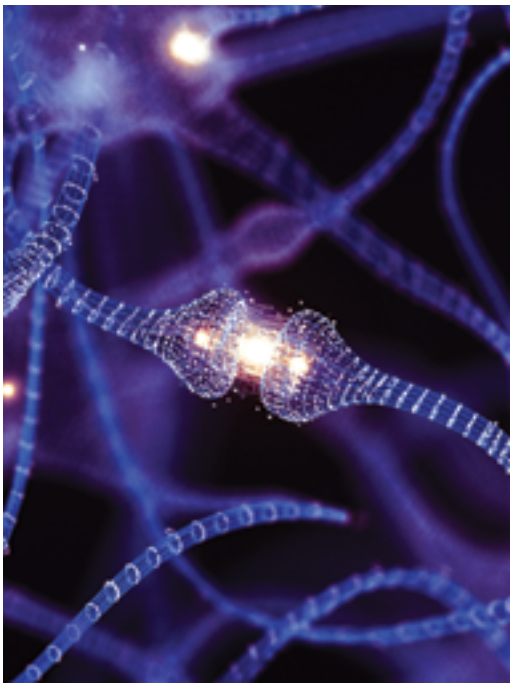

A false dichotomy: Functional gait overlay in neurological disorders

Stephanie Thomson, Isabella White, Rudy Goh, Stephen Bacchi, Luke Collins

CASE

A woman, aged 35 years, presented with new symptoms of sudden onset left lower limb paraesthesia (without sensory loss), gait abnormalities and escalating fatigue. Over several days, the paraesthesia had fluctuated with overall progression in a non-continuous fashion, and her gait had changed, with knee buckling and a tendency to limp on the left leg. These new symptoms were in the context of a previous diagnosis of a clinically isolated syndrome, defined as a single episode of demyelination, similar to that which can be seen in multiple sclerosis (MS), but which does not yet meet full criteria for MS. This was characterised by one episode of left-sided optic neuritis 12 months prior, with work-up at that time revealing a single unmatched oligoclonal band and magnetic resonance imaging (MRI) showing non-specific white matter abnormalities. On examination, the demonstrated gait was variable, alternating between left-sided antalgic limping and left-leg dragging with knee buckling. She could complete tandem gait with some mild unsteadiness but without overbalancing and she was able to hop on either leg. There was give-way weakness (initial resistance followed by sudden loss of strength) throughout the left upper and lower limb when testing power with intermittent bursts of normal power. Hoover's sign (resolution of hip extensor weakness on contralateral hip flexion against resistance) was positive.[1] The remainder of the limb neurological examination, including tone, coordination, reflexes and sensory testing, was normal.

QUESTION 1

What are the features of a functional gait disorder?

QUESTION 2

What is meant by functional overlay in neurological disorders?

QUESTION 3

How should functional overlay influence work-up and diagnosis for neurological disorders?

QUESTION 4

How should functional overlay be managed?

ANSWER 1

Functional neurological disorder (FND) refers to motor, sensory or cognitive symptoms that arise from disordered functioning of neural networks rather than identifiable structural abnormalities. Functional gait abnormalities are one possible manifestation.

FND, in which symptoms and signs manifest without conscious intent, is entirely distinct from factitious disorders and malingering, in which symptoms and signs are produced volitionally. Additionally, FND is not a diagnosis of exclusion. The diagnosis of FND is a positive diagnosis based on the presence of physical examination findings, in particular those that demonstrate inconsistency between voluntary and 'automatic' states (such as gait while focusing on walking as opposed to gait while distracted by performing arithmetic).[2] Functional gait disorders can take a variety of forms (Table 1) but have several common characteristics and positive physical examination findings that might aid in diagnosis (Table 2; Figures 1–2).[3–5]

ANSWER 2

Functional neurological symptoms can be present in up to 12% of patients with other neurological disorders.[5] These functional symptoms are often described as a functional overlay. Rather than being mutually

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Table 1. Common patterns of functional gait disorder

Pattern	Characteristics
Slow-hesitant	Excessive or uneconomical slowness of walking. May have excessively wide base without true ataxia
Astasia-abasia	Refers to inability to stand or walk despite normal leg function while supine. Typically occurs with staggering or bouncing movements where the patient veers and lurches from object or person and catches themselves at the last moment
Monoplegic/dragging	The entire leg drags from the hip like a so-called 'sack of potatoes' with the forefoot remaining in contact with the floor throughout the gait cycle. This is inconsistent with pyramidal leg weakness in which circumduction of the affected leg is expected
Bouncing or knee-buckling	Buckling of the knee without falling or uneconomical squatting during gait
Limping or antalgic	Might have inconsistent or variable limping or antalgic pattern gait, particularly in the absence of pain

Table 2. Selected physical examination findings supportive of functional gait disorders

Physical examination manoeuvre	Finding supportive of functional gait disorder	Notes on performance and interpretation
Dual task while walking	Improvement in baseline gait while distracted	A variety of dual tasks might be undertaken including mental arithmetic, reciting the months of the year backwards, or performing physical gestures suggested by the examiner (eg rapidly alternating touching thumb to other fingers)
Tandem gait	Pronounced side-to-side wobbling/windmill-like movements of arms (Figure 1) without loss of balance. Improvement in baseline gait	Exaggerated truncal sway without falling or side steps is supportive of a functional gait disorder. Watching videos of such functional gaits might be informative and are available at the cited references[2,5]
Walking backwards	Significant improvement of gait abnormality	It should be noted, however, that there are several gait abnormalities due to other neurological disorders that can have variability as a characteristic of their presentation (eg task-specific dystonia only occurring while walking forwards)
Shoulder tap test[4]	Retropulsion without application of posteriorly directed force (Figure 2)	When posteriorly directed force on a patient's shoulders results in retropulsion, this sign is supportive of conditions such as Parkinson's disease. In this modified test, the shoulders are tapped from above, without posteriorly directed force

exclusive, having a neurological disorder might predispose one to develop functional neurological symptoms (eg functional seizures in epilepsy).[6]

ANSWER 3

Given that functional neurological symptoms might coexist with other neurological disorders, work-up directed towards other possible diagnoses might still be warranted.[7] For example, in the present case, it is possible for one to have a small demyelinating lesion causing sensory change, which then triggers a functional gait disorder. Even when another underlying condition is possible, it is still necessary to acknowledge functional symptoms when present, and to acknowledge uncertainty about underlying diagnoses while work-up is ongoing.

ANSWER 4

FND treatment begins with an accurate, non-judgmental discussion of the diagnosis.[8] Useful resources for patients, families and healthcare providers include https://neurosymptoms.org/en, which is prepared in conjunction with one of the world experts on FND, Professor Jon Stone, and FND Australia (https://fndaustralia.com.au). The general

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Figure 1. Windmilling' response on tandem gait. This response is suggestive of functional gait disorder.

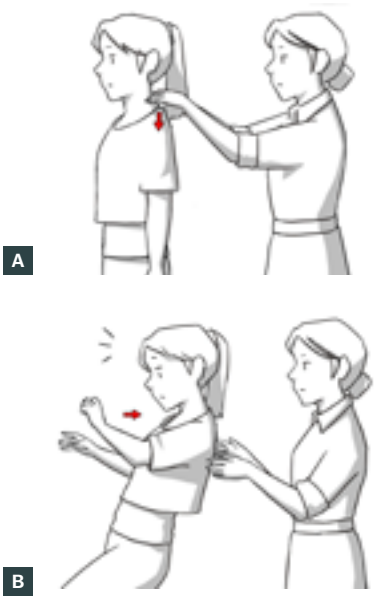

Figure 2. Shoulder tap test. (**A**) Demonstrates the direction of force that should be applied. (**B**) Demonstrates retropulsion suggestive of functional gait disorder.

Box 1. Proposed management strategies for functional neurological disorder

Establish two-way communication and engage patient in their own treatment

Explain diagnosis with clarity using principles of inclusion and positive clinical features rather than exclusion of alternative pathology

Treat co-existing condition(s) such as migraine, chronic pain, anxiety or depression

Employ a multidisciplinary approach to developing individualised management plans within a biopsychosocial framework, including:

- neurological assessment and management of any comorbid neurological conditions
- general practice
- physiotherapy
- occupational therapy
- psychotherapy.

Consider the limited role of psychopharmacology:

- in the treatment of comorbid mental health disorders if present
- when selecting a serotonin reuptake inhibitor and selective noradrenaline reuptake inhibitor for persistent postural perceptual dizziness (benefit shown in uncontrolled trials)
- when stopping antiseizure medications for functional seizures.

Treatments with no proven benefit include:

- transcranial magnetic stimulation for functional motor disorder
- botulinum toxin for functional tremor.

practitioner has a pivotal role in the longer-term management of patients with FND. Allied health, especially physiotherapy, might also play a key role. Psychotherapy might be beneficial in the presence of psychological and/or psychiatric comorbidity. Functional overlay can be managed similarly, in conjunction with management of the other neurological disorder (Box 1).[9]

Case continued

MRI of the brain and whole spine was stable with no new lesions and no contrast enhancement. Based on the clinical presentation and examination findings, a diagnosis of functional gait disorder and functional sensory symptoms was made. The patient was educated about FND and informed of the significance of her physical examination findings, including the variability in her gait and the presence of functional signs such as Hoover's sign. She engaged with a physiotherapist experienced in managing FND. At her routine six-month follow-up, her surveillance imaging remained stable, and her symptoms had significantly improved. There were no residual abnormalities affecting the upper limb though she continued to experience intermittent left leg sensory abnormalities and occasional gait changes when tired. She had made good progress in developing awareness of situational triggers for her symptoms and automatic behaviours to help improve her walking.

Key points

- A functional gait disorder is a clinical diagnosis based upon the presence of positive physical examination findings, including the presence of variability or inconsistency.
- Functional neurological symptoms often co-exist with other neurological disorders, which might be referred to as functional overlay.
- Like any other disorder, making an accurate diagnosis, counselling and instigation of treatment (in particular, physiotherapy) can help patients with functional neurological symptoms.

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