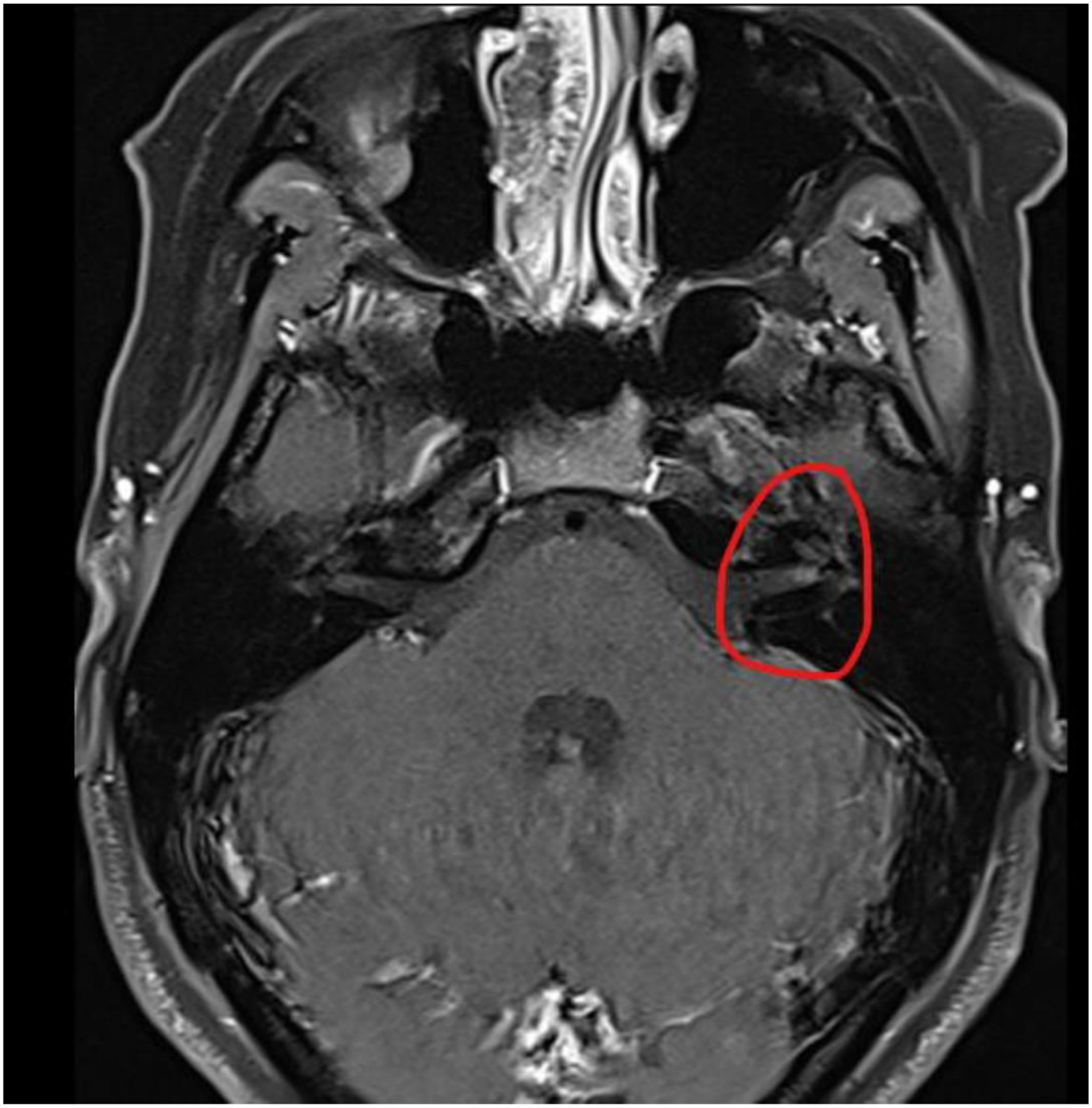


Figure 1.

This case reflects the importance of performing a thorough physical exam in patients with suspected functional neurological disorder. It highlights the fact that FND is not protective of other conditions and may coexist with other conditions that should also be addressed. If unchecked, our patient would have run the risk of long-term neurological sequelae of untreated Bell's palsy, along with risk of poor acceptance of FND diagnosis.

IMPROVING ACCESSIBILITY FOR FUNCTIONAL SEIZURE PATIENTS IN AN OUTPATIENT SPECIALIST CLINIC: PATIENT CHARACTERISTICS AND OUTCOMES

Lana Higson (Monash University Central Clinical School, lana.higson@monash.edu*), Walter Hipgrave, Tobias Winton-Brown, Terence O'Brien , Genevieve Rayner, Rubina Alpitsis*

Objective: To perform an audit of the first 12-months of clinical operations to assess the feasibility of our public outpatient clinic for functional seizures.

Background: Functional (psychogenic non-epileptic) seizures are common, costly, and disabling. We initiated a public outpatient clinic for the assessment and treatment of functional seizures, linked to a major comprehensive epilepsy centre in Melbourne, Australia.

Methods: Clinical notes for the first 12 months of the functional seizures clinic were systematically reviewed with data compiled for referral pathways, clinic attendance, clinical features, treatments, and outcomes.

Results: Of 88 new functional seizure patients, fewer than 10% were non-attendees. Most were diagnosed by a seizure captured during video-EEG monitoring and accepted the diagnosis. Most were having seizures at least weekly, with little sense of control and significant impairment. The majority of individuals had significant psychiatric and medical comorbidity. Predisposing, precipitating, and perpetuating factors were readily identified in >90% of cases. Of 52 patients with follow-up data, more than 90% were stable or improved.

Conclusion: The Alfred functional seizure clinic, as an early example of a public outpatient service for functional seizures, is feasible and potentially effective.

RE-PROGRAM: THE EVALUATION OF A BRIEF INTERVENTION PROGRAM FOR PATIENTS WITH FUNCTIONAL SEIZURES

Higson L (Monash University, lana.higson@monash.edu*), Winton-Brown T, Rayner G, Alpitsis R, O'Brien TJ*

Objective: To retrospectively evaluate Re-PROGRAM, a novel, brief intervention for functional seizure patients in an outpatient setting.

Background: Functional seizures are associated with major disability, increased mortality, and costly healthcare utilization. There is a paucity of targeted evidence-based interventions that reliably offer improved outcomes for functional seizure patients.

Methods: Thirty patients with functional seizures participated in a novel intervention program between August 2020 to January 2022 at the Alfred Hospital Functional Seizures Clinic. The evidence-based intervention consisted of five one-hour consecutive weekly appointments via Telehealth, where psychologists engaged patients in seizure-management skills, lifestyle modification, and behavioral activation strategies. Following the intervention, patient feedback was collected using a 24-item self-report pre-post intervention comparison questionnaire. The average time from program completion to survey return was 218±157 days.

Results: All patients enrolled in Re-PROGRAM completed the scheduled sessions. Of the individuals who returned the post-intervention questionnaire (n=15), 100% reported an overall improvement in their condition. Over 87% of individuals reported a greater ability to control their seizures and an improvement in quality of life, with all but one reporting a reduction in seizure frequency. Most patients (93%) reported that their "life had changed" as a result of the program, and all patients indicated that they would recommend the program to others. Approximately one-third of patients (33%) reported a reduction in healthcare resource utilization since completing the intervention.

Conclusions: This retrospective evaluation demonstrates the feasibility and acceptability of RePROGRAM as a brief intervention for individuals diagnosed with functional seizures delivered in a clinical outpatient setting and warrants further investigation in larger scale, controlled studies.